



Regina Catholic Schools

Innovation and Excellence in Education:

21st Century Learning: Tinker Tub Project

Nominated by:

The Board of Education for the Regina Roman Catholic
Separate School Division #81

Submission For:

The Premier's Board of Education Award for
Innovation and Excellence in Education

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Introduction

Regina Catholic Schools believes its primary responsibility within a faith-based educational system is to develop life-long learners and engaged citizens who understand their place and social responsibility in a 21st Century world. Specifically, the Board of Education for Regina Catholic Schools has established a strategic plan for the division focused around four primary commitments to students and families: a commitment to nurturing Catholic communities of faith, developing literacy and numeracy, providing equitable opportunities and transitions for students, and promoting essential skills and practices in 21st Century education. (Board Policy 1 – Division Foundational Commitments and Board Strategic Plan)

This award application focuses on a division-wide innovative inquiry opportunity – The Tinker Tub Initiative. Inspired by the excitement and success of Maker Spaces, this on-going collaboration project supports the pillar of “Essential Skills and Practices in 21st Century Education” and the Board’s commitment to students that they will develop and share their skills, gifts, and knowledge. In this project, students lead their learning through exploration and inquiry within a safe, collaborative setting, becoming knowledge curators and creators, not merely knowledge consumers.

Program Goal

The Board of Education recognizes that our students operate in a technology-rich and rapidly changing world. Shifts in technology and the impact of globalization require educators to employ innovative instructional strategies grounded in best practice pedagogy to ensure student engagement in “real-world” challenges and experiences.

Increasingly, the careers in which our students will engage do not currently exist (Krueger, 2017, ISTE Conference). How are we going to prepare students for the future? What skills do students need to have today that will migrate to a future that is uncertain? How can classrooms cultivate student curiosity, initiative, creativity, imagination, collaborative skills, as well as critical thinking and problem-solving abilities while still nurturing integrity, persistence and good citizenship?

In response to these queries and in support of the Board’s Strategic Plan, division personnel examined the “4C’s” encompassing learning and innovation skills outlined in the framework for 21st Century Learning. Developing the skills of critical thinking, communication, creativity, and collaboration as well as the ISTE (International Society for Technology in Education) Standards for Students support the goal of cultivating empowered-learners, innovative designers, computational thinkers, knowledge constructors, and digital citizens. The result was the development of the Regina Catholic School Division (RCSD) ‘Tinker Tubs.’ These mobile classroom resources and project kits provide a framework for integrating the essential skills for 21st Century learning into our classrooms. It is not only about innovation in teaching and learning, but about also about what will “empower students to learn ‘how-to-learn’ and to engage them in continuous improvement (Canadian Library Association, 2014, p. 4)

Program Description

The Tinker Tub Initiative provides classroom teachers the opportunity to work collaboratively with curriculum experts to develop interdisciplinary inquiry projects, essentially travelling makerspace kits, which engage learners in STEAM (Science, Technology, Engineering, Arts, and Math) activities. Teachers engage, model and facilitate 21st Century learning opportunities through the strategies of discovery and exploration. Commencing with a project inquiry, students utilize the materials and task cards, to guide the process of planning, exploring, assembling, disassembling and discovering through hands-on experimentation. This inclusive and collaborative learning supports a diverse variety of student interests and intelligences. This instruction resource benefits not only the classroom; but often makerspace events are coordinated to engage multiple grades, teachers, parents, and community partners creating a powerful learning



community. Within this safe space, students are encouraged to imagine, experiment, fail, and reimagine through problem solving. Teachers facilitate side-by-side learning and utilize assessment conversations, observations, and products to inform interdisciplinary outcomes within the curricular areas of science, technology, math, and the arts. Information and Library Services rotate circulation of the themed Tinker Tubs and measure usage while building capacity across the division. Self-reflection forms monitor student engagement and learning, and teachers provide feedback on the effectiveness of the resource kits and strategies.

To effectively and purposefully develop and integrate the Tinker Tubs into existing curricula, several RCSD departments and personnel within curricular areas collaborated: Education Technology, science, math, English language arts, practical & applied arts, and Information & Library Services. The result was the formation of eight Tinker Tubs based on themes which promote critical thinking, communication, creativity, and collaboration. The themed kits currently in circulation are as follows: 1) Breakout Edu, 2) Architecture Goes to School, 3) Rube Goldberg, 4) Media Creation, 5) Circuit Creations, 6) Coding and Robotics, 7) Inventions and Recycled Materials, 8) Tinker Lab and Breaker Space.

Each of the tubs created build learner capacity and the skills necessary to meet the demands of an ever-changing environment of the 21st Century. Six of the Tinker Tubs have multiple duplicate tubs that allow five schools simultaneous use of an identical themed kit. Two kits are school-based and may be set up on a permanent or semi-permanent basis.

Through the development and implementation of Tinker Tubs, students have the potential to accelerate and deepen learning. Educators become not only facilitators but also activators and change agents (Fullan, 2012, p. 47) by providing a structure that encourages students to take charge of their own learning, cultivating their intrinsic motivation to contribute to the learning community, a community of learners that will now live, work and lead us into the 22nd century.

Direct Board Influence and Participation in the Innovation

As referenced in the introduction of this application, *RCSD Board Policy 1* outlines a commitment to the development of essential skills and practices in 21st Century education as part of the Division Strategic Plan in support of the goal that “students will have a foundation for success” evidenced through “continuous academic success” and “proficiency in technology”. This goal is articulated in the RCSD Board of Education SMART goals for this commitment:

1. 100% of all RCSD schools will have a Learning Improvement Plan goal that focuses on the improvement of technology integration into instruction.
2. 100% of RCSD teachers will have accomplished a C2PG goal that focuses on the Essential Skills and Practices in 21st Century Education using the ISTE Standards for Educators.
3. 100% of teachers will incorporate into their long-range plans the Sask. Ministry of Education Digital Citizenship continuum.



In addition to establishing the vision and mission for participation in innovation and excellence, the Board has demonstrated its commitment to this project by directing financial supports necessary to actualize this project. In a time of increasing demands on budgets, RCSD has continued to support the staffing of teacher-librarians, with an allocation in every one of its 27 elementary schools. The role of the teacher-librarian is integral to the creation, distribution and management of the Tinker Tub Initiative as they work directly with teachers and the Information and Library Services Department and curriculum consultants in



the development and deployment of this initiative. Further to the support of teacher-librarian allocations, the Board recognizes the value of curricula experts in the positions of coordinators, consultants and coaches who work alongside classroom teachers with sufficient support resources and professional development for these instructional leaders to promote best practice pedagogy for 21st century learning.

Finally, the Regina Catholic Board of Education have actively participated in Maker Space events and in May 2019 had an opportunity to observe, participate and interview students engaged in Tinker Tub inquiry projects.

Innovative Nature of the Program

Previous Approach

Before this initiative, most classrooms used traditional materials (textbooks, some online resources, and distinct subject blocks) as they taught curricula. Curricular leaders had begun work on kits, which integrated subjects, yet materials were generally presented in a time-honored manner (teacher giving information to students). The desire to leverage the instructional strategies and pedagogy used by teachers creating Maker Spaces led to the creation of Tinker Tubs and authentic 21st Century teaching.

While Maker Space challenges did exist, they did not always align tightly with curricula, and teachers were often isolated. Division leaders wanted to support these innovative thinkers and create a maker mindset that would align with curricular outcomes and permeate division schools throughout the year. Through an interdisciplinary approach, Tinker Tubs would support teachers and students in building capacity in 21st Century instruction and learning.

Students think critically as they face inquiry questions around curricular outcomes. Engaged, they are eager to tackle challenges presented. Students learn in new ways as they are immersed in innovative teaching. From traditional teaching with the occasional use of single or short-term Maker Space challenges, the division has moved to student-centered learning with the development of 21st Century-focused Tinker Tubs.



Program Details

Tinker Tubs are designed as “catalysts for engagement with information, ideas, thinking, and dialogue. Reading thrives, learning literacies and technology competencies evolve, and critical thinking, creativity, innovation and playing to learn are nourished.” (Canadian Library Association, 2014, p. 6) When introducing Tinker Tubs into the classroom, the creation team focused on learning targets that would:

- Improve student engagement;
- Encourage active learning directly linked to curricular learning outcomes;
- Address the diverse needs of all learners;
- Allow for increased ongoing feedback to students (assessment for learning) and gather evidence of learning (assessment of learning);
- Allow for student ownership of learning, independence, and responsibility;
- Provide opportunities for students to leverage collaborative skills;
- Engage students in inquiry within the context of learning communities.

Each Tinker Tub focuses on unique aspects of a maker mentality as students discover, explore, create, invent, and share. Critical thinking is the core. Teachers link learning across curricular areas as students plan, conduct research, design solutions, and evaluate the process and outcomes. With sample task cards at differentiated levels of difficulty, students realize different solutions exist; there is no ‘right’ answer.



Planning sheets and journals in each Tinker Tub require students to record their thinking and the process used to reach solutions. The last area on the planning sheet requires improvement or revision. For example, while engaged in a doodlebot task (robotics), partners are challenged to revise their design so the doodlebot creates a smooth/dotted path. Through revision, students learn to embrace ambiguity. They realize that trial and error are part of learning; perseverance and critical thinking in the face of challenge are sought-after traits.

Program Details – Methods/Strategies & Action Steps

In the 2016/2017 school year, division curricular leaders observed excited student response to a few teachers' Maker Space learning environments. Interest in directing this work at a division level began. These leaders had several questions:

- Given the division emphasis on interdisciplinary teaching, how could Maker Spaces provide opportunities for interdisciplinary learning with their innovative learning environments?
- How could a Maker Space mentality be taken large scale and promoted division-wide, while maintaining the integrity of required learning outcomes?
- How could RCSD support schools with the fiscal and physical constraints of implementing and operating a Maker Space?
- How could any project begun continue the direction of the division in emphasizing ongoing formative assessment, fidelity to curricula, and innovative opportunities for learning?

Division curricular and technology leaders worked with elementary teacher-librarians and the idea of generating Tinker Tubs began. Based on the interest in STEAM Tinker Tubs, these leaders would not only develop STEAM tubs, but would assure that they supported an interdisciplinary, inquiry approach to multiple curricular areas. Such subjects as the fine arts, language arts and career education would be included. Given division interest in improving math, science, and language arts (reading/writing) performance in provincial, Canadian (PCAP), and international (PISA) assessments, the Board approved the proposal for funding of collaborative planning and resources.

Research and development began. Division teacher-librarians each volunteered to be part of teams creating the tubs. Teams worked within a framework that ensured the integration of essential skills for 21st century learning (critical thinking, communication, creativity, and collaboration). As they targeted specific curricular outcomes, inquiry questions emerged and resources to support classrooms were purchased. The creative inclusion of language arts and other subject areas accompanied the STEAM targets, as did both formative and summative assessment tools. Finally, digital support resources with the support of Technology Services were created and uploaded to a school division webpage.

The hope was that each Tinker Tub would not only contain the materials to address STEAM innovation and creative thinking, but also expand the notion of what a Tinker Tub is. For example, a variety of written materials (e.g., books, articles) and writing prompts assist the teacher in targeting literacy outcomes. The extension component of a webpage for teachers became a key resource. Teachers have access to digital information, videos, and documents that are an integral part of the Tinker Tubs, showing teachers how to link tub activities to curricular outcomes, expand learning through process logs (literacy goals requiring them to ask, imagine, plan, improve, and create), create community connections, expand literacy through related literature, and use both formative and summative assessment. Over the three years, this webpage has become a resource that allows users to replicate the Tinker Tubs.

Tinker Tubs Created - Highlights

Media Creation: Using green screen technology, stop motion animation and digital storytelling apps and programs, students have opportunities to invent a wide array of digital maker projects. Examples include 'on location' weather reports, stop-motion animation book reports, and exploration of cultural diversity through digital storytelling.



Breakout Edu: Locks, books, games, and puzzles teach critical thinking, teamwork, and complex problem solving in all content areas. Multiple challenges presented to students teach core academic subjects and apply problem-solving strategies within a real world, collaborative context to solve problems of differentiated complexity and type.

Circuit Creations: Students use electronic circuits and kits to explore, create, move and manipulate objects.

Coding and Robotics: By introducing students to unplugged coding, coding online with apps, and then coding with robotics, students have designed such things as LED name tags and game controllers.



Rube Goldberg: Students create their own Rube-like contraption by taking a simple task and making it extraordinarily complicated (<https://www.rubegoldberg.com/rube-the-artist/>). Classmates and teachers have been in awe of such contraptions that ring a bell or drive a car into a cup.

Architecture Goes to School: With materials and tasks to support construction-based challenges (e.g., Rigamajig, paper structures, Lego challenges), students have designed and built devices that will move a pumpkin from one location to another, built weight-bearing bridges and built the tallest free-standing tower.

Inventions with Recycled Materials: Here, students use recycled materials to create new inventions. The beauty of this space is that it is nearly free! Resulting creations include building a raft that floats and creating a fashion design out of recycled materials.

Breaker Space & Tinker Lab: What can we do with misfit toys and broken electronics? Give these to students to disassemble and discover new possibilities. Student can use a breaker space to analyze how something works and to reinvent.

Year Two (2017/2018) saw the first distribution of Tinker Tubs, with accompanying training for school administrators, teachers, and students. The tubs were an immediate hit. Throughout the process, students and teachers gave feedback for improvement. As popularity grew, students engaged readily and schools began using Tinker Tubs for family literacy evenings.

Because the school division expectation was that teachers engage in curricular mapping, a year-long rotation schedule was created and shared in the spring. This facilitated teachers as they aligned their long-range plans with the Tinker Tub schedule. Response to this innovative support has been excellent.

Year three (2018/2019) had all elementary schools in the full implementation stage and included an exciting addition to the tubs - a career education curricular expansion. A Career Connections Flipgrid added to the division webpage highlights various careers, and uses community members, including parents, as presenters who talk about multiple aspects of their careers.

The RCSD Tinker Tubs have provided a path to integrate the essential skills for 21st century learning into our schools, while attending to multiple curricular areas beyond STEAM. They have offered an opportunity for each of us to work “collaboratively toward excellence.” (Canadian Library Association, 2014, p. 5)

Sustainability of the Innovation and Cost/Benefit Analysis



The clear direction established by the Board's Strategic Plan to develop essential skills for 21st Century learning provides the foundational rationale and financial support for the sustainability of the Tinker Tub Initiative with its focus of inquiry and project based learning opportunities for our students. This initiative although funded by the resource allocations of the Board, has also garnered the attention and support of community and educational partners, validating the necessity for such an ambitious and high cost project in terms of student engagement and "real-world" applications. The deployment of the Tinker Tubs is centralized to realize financial efficiencies. The eight themed kits are pre-scheduled and rotated throughout the division's twenty-seven elementary schools. This allows time for teacher-librarians and teachers to collaboratively plan for the integration of Tinker Tub activities into long-range interdisciplinary instructional plans. This makes the deployment of the Tinker Tub initiative streamlined and cost efficient while building instructional capacity.

Client Support for the Innovation

Division SMART goals are integrated into every school's Learning Improvement Plan. Action plans are developed at the school level and support is provided at the division level by the Student Achievement team consisting of curriculum coordinators, including the Coordinators of Information and Library Services, Curriculum and Instruction, Technology and Student Services and curriculum consultants in technology, science and math, arts education and literacy. The Student Achievement team works collaboratively as drivers of best practice pedagogy and professional development and innovative projects such as The Tinker Tub Initiative. The Student Achievement Team also examines school division data and creates A3 action plans around the ESSP for the division. These action plans examine root causes, assess risks and needs and allocate resources and supports accordingly. The division focus on improved literacy and numeracy skills, as well as essential skills and the broad goals of learning (life-long learning, engaged citizenship, and social responsibility) are aligned with the sector goals. The collaborative process around the data analysis and construction of A3 plans creates a high level of accountability.

Partnerships in the Support of the Innovation

The division has developed an extensive list of community partnerships including school community councils, local businesses, Sask Polytech and the University of Regina who have provided support for maker space equipment and/or events. Community partners serve as mentors and collaborators as outlined in the Career Connections FlipGrid extension and as judges at maker space events. Most notably, Follett Learning, an educational resource company, recently named Regina Catholic Schools the Grand Prize Winner of the 2019 Follett Challenge for Innovative Educational Programming for 21st Century Skills. The 60,000 dollars of Follett products and services will support the expansion of the project to sustain and expand existing Tinker Tubs and to drive the creativity collaboration of teachers and teacher-librarians under the direction of Information and Library Services, Education Technology and Curriculum and Instruction personnel to create additional themed tubs.

Evidence of Improved Student Achievement

The impact of this initiative is quantifiable in terms of student engagement and ultimately, student achievement. Division SMART goal data measuring student achievement around curricular outcomes is gathered around math problem solving and inquiry, as well as literacy – reading and writing. For the past five years, RCSD has seen an increase in student achievement in math at grades 1-8 in the division common summative assessment and increased achievement in high school math credit acquisition.

As outlined in RCSD 2017-2018 Annual Report, the Division SMART goals for grade level mathematics was that 80% of students in Grades 1-3 would be performing at or above grade level in the number strand. This goal was met for both Grade 1 and 2 with 88% of our Grade 1 and 82% of Grade 2 performing at or above grade level, as determined by our year-end summative assessment on the number strand. Grade 3 fell just short of this goal with 77% of students performing at or above grade level on the number strand, a notable 6% increase from 2017 results. 65% of Grade 4 students, 68% of Grade 5 students, 64% of Grade

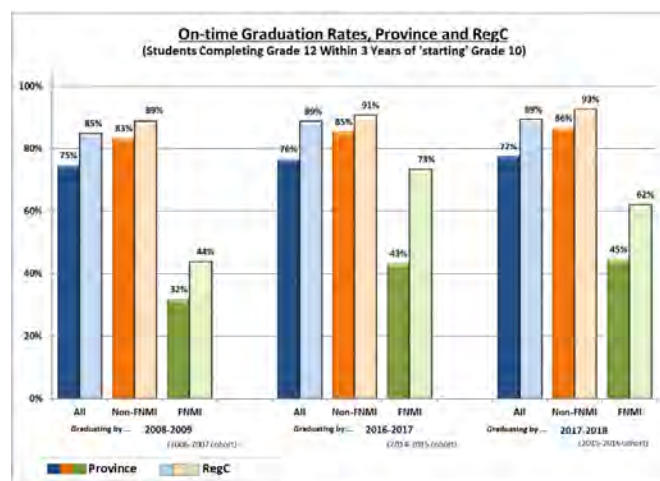


7 students and 62% of Grade 8 students were performing at or above grade level on the number strand. All grades with the exception of Grade 4 showed gains from 2016-17 data. Also, 76% of students in Grades 1-4, 5, 7, and 8 achieved 70% or greater overall on the year end summative assessment, a 1.1% increase in Division results from last year and an almost 10% increase over the past five years.

In 2018-2019 the provincial math rubric was used to gather data at grades 2, 5, and 8 for student achievement on the number strand. This baseline data year indicates that 74.4% of Grade 2 students were at or above grade level in the number strand, 68.1% of Grade 5 students and 72% of Grade 8 students. What the division is seeing is a gradual increase in math performance in grades 4-8 students, a target group for the Tinker Tub Initiative. It appears this STEAM and inquiry learning has provided a strong foundation for our students transitioning to high school as well. In 2017-2018, 96% of the division's grade nines successfully completed the grade nine mathematics program and this same cohort of students as grade tens (2018-2019) experienced a math credit acquisition rate of almost 90%, well above the sector goal of 80% and in achievement of the division math SMART goal of 90% of all high school math credit acquisition.

The Tinker Tub project also embeds literacy skills through the task cards which require reading, writing and the student engagement in reference materials. Regina Catholic has consistently demonstrated 80% or higher grade 1-3 benchmark targets in grades 1-3. Although below the sector goal of 80%, writing data collected around the Provincial Writing Rubric shows that in 2017-2018, 64% of grade fours, 68% of grade sevens, and 75% of grade nines were writing at grade level. 2018-2019 data was comparable at 64%, 62% and 70%, respectively. It is noteworthy that this data is currently above the provincial average.

In addition to math and literacy achievement, it is important to note that as the Tinker Tub Initiative is an interdisciplinary project, learning applications are made in science, practical and applied arts, and arts education in outcomes such as inquiry, communication, comprehension and responding, problem solving, and creation. Increased student engagement and increased achievement in these curricular areas all contribute to the bottom line – improved graduation rates. Regina Catholic achievement in OT Graduation Rates. Regina Catholic schools continues to improve overall OT Graduation Rates and make gains in FNMI graduation rates.



This achievement correlates with student and parental engagement in the learning process and the professional capacity of our instructional staff. This initiative supports transformational and pedagogical shifts observed through the teacher professional growth walk about/talk about process. Administrators are observing 21st Century instruction and learning in action.

The Tinker Tub Initiative has the potential to create a legacy of sustained change in professional practice to support student learning now and in the future. Our hope is continued improvement in on-time graduation rates, mathematics and science performances on

division level common assessments, provincial assessments and the PCAP and PISA, but ultimately the success of our students will be measured by their demonstration as life-long learners engaged in empowered citizenship.

