The Oasis Skateboard Factory: Return to the One-Room Schoolhouse

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Abstract

How can you get young people interested in science and mathematics? What efforts are there to integrate the experiences of high school students into the things they need to do and learn in school? How can action sports, like skateboarding be used to teach science, mathematics, language arts, history and help at-rick and marginalized students to grow in their engagement and motivation in high school, as well as to graduate? This is in part answered at the Oasis Skateboard Factory (OSF) an alternative high school in Toronto, Canada. The factory, under the direction of founding teacher Craig Morrison, has enjoyed success since it opened in 2008. The OSF enrolls 25 students per semester and they earn academic credits as they develop their artwork, design and manufacturing skills through a skateboard-centric academic construction process. Additionally, students who are part of this academic program have a 95 percent graduation rate.

Keywords: curriculum, stem, action, science, physics, mathematics, skateboarding

Introduction

Walking down Queen Street to the Park, I headed north on a beautiful sunny fall day in Toronto, as I headed towards 707 Dudas Street West, where the Oasis Skateboard Factory is located. There, I met up with Craig Morrison, the leader and founding teacher of OSF and Lauren Hortie, his partner and fellow teacher. Together, they work with the 25 or so students who make up the group who attend this school.

Located in a non-descript room (Room 3) in the Scadding Court Community Center, the activity inside the room accentuates the actual happenings that are in this modern day makerspace. Students come in and begin their day, which begins at 10:30 AM and continues uninterrupted until 3:30 PM. This is partly by design, as Craig related to me, that it is better to get the students there and keep them working, rather than have too many breaks, where you might lose students or momentum within the classroom.

One thing Craig mentioned to me previously was that the OSF did not use project-based learning or a problem-based learning, they use a product-based learning approach. In that, the instructional approach centers on how the outcomes produced were most important for each student, as they need to pass benchmarks and achieve concrete results, not just grow through the experiences alone.

The Active Classroom is Constructivist

For education to be constructive, the traditional teacher-student relationship, which historically has been defined by a method of the teacher delivering content while students listen passively, is discarded. Instead, teachers must serve as facilitators, mentors, role models, co-inquirers and friends, while helping students to seek understanding to the content of the classroom curriculum (Mezirow, 2003). Teachers need to view themselves as respectful guides and compassionate helpers who provide students the opportunities to become actively involved in their own learning and in classroom operations. The importance of an active environment for learning that integrates oral, visual and kinesthetic strategies by the teacher allows for learning to center on the students (Tillman, 2016).

In this manner, teachers become change agents, linking the relevant life experiences of the students to the content of the curriculum, and in no area is this more needed than in high school alternative education. The teacher must work to establish links within their learning communities, and to try and engage their students in active learning projects that require them to interact with individuals inside and outside the school (Tillman, Zhang, An, Boren and Paez-Paez, 2015). In this pragmatic approach, the teacher needs to extend the content into the fabric of student's lives, not solely as a subject to be explored uniquely in a classroom.

To enable such an approach to be implemented practically, educators should utilize teaching strategies that emphasize providing experiences first, and content delivery second. One such method that is valuable as a pedagogical and curriculum organizer is Constructivism, which is a learning strategy that builds upon students' existing knowledge, beliefs, and skills (Brooks and Brooks, 1993). "It includes skills and activities that increase curiosity for research, satisfy student's expectations, and make the student focus on an active research for information and understanding" (Ergin, Kanli, & Unsal, 2008).

Within a constructivist approach, as students encounter new information, they work to synthesize new understandings based on their current experiences and their prior learning. Students self-assemble meaning while continually self-assessing their understandings of concepts set in a context of their own world experiences. In other words, the constructivist approach to learning states that learners of all ages build new ideas on top of their personal conceptual understandings (Eisenkraft, 2003). In this process, students and teachers experience common activities, while applying and building on prior knowledge.

A five-phased process known as the 5Es, which include the phases of engagement, exploration, explanation, elaboration and evaluation, characterize constructivism (Bybee, 2006). "The important point is that each (learner) has their own construction, their own understanding, rather than some common reality" (Duffy & Jonassen, 1992). With this co-learning approach, students and teachers are enabled to construct a deeper and more comprehensive understanding through activities that match their cognitive capabilities and are delivered in a framework with first sparks motivation, incites inquiry and as a result of collective experience, delivers content knowledge in conceptually correct contexts. The key to the constructivist method is to build on previous learning and to apply new learning in a meaningful context, which centers in active learning and requires learners to address their own understandings in the context of new experiences and learning opportunities (Robertson, 2014).

Towards this end, a central goal at the Oasis Skateboard Factory is to keep everyone moving forward in order to continually grow and achieve both academically and productively. In this tight 1 room makerspace, Craig and Lauren continue to prod, to push and to encourage each student to keep on task without making it seem that they are calling them out, just letting them know that they need to keep moving forward. The teachers embody the stance of co-learners, working alongside the students, and staying flexible with each person and their individual progress. These are the guides on the side, keeping the momentum going, while they also keep an eye on the skills and knowledge the students need to gain in order to fulfill their graduation requirements.

For example, each one of the OSF students is responsible for a specialty skateboard deck that they have to create, utilizing a unique shape and a unique graphical technique. The boards ranged from longboards, cruiser short boards, pool boards, street boards as well as downhill boards. The students had to ensure that the dimensions were symmetrical and that the alignment for the trucks and wheels was accurate and precise. This required them to integrate mathematics into their designs, and to make practical connections between their ideas and the goals of the project to be functional and artistic.

Engagement and Motivation are Keys for Learning

Engagement activities should help the students to make connections between past and present learning experiences, to move the students to become thoughtfully involved in the concept, process, or skill to be learned. In other words, the student should relate to the problem being posed and be invested in pursuing a solution. Previous studies using skateboarding, specifically the constructions of ramps, as a hook to engage students in real world applications of mathematics "lend support to the argument that all students can benefit from and deserve the opportunity to engage with interesting and challenging problems" (Stephens, Botge and Rueda 2009).

For example, the OSF students are required to produce five distinct shapes of boards utilizing six different processes for graphics, which include the creation of stickers, screen printing, laser etching, spray painting, wood burning, and stencils. Each of the students is part of a team or multiple teams, depending on their interests and areas of expertise. In this way, the instructors not only employ a series of jigsaw techniques, they require that the students actually work with one another with multiple outcomes intended. In this way, they experience the pieces of the puzzle together and integrate in the other areas collaboratively. Additionally, previously marginalized students who have experience in these activities at OSF, but may have struggled in some specific content area, can become experts in their strengths and contribute greatly to the classroom processes while building their less developed academic skills in collaboration with others.

About twenty-five students can attend the Oasis Skateboard Factory in this one-room schoolroom setting at any given semester, and half of them are eligible to graduate in a given academic year. As an alternative school, this can be seen as a final option for many of the students, who did not succeed in a traditional high school. The irony is that the OSF has a 90-95% graduation rate, which far exceeds any other public school in the Toronto School District. Interestingly, this is also done without a dedicated school site, as the classroom is merely a room rented in a community center, that each night needs to be cleaned up, in case another activity is booked in the room for the evening. The budget for materials at the OSF is just around $5000, which is quite small in terms of the amount of work the students need to produce. It seems logical that if they had a dedicated space for this makerspace classroom, as well as an art gallery connected to a store front, they could in effect be a thriving educational business.

Key to this engagement strategy is providing students with opportunities to explore concepts with familiar materials in a hands-on manner, so that they can have experiences that are kinesthetic, visual and require collaboration. Hands-on learning plays a valuable role in the constructivist paradigm, as it is the process of learning by doing (Dewey, 1970) that is utilized in explorations and experiments.

Explorations are driven by Student Questions

Have you ever gotten a new computer or a new cell phone? What was the first thing you did? If you are like most people, the first thing you did was turn it on and begin to explore its functions based on what you have learned previously on your own or with the aid of others. Usually, this type of exploration will continue unbridled, until some problem is encountered or some aspect that needs further understanding is revealed (Robertson and Lesser, 2013). Generally, at that moment, a person will consult a manual or get some help from a friend or colleague in order to better understand exactly what is going on and how best to correct it. In this way, the importance of the exploration is that it provides an experience for the learning that builds a foundation for content delivery and understanding.

A quality exploration activity is central to building on the initial aspects of getting students engaged. In the case of the students engaged at OSF, specific interdisciplinary activities have been designed by the instructors to incorporate asking questions, developing teamwork and gathering data. In a constructivist framework, the exploration phase should provide students with a common base of experiences and build directly on the motivation to learn inspired by engagement activity (Tillman, An, Cohen, Kjellstron & Boren, 2014). As students actively explore through these experiences, they are already learning, and the teacher can provide an environment for inquiry, in which students identify and develop concepts, processes, and skills based on an open-ended approach. “The correlation between the subjects taught in Science and especially Physics lessons and daily life is very important” (Ergin, Kanli and Unsal, 2008). The purpose of this approach built on exploration, asking questions and seeking answers within the exploration phase allows students to explore meaningful science topics set in the context of something they enjoy doing.

In this active learning approach, the OSF students are in control of their learning and take responsibility for the work they are doing, both independently and collaboratively. The interesting thing is that the tasks are laid out, in terms of outcomes, and the process is a bit open ended in design. Yet, the goals remain clear and to the point, the students need to produce their products, a custom designed skateboard deck complete with graphics, for which they will mount trucks and wheels to make it part of a catalogue for the final showcase, which culminates each end of semester. This will include descriptions of the work, as well as requiring them to talk about their work with synthesis, so that they gain skills in oral and written communication. The theme of native studies also comes out clearly in the artwork associated with each deck, that is done uniquely and well researched authenticity.

This approach maps well to the use of constructivism as a method for integrating transformative education as an approach designed to enhance the interest and motivation of students in completing high school requirements. By immersing students in a product-based learning approach that is based on skateboards and focuses on the goals and objectives of required academic standards, the process skills and overall content knowledge of the students have the potential to greatly increase (Robertson, 2014).

Located next to the OSF school site is a local skatepark, which the class often uses for research experiments, as well as to host a number of guest speakers and skateboarders. For example, the teacher may want teams of students to gather data from three different stations in a local skate park, which seems to be an unlikely place in which to study science. Of course, there would need to be real athletes who can perform specific maneuvers. In this three-station example, the first station could be a half-pipe, a semicircular ramp structure, where riders would move back and forth and where students could calculate angular motion. The second station could be an inclined plane approximately one-meter-tall and three meters long. As the riders drop in on the inclined plane ramp, students could record the time it takes each rider to reach the edge of the ramp. From this data, the students could calculate the acceleration of each rider. The third station in this example might be a grind bar, a metal pole affixed to the ground on which a rider would travel up and over. The student teams would need to calculate the velocity of the rider, as each athlete rode across the grind bar, and to determine at what minimal velocity a rider could encounter the grind bar and still make it to the end.

As students explore such science concepts as acceleration, velocity and angular motion in a real-world context, they develop a broader understanding of those principles through mathematics in the context of their own experiences. When students are able to share their collective observations and understandings through small group discussions, they are able to strengthen their understandings of these concepts. This approach has also been shown to increase congruence in teaching, an instructional strategy that aligns the coherent relevance of a curriculum with the specific content knowledge and skills of a lesson to create optimal learning (Bybee 2003). This sharing within cooperative groups is a fundamental strategy in the constructivist approach, as it allows the teacher to facilitate the learning process, and also helps students to develop a common base of experiences on which to make connections to content. The teacher can then best use the knowledge and skills from open-ended field-based experiences to students take responsibility for their own learning, which is a fundamental tenet of the constructivist method. In the areas of science and mathematics, often called the "language of science", reasoning and making sense of content in context are critical factors that help students organize their knowledge in ways that enhance the development of conceptually correct understandings (Martin 2009).

Explanations are Times to Present Primary Content

Going back to the example of a new cell phone or new computer, once a problem is explored and a person cannot fully understand the next steps to follow, there is a need for content and a real self-directed desire that maps to the experiences found during exploration. In other words, a person is ready for the content because of the experience in which they have engaged, and terms applicable to specific functions or situations take on new meaning, as they are now presented in a connected manner to a learner's previous experience.

Studies have shown that students, who are involved in active learning in meaningful contexts, acquire knowledge and become proficient in problem solving. The long-term prospects of this approach seek to determine how the implementation of curriculum approaches built around student interests such as skateboarding can impact student achievement in the area of science content and conceptual understandings.

Taking this back to the Oasis Skateboard Factory, each student is responsible for developing their own brands, which include names like Volcano skateboards, Zim Skateboards and Black Light Wolfpack. The students have to plan, design, build, create, develop and implement all aspects from the construction of the deck, to the artwork on the bottom, as well as understanding the style of board complete with well-intended dimensions and alignment for the trucks and wheels, which will give the deck the ability to roll.

It also seems that the addition of community members, such as the many experts in skateboarding, design, manufacturing and graphics who regularly visit the Oasis Skateboard Factory. The volunteers all try to add to the discourse in the classroom, hoping to be an addition and not an obstruction to the flow of the learning, as the students go about their non-linear path, which so much resembles the way work is done in real life. Craig and Kristin, along with each student, are at times managing their processes, directing themselves, working to meet requirements and enjoying the collaboration of the others in the room.

Getting students engaged and exploring concepts must invariably help students to master content, and this approach should extend beyond purely prescriptive approaches. When students have authentic tasks that allow them to directly manipulate data, they uncover content that is relevant to the ideas they have been exploring (Buchanan and Stern, 2012). To return to the skate park example, after gathering the data in teams, students then made mathematical calculations, discuss their results, and justify their solutions within each group. This strategy requires student teams to actively interact with the content of the lesson, to collate the content from any provided worksheets, and to discuss their collective experience to provide logical solutions requiring analysis and synthesis of information (Robertson, 2009).

Elaborations Deepen Connections to Concepts

As students gain experiences and are able to direct their own learning, they can then look to understand through interacting with primary content, while the teacher can develop approaches to steer them deeper into topics that need clarification. This also provides an opportunity for students to move past memorizing content as facts, but to make the content part of their collective learning, so that the skills of analysis of information and its synthesis into new situations is explored and explained (Robertson, 2014). In the case of the OSF students, the products must be addressed in an interdisciplinary fashion that requires each student to demonstrate their understanding of the learning objectives presented in terms of student outcomes. For example, each student must design and create their own brand of skateboard, which includes the construction of physical board (mathematics and science), the marketing materials (language arts, graphic arts), and the connection to local indigenous cultures (history and cultural studies). The purpose is to provide students with a menu of activities based on their interests, as well as hands-on explorations that focused on specific concepts in physical science that are aligned with state and national academic standards.

This elaboration phase is designed to extend students' conceptual understanding into applications of skills and behaviors, and to deepen and broaden their content knowledge. During activities in the classroom, the students would again be assembled into teams, albeit it in new groups, in order to provide new perspectives and collaborations. The students then would gather data in order to solve problems in the focus areas that centered on the content that is being covered in the classroom. For the OSF students, this can be manifested in a needs assessment that includes members of the local community, surveys that are designed in class and administered to various constituents (students, parents, educators, community members) that are then analyzed and integrated into the marketing plans for various products within the classroom. This emphasizes the interdisciplinary nature of learning through classroom activities now extended in the elaboration phase, a connection that that fosters deeper and broader understandings of the connections and relevance of required content into real life (Bybee, 2003).

Evaluation Demonstrates the Progress

The use of creative learning situations, such as the skatepark to gather data from real athletes, can provide a context for students to ask their own questions about their learning experiences as they develop their own content knowledge as it relates to the overall curriculum. The worksheets, activities, quizzes and tests can all be part of the classroom evaluation for the teacher, and in the constructivist method, there is a need for a final demonstration by students. For example, students may have to construct their own catapult using a set of provided materials and then in three trials, launch an object, such as a marshmallow the farthest distance, an also explain the concepts of the lever and fulcrum as it pertains to their specific design.

Students also have the opportunity to present their work and products to community members at an open house that requires them to demonstrate their understanding to a variety of audiences. This ability to synthesize their learning into explanations, both orally and written, showcase their learning in pragmatic manners that empathizes critical thinking. Within a culminating event such as this, students should have to demonstrate their understandings, as this type of evaluation then provides an opportunity for each student to gauge their own progress and for the teachers to see exactly what students understood as a result of their own experiences.

In summary, the evaluation phase requires learners to assess their own understanding and abilities, as well as to allow the teacher to evaluate students' understanding of key concepts and skill development (Robertson, 2014). The assessments should be both formal and informal and continuous, in order for the teacher to best help the students learn at their own levels. In the case of the Oasis Skateboard Factory, conducting the activities in a constructivist framework gives students a chance to assess their own understandings in the concepts they are required to learn.

Conclusion

How do educators get students to enjoy learning? The Oasis Skateboard Factory proposes to answer this question by filling each day in the classroom with exciting activities that allow students to discover connections between mathematics, science literacy, design, cultural studies and skateboarding. As key elements are presented to keep the students engaged and wanting to learn, the inherent motivation to learn within a student is activated and through the constructivist method, this desire for understanding is fostered and facilitated by the teacher. If students are "hooked" by an opening activity because they connect to skateboarding or enjoy visiting a local skateboard park to gather data, the teacher has in effect captured their interest and activated the student's abilities to relate effectively to the content.

By engaging, exploring, and explaining the content in relevant terms and experiences, the students could then elaborate on their skills and understandings by doing other activities directly connected to their various interests. Finally, students should have many opportunities to elaborate upon and to evaluate their own conceptual understanding by through each day's classroom activities. "Essential to expertise is mastery of concepts that allow for deep understanding. Such understanding helps the learner reformulate facts into useable knowledge" (Bybee 2003).

Often classroom teachers face the pressures of high stakes testing and of covering massive amounts of material in limited periods of time. In most high schools, students are not often engaged and do not seem to enjoy learning skills, nor do they see connections between the real world and the topics being studied. By implementing the constructivist approach of the 5E lesson model in an innovative and creative way as presented at the Oasis Skateboard Factory, students are immersed in required content and can participate at a higher cognitive level in an enjoyable and student-centered manner.

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