



The Challenge of Developing Resiliency in Rural Setting

Creating a Design Challenge for Grades 7 – 9 Students Living in Rural Contexts

Executive Summary

In December 2016, a planning team of senior administrators, shop teachers, and learning leaders met to design an initial district wide Maker Day for small school district in rural, interior British Columbia. They wanted to create a design challenge that was situationally relevant to grades 7 – 9 students and inclusive of students’ learning styles, gender, academic levels, trades and technologies’ skills, etc.

Introducing design thinking to students in grades 7 – 9 requires a great deal of thought and consideration since students at this age have reached a complex developmental stage of life (see table of characteristics in section—Setting the Stage).

Organization Background

The school district is located in a rural, mountainous setting where communities are directly impacted by their environment. It is one of the smallest districts in British Columbia and hosts small schools located in small communities connected by winding roads through mountainous valleys. Many residents have family roots going back many generations, typically in occupations directly linked with resource extraction. The majority of the students engage in outdoor activities, as there are limited organized community recreational or social activities. This means that the community uses recreational vehicles such as snowmobiles, ATVs; they camp, hike, canoe; and they generally engage with environment. Therefore, they position themselves in situations where changes in environmental conditions potentially puts them and their belongings at risk.

The Maker Day planning team consisted of local teachers and administrators, including:

- A Superintendent of Schools
- A Director of Instruction
- Two shop teachers
- Two learning support teachers

The Maker Day planning team consisted of key subject matter experts and innovators in their district and classrooms. These leaders were expected to support other teachers as they shifted their professional practice to include Maker pedagogy.

Setting the Stage

The planning team identified the need to build capacity amongst the students and teachers for design thinking, and to understand the connections between the Maker and the new ADST curriculum. Another goal was to develop a design challenge that aligned with research into the developmental needs of students in grades 7 – 9. The team drew on the work of Lawrence University in Wisconsin, which suggests following the developmental characteristics shared in the table below as an important consideration when planning for students in their early teen years (https://www.lawrence.edu/mfhe/www_dept_student_dean_sub_volunteer/Everyone/developmental%20characteristics.pdf)



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The design challenge was written in a way that honoured the development characteristics of grades 7–9 students identified in the section, Setting the Stage. Specifically, the design challenge and the design thinking process helped students to engage in social interaction, risk taking, action and movement.

| Early Teens Grades 7–8 (13–14 years) | | |
|--|--|---|
| <p style="text-align: center;">Physical</p> <ul style="list-style-type: none"> • May appear awkward as result of rapid physical growth • Experiencing the beginning of puberty • Differ greatly in rate of maturation • Need to become familiar with changing body with strong drives • Tend to tire easily • Have a high activity level and appetite • Enjoy cooperative games and competitive sports | <p style="text-align: center;">Social-Emotional</p> <ul style="list-style-type: none"> • Sensitive to their appearance • Establishing a personal moral code • Unsure of their place in society • Depend on their peer group to develop identity • Critical of their parents and home • May adopt extremes and fads in clothing, speech, handwriting and mannerisms • Form close one-to-one friendships • Enjoy small, peer-dominated group discussions • Have a strong desire to assert individuality and independence | <p style="text-align: center;">Cognitive</p> <ul style="list-style-type: none"> • Capable of high level of abstract thought • Beginning to think about their future life roles • Need time and freedom to engage in self-reflection • Are able to postpone gratification • Can plan ahead and organize tasks with little or no guidance from adults • Beginning to develop views about social issues |

Case Description

The planning team used Taking Making into Classrooms: A Toolkit to Foster Creativity and Imagination. All grades 7 – 9 students, and their teacher representatives, were invited to participate at a Maker Day hosted at the district’s largest and most central high school.

The planning team developed a design challenge with a focus on planning how the community responds to changes in the natural environment, such as the effects of climate change and weather-related disasters. The nature of the design challenge, with its focus on resilience, required students to think about potential environmental challenges impacting their region and consider how those challenges could be mitigated. The design thinking process as described in the toolkit promotes divergent, lateral, problem finding and disrupts the students’ rush to solve the challenge using their first ideas.

Knowing that some aspects of the design thinking process would frustrate the students, local experts were invited to help support the learning. The panel of disaster management experts (i.e., firefighters, RCMP, volunteer Search and Rescue personnel, and local mayors) helped the students tackle the design challenge. These experts could share real experiences and examples and help foster workable, yet innovative, solutions to the design challenge.

The students were encouraged to think big and take risks with their ideas. They demonstrated skill with the design thinking process and effectively used the design sheets to structure their thinking. The panel circulated around the room during the design thinking process and was available to ask and answer questions that would promote deeper thinking. The experts provided encouragement to the students, shared stories from the field, and offered suggestions for prototype improvement.



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As the students began work on their final sketches, the experts formed a panel along one side of the gym and waited for groups to pitch their ideas. If the sketch required more work, the group was invited to return to the panel after fleshing out the ideas and possibly redrawing the prototype. If the panel approved the initial design sketches, the students were provided with their Participant Kits, allowing them to start building their prototypes. Approximately two-thirds of the ideas were approved in the first pitch.

During the gallery tour portion of the day, students explained how their design prototypes addressed specific problems found in the design challenge, debriefed their learning with the organizers and local experts, and shared the personal reflections and insights that were developed during the design thinking process.

In an evaluation that students completed at the end of they day, they stated that they gained an understanding of the design thinking process, appreciated having an opportunity to learn in this manner, and expressed a desire to participate in similar the process again in the future.

The design thinking process aligned with the developmental characteristics of students at this age, and achieved the organizers goals of helping students to engage in social interaction, risk taking, action and movement, in the following ways:

| Developmental Characteristic | Elements of the Maker process |
|------------------------------|---|
| Social interaction | <ul style="list-style-type: none"> • Interviewing for empathy during the design thinking process • Sharing ideas and designs • Talking with experts |
| Risk taking | <ul style="list-style-type: none"> • Pitching ideas to the expert panel • Using the tools and materials as needed • Making timely decisions • Explaining solutions during the gallery tour |
| Action / movement | <ul style="list-style-type: none"> • Ability to move about the room and talk with the experts • Active participation during the building of prototype • Using authentic tools and materials during the building of the prototype |



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Solutions and Recommendations

The most important recommendations from the experience with School District 10 includes the need to:

- Identify a topic and problem scenario that is meaningful for rural students that links their curricular knowledge with their context and experiences. Student feedback during the day, the gallery tour and on the evaluation form confirmed that the challenge was appropriate, intriguing and engaging.
- Anchor the learning experience by making explicit connections to the curriculum
- Make sure that the connections with the learning and context are intentional and purposeful.
- Recognize that initially the design thinking process is frustrating and new. During the process the facilitator needs to be lively, helpful and encouraging
- Realize the build is where the students' learning is made visible BUT recognize the quality of the build is grounded in the quality of the design. This was evident in the quality and attention to detail of the prototypes and in the completeness of the design sheets and the passion with which the students shared their prototypes during the gallery tour.
- Ensure there are adequate tools and materials to support the prototyping and facilitate the making.
- Develop a safety plan based on the materials and tools that are used in the challenge.
- Debrief the learning with the students through the gallery tour as well as personal reflections on the design-thinking sheet. This is important for the event organizers and also for the students to speak to their own learning. The gallery tour offers opportunities for the students to speak to their process and their work. As people come to each table, students can explain their work, contributions, ideas, etc.

Current, Future or Related Challenges

The next steps for SD10 will be a workshop with teachers to scale the district's' understanding of design thinking and to develop "made in SD10" design challenges, relevant to the region, rural learning, and British Columbia curricular link.



Key Terms & Definitions

Design Challenge and its components: A design challenge puts design thinking into action—it's the prompt or provocation for an open-ended project that encourages students to ask questions, take initiative and think creatively. Creating a design challenge is a way for students to cycle through an entire design-thinking process at least once. Three primary ways to structure a design challenge include:

1. As an inquiry question
2. As a problem to be solved
3. As a scenario to play out

Developmental Characteristics of Grades 7 – 9 Students: Reference the resource (https://www.lawrence.edu/mfhe/www_dept_student_dean_sub_volunteer/Everyone/developmental%20characteristics.pdf).

Resiliency: Generally defined as the capacity to recover quickly from difficulties. Resilience can be developed to attend to emotional, social, physical, economic, etc. The issues that impact us at a personal, community, provincial, national, global level.

Rural Communities / Contexts: Cover an expansive geographic area with significant distance between individual schools, and has small numbers of students



Design Challenge: Living Proactively and Mindfully in a Complex World

Overview

People choosing to live in the Columbia Basin and our area of the Kootenays, live here for the lifestyle and a rural experience. Many of us who work in resource industries, tourism, eco-tourism, and the service sectors, spend our free time outdoors hiking, rock climbing, mountain biking, swimming in the lakes, fishing, and hunting. Part of living in a rural environment, is we pride ourselves on our resilience and sustainability. We grow food in our own gardens, feed our families with fish we have caught and food we have preserved, mushrooms we have picked, and berries we have foraged. We cut firewood to keep ourselves warm in winter.

What nature can provide sustains us. And we also recognize that occasionally, nature presents challenges. As much as we love nature and our environment, there are times we grapple with its forces.



For example, in Nakusp and New Denver this summer, bears become more frequent visitors, and in some cases, problematic. The beautiful fruit trees we enjoy, became attractants for the bears. Heavy rains in the spring cause mud slides like recent ones in Edgewood, Burton and Silverton that close local roads and impede access to food, health care, and impact our homes. As climate change impacts our region, winds are higher, and the power lines go down more often. Forest fires at West Arrow Park and southern Slocan Lake in 2008, ravaged the mountains, cut off power for days and hundreds of people were evacuated. As our forests become drier and more vulnerable, we now worry about fires each summer.

Our resiliency in creating school greenhouses, gardens and Farm to Table programs help. Our preparation with learning Ground Search and Rescue skills and First Aid skills help. When a snow storm hits, we shovel or plow snow for our neighbours, and when our community needs help, we step up.

Waiting till disaster happens is not what humans do. We prefer to be proactive.

Living in rural places means being resilient and thinking ahead. We know it is a better quality of life to thoughtfully plan and prepare. Human beings have a need for taking agency, for acting, and not being paralyzed. Being resilient and living in harmony with our environment—the bounty and the challenge—is what defines us as rural people.

Design Rationale

What does it mean to be prepared? As individuals, we need to think about how to make ourselves more responsible, and consider and plan for the challenges that come our way. With climate change, weather-related disasters—floods, mud slides, forest fires, power outages—are becoming the norm, and will become even more common in the future.

We, in our SD10 communities, need to ensure we are ready. We need to make sure that as individuals and families, we have our own disaster planning organized. In the 2016 wildfire in Fort Mac Murray, the people who survived best had already planned for their own safety and survival. They had prepared rather than were waiting for people to come to help them.

Resilience means being able to look at after ourselves. Knowing where the candles are when the power goes out, knowing that you have generator (with gas!) should the power be out for days, having wood heat in case there is no electricity, or blankets and a shovel in your car in the winter in case you have to dig out of a snowbank, or wait for roads to clear. That's being prepared!

While there are organizations in our communities to help such as RCMP, GSR, local hospitals and local governments, in disaster situations, we need to think locally and be part of the solution, not part of the problem.

Problem Scenario

Your team has been selected to design a tool and make a prototype or a solution that would help a community become more prepared and resilient in addressing some of the challenges that you may face from our interface with nature.



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Parameters

- Your design must be original and adhere to your design sketch.
- Your prototype must be no larger than one metre square. Think scale. If you are protecting fruit trees from bears, make the prototype to scale.
- To develop the prototype, you must use some of all the materials found in your participant group's kit.
- You can use materials found in the Appropriate Technologies Bar¹ and the Pantry to aid your group in the development your solution. Tools are available from the Tool Crib.
- You must make a reflection board that includes your updated design sketch, a description of how your prototype addresses the challenge, a reflection on the group process, and how your group navigated solving the problem.
- Your prototype must incorporate three (3) functional elements enabled by components from the Appropriate Technologies Bar, and your team must be prepared to explain how these components support your prototype.

Success will be determined by:

- Quality of the reflection board
- Degree to which your prototype addresses issues suggested in the design challenge
- Degree to which you have used the materials found in your kit
- Degree to which the functional elements from the shared Pantry enhance your prototype
- Describe to which you have accurately and carefully developed your prototype – is it to scale? does it model functionality? and display aesthetic quality?
- Degree to which you have measured and cut accurately, and fabricated carefully
- Degree to which your prototype aligns with your design sketch

Before your design prototype is approved, you must “pitch” your idea to the panel for one minute.

¹ This challenge requires three common areas with supplies and support for participants: Pantry (simple prototyping materials), Tool Crib (fabrication tools) and Appropriate Technology Bar Supplies for the Pantry and Tool Crib are outlined in the Maker Day Toolkit 2 (<https://commons.royalroads.ca/takingmaking/maker-day-2-0-toolkit/>).