It's a Minecraft Party!

Using Minecraft to create an interactive and engaging Science Unit

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Introduction

This resource was created to demonstrate an effective use of integrating technology in a Science classroom. This particular resource is about using Minecraft in the classroom and implementing gaming as a fun and engaging way to consolidate science concepts. There is something for everyone in this resource no matter where you are in your learning journey: whether you are currently using technology in your classroom effectively, just beginning to use technology, or wanting to begin, this resource will assist you in your learning process.

How to use this resource

Though this resource is geared to a primary lesson it can be adapted for any level of Science that you teach. The resource is divided into five sections: my guiding principles and beliefs about using technology, a brief introduction into using technology in the classroom, what is Minecraft and how do I use it in a Science classroom, assessing inquiry, and a section of concluding statements. In summary, the goal is for you the reader to have an informed understanding of: Minecraft and its use in a Science classroom, why integrating technology is so important and how you can easily step into the realm of using technology.

Guiding Principles

To begin, I want to discuss some of the teaching philosophies that guide my practice. These philosophies are a part of my teaching and influence my decisions, planning, and use of

technology in the classroom. Understanding them will help you understand how this resource was created and is meant to be used.

This may be a redundant statement but first and foremost, technology will never replace good teaching. This is the foundational tenet that I plan with when using technology in the classroom. Technology is a tool with which we can engage, promote and further develop our students' thinking but it is not a replacement for quality teaching whereby teachers balance and combine students' needs, mandated curriculum expectations, learning development, and best practices around teaching with technology.

The second guiding principle is that I teach predominantly through inquiry. Science inquiry can be described as follows: to encourage students to explore, evaluate and reflect on concepts within a science classroom. Teaching revolves around hands on experiments that relate to children's questions about the real world. This is a much different approach than the conventional method of teaching science. Traditionally, science education has been viewed as a body of knowledge that students learn through direct instruction (Center for Science, Mathematics and Engineering Education, p.14). Colburn (2000) suggests three other teaching strategies that promote inquiry (pg. 44). Firstly, provide students with wait time after asking leading questions. This is an important skill to remember because students need to struggle a little to build and understand concepts. Secondly, when responding to students, paraphrase their learning or repeat what they have said. This strategy has two benefits: it gives validity to what students have created, and it also allows students to hear and reflect on what they have just said, providing an opportunity for students to re-evaluate their thinking. Finally, avoid telling students

what to do. This is hard to do, as educators want to help students learn. Students must develop understanding on their own, facilitated by teachers' questions, prompts, and challenging tasks.

Thirdly, I teach with full integration of technology and curriculum. What I mean by this is that I don't necessarily use one particular tool for a lesson. Often, lessons incorporate multiple technologies and multiple ways of engaging students. I know that if you are just beginning your journey using more than one piece of technology at one time may seem intimidating but I encourage you to think of multiple ways to combine technology into a unit or lesson in order to bring the full impact that technology has to offer.

The next important principle is that I plan and teach units with full integration with other subject areas. Being a primary/ junior teacher I am afforded the opportunity of teaching all subject matter. This gives me the license to integrate science into my language and math curricula. Integration allows me to go deeper within my curriculum and units. It opens them up and allows me to take my time with the development of concepts. If you don't have this luxury I encourage you to find creative ways to plan with other teachers to open up your classroom. Bringing in multiple curricula allows you to open the project up and hook students into deeper learning.

The last principle is that when given the opportunity to impress, students will often impress. Throughout my teaching career I am constantly impressed at what my students are able to do when given the opportunity. I say this as a guiding principle because I know at times I have experienced fear in doing something with technology; in my mind I said my students would not be able to handle it. However, if I hadn't taken a leap of faith I wouldn't have had these amazing

learning experiences with my students. I encourage you to use this resource to explore and see what your students can do when given the opportunity to shine.

Introduction to Using Technology in the Classroom

Continuum of learning with technology

I will first preface that I have always felt comfortable around technology and I know that many educators do not have the same sentiments that I have. However, whether you feel comfortable with technology or you don't, teaching with it is a whole new ball game. The first thing to remember is that nothing replaces good quality teaching. This took me a long time to figure out. My very first attempts at teaching, what I like to call the early phase, had me using technology for the sake of using it. I would often hear about these amazing tools and want to try them right away in the classroom. Now I understand that for many teachers this early phase might feel intimidating. If this is the case I would encourage you to try one strategy this year and work on developing it in a good pedagogical way into your practice. As you work on planning that one aspect of technology you will see how to incorporate more technology in your classroom. It was also during this phase of learning that I was able to explore other pieces of technology, such as iPads, video recorders, and a variety of computer learning programs which in turn resulted in increased confidence to continue seeking more technologies that my students and I could use in the classroom. In addition, it taught me to be flexible and adaptable as often times many of my ideas did not work the first time I implemented them and plans had to be changed.

It was for this reason that during the first phase I would often reflect and wonder why the technology really wasn't doing anything productive for my students, pushing me to think deeply

about the purpose of using technology in the classroom. The more I reflected on this, I realized that tech was needed to augment my lessons not just substituted for something that already existed. For example, in this stage I often thought that because my students were typing or using a voice recorder I was using technology to enhance my lessons. I observed, however, that their thinking processes and levels of conceptual understanding weren't very different from those they might have achieved using traditional pencil and paper tools. In other words, my students didn't experience the "aha moments" I was hoping for; a big aha moment for me though: I hadn't changed the task! I started to move into my middle phase of using technology.

During this phase technology was used to create and communicate my students' ideas. I didn't just use it to replace an existing tool but rather to enhance or engage my students' thinking. In this middle phase I had students make movies, video vloggs for reflections, communicate using epals, and create web pages. It was in this phase that I saw a huge potential for the use of technology and my enthusiasm for its use grew exponentially. Often during this phase my students were engaged but only because they got to use technology not because of the curriculum being deep enough or the topic being of interest. Frequently I questioned the purpose of technology in the classroom: technology was great; I loved how engaging it was, how my students seemed to want to learn and be a part of the lessons but I still felt that something was missing. Intuitively I knew that technology was important to their learning but not for their learning: technology should be used to enhance the learning experience, make it easier to complete tasks but should not be the main reason why you are teaching. Technology is not a replacement for good sound pedagogy, more like the icing on the cake that makes it over the top. This reflection moved me towards the last phase of using technology: proficiency.

In this phase I saw the importance of a good solid teaching plan first. Now I was always thinking about the big curriculum connection and not just what tool was interesting or nice to use. Once I had the curriculum and learning goals set I went in search of the best tools for the job. In this phase my students often completed tasks that would allow them to share their work with others, to not only enhance the learning but connect them to others. Technology no longer became what tool do I use but what tool is best for this particular learning.

My use of technology has now become my right hand. I no longer use just one tool but a unit or project incorporates many; it all depends on the learning objectives and the desired outcomes. However, the journey was not a wasted time. Throughout each step I gained valuable knowledge to assist me in becoming proficient with the use of technology. Each step brought me closer to realizing how to use technology effectively and efficiently; each step brought a deeper understanding of the role that technology can play in effective teaching practice and engaging students in active inquiry learning.

The importance of using technology

As previously mentioned I personally believe that technology has a very important role in our teaching and in education. Due to the rapid changes in technology the skills that we once thought were necessary to teach are no longer as important; students will need new skills and different skills as they grow up and eventually join the workforce. With the new demands come new ways of teaching and this is where I see technology fitting in and being used in education. Unfortunately, as fast as technology has changed, the classroom hasn't. As educators we need to think about how we are incorporating these rapid changes and pace of life. This is the life that our students are growing up in and will become contributors towards. I have always liked this

statement, “The jobs our students need for the future may not have been invented yet.” I am not too sure who stated this but it reminds me that we need to be thinking about the future that our students will one day occupy. This includes teaching with technology and its ever-expanding and ever-changing variety of tools. It is also important to focus on how we will be using that technology within our curriculum in order to promote vital critical thinking skills.

Teaching with technology supports students’ in the following ways: effective learners actively process information, information from multiple perspectives increases the durability of instructions and effective instruction should build upon students’ knowledge and experience and be grounded in meaningful contexts (Hooper and Rieber, 1995). When we teach with technology we provide our students with opportunities to actively process information on multiple levels. Students are writing, listening, and on some occasions, using devices to manipulate the information they are receiving. In addition, students receive and reflect on information from multiple sources: teacher, peers, video, screen and printed sources. Using technology is relevant and current to students today. Outside of the classroom they are immersed in a world that uses and experiences technology every day.

What is Minecraft?

Minecraft is first and foremost a game. However, it is what we call a sandbox game, which means that within the game students can build whatever they decide. Minecraft uses the imagination of the player to build and develop a block world that may remind you of the original Mario game. Inside the game the player has two options: 1) survival mode, and 2) creative mode. Survival mode is likely the version that you hear about most frequently. Zombies, Creepers and Spiders are vernacular that is synonymous with this well known game. In Survival

mode students start with limited resources and must survive in the hostile world of Minecraft. Students have to mine, harvest and build a community. Though this mode has some interesting applications in the classroom[1], creative mode is most likely where you will spend the majority of your time. In creative mode all the rules that are in survival mode still apply but you have no monsters and all of the resources are open. Students can build whatever they choose with any tool they need.

There are also two versions of the game that you may want to know about. The first is the computer version of the game. For this version you need to register and download the program. The second, and one that I recommend using, is the iPad or android app. Minecraft pocket edition is an excellent way to enter into the world of Minecraft. The biggest difference between the two is that you cannot get Redstone[2] in the pocket edition. Whether you use survival mode or creative, the important thing to remember is that in Minecraft your options are open and limitless.

Purpose of the Tool in Education

Because you can do whatever you want in the game of Minecraft the possibilities for education are endless. This holds true for any age group or division. The lesson you will see in this resource is demonstrated in a Grade Two classroom but you can use this very same lesson for any division in Science and for any strand. This lesson came about because my teaching partner, Keri Ewart, and I were trying to bring more inquiry into our Grade Two Classroom. We

[1] Please see other ideas for this section.
[2] Redstone is used to create electronic circuits inside of the game. It allows you to create switches, and series, which is helpful for many older students.

had heard so much about gamification[3] and how it could be used to build deeper concepts. My teaching partner and I decided on Minecraft for two reasons. The first was that all of our students were discussing Minecraft and seemed highly interested in the game. The second part came a lot later when we had an opportunity to learn more about this amazing resource. Once we saw that we could do almost anything within the game it was easy for us to conclude that this game would allow us to engage our students in some critical thinking about air and water. In addition, it wasn't just a substitution for something we could do without technology but it offered an augmentation and opportunities for redefinition as defined by the S.A.M.R model[4].

Using Minecraft in the Classroom

In this section you will see one particular use of Minecraft in the classroom. The lesson you are about to see is from my Grade Two Classroom. The Classroom consisted of 20 students (8 boys and 12 girls). We had a 1:1 iPad and Chromebook setting in the classroom, mainly due to a large research grant for the grade 2s that year. The students were well versed in the use of technology and it was a part of their everyday school life. However, this lesson can be done with as many pieces of technology as you are able to use; it does not need to be 1:1. During this time I was team teaching with a my colleague, Keri Ewart, and we would often have both of our classes working together on this project. The purpose of the lesson was to demonstrate and consolidate students' understanding about the various science concepts in air and water. As a team we decided to have the students work in partners to devise a game inside of Minecraft called,

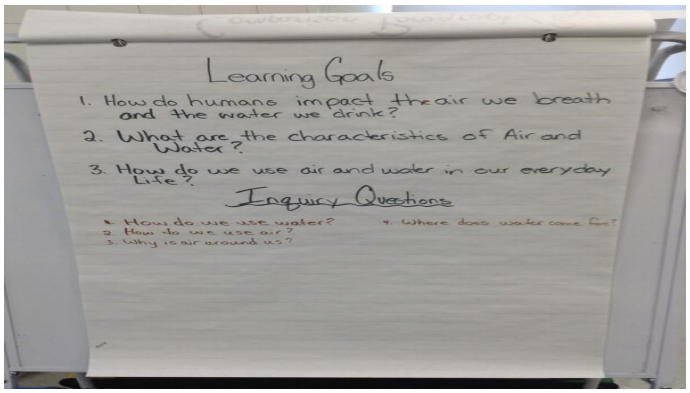
[3] Gamification is incorporating the aspects of games (points scoring, competition with others, rules of play) into activities such as education.
[4] S.A.M.R stands for substitution, augmentation, modification and redefinition. This theory was developed by Dr. Ruben Puentedura and is used a lot to describe the mindset for 21st century learning and use of technology.

WaterCraft. We used 80 minute blocks for our lessons.[5] This block of time was our literacy block which we integrated with our science unit. We gave the students a block of time everyday and the whole unit took the students three weeks to complete.

Learning goals

Our learning goals for this lesson consisted of:

1) Demonstrate their understanding of the properties of air and water
2) Show their understanding of an important global issue involving air and water
3) Show their understanding of how air and water are polluted



Overview of the Lesson

First and foremost this lesson was not just a culminating task but a project that students worked on throughout the unit (see Appendix A for full lesson). At the beginning of the unit students were given the parameters of the project and the learning objectives. Those parameters included: not using any of the monster spawning eggs, no weapons, and their game had to make sense within the context of air and water. It was important to establish some parameters as the game is an open sandbox game. Anything is possible and students will explore all options inside

[5] Please note that even though we used an 80 minute block of time this activity can be done within 40 minute times too. However, the important part is that it is an activity that will take time to learn and develop not just let's use Minecraft and see what happens.

of the game. We also gave the students a couple of days to just explore Minecraft and its possibilities. During this time students could do anything they felt like, which gave them the outlet to see what each icon did and the implications it had within the game's world. We also noted that even though it was a very popular game not everyone had had experience with it, so it was important to give them opportunities to explore and develop skills inside of the game. For the more advanced students we gave them challenges which were linked to the unit or had them teach the other students. Every time students worked on an experiment or learned something about air and water they would then record their findings in a journal or google document. Throughout the unit students were given opportunities to read and write about the learning goals and practise the gaming aspects of Minecraft itself. Each center gave students opportunities to test ideas out, learn the game components (how to build, fly, find icons, etc.), and build drafts of their project levels. Practising is an important element in the design of this project as students must be given opportunities to learn how to use the tools proficiently before being required to apply and adapt them to their learning of new material. This precept holds true for non technology strategies as well. For example, if you want to use a think, pair, share strategy or a carousel to consolidate or generate new learning, students will be more successful if they have been taught the strategy first, using material that is familiar to them, e.g favourite book, meal, movie, etc.

The students worked in pairs to demonstrate their understanding of these principles. The students had to create 3 levels in the game. Each level had to contain challenges or show the facts that they had collected for the learning goals above. Before the students worked in Minecraft we had them research ideas and explore experiments about air and water. Every time

students conducted one of these experiments they collected their information for this project. Once all of the information was collected the students worked in pairs to build their world. When the world was finished they would then use iMovie to create a small trailer to advertise their game to the world around them. It is important to note that this project took some time to complete and was not accomplished in a day or two. It took several weeks to research, work with the game itself, test out ideas, build drafts[6] and then finally complete the finished project.

Curriculum connections

As I mentioned before, planning is the key to all purposeful integration with technology. Also, because one of my guiding principles is teaching through Inquiry, this particular lesson covers multiple expectations. If we look at just the Science curriculum, students must use all of their knowledge about air and water in order to complete the challenges in the game. The game has three levels that the students have to create within Minecraft:

Level 1: The Water Cycle and properties of Air and Water

[6] When I mention the word "drafts" it is not like your typical writing draft where you can see your mistakes and revise. Students would try something out and if it didn't work they would destroy and rebuild or go to another area in the world. When they were completely happy with the finished project students submitted it as their final game.

In this level the students must demonstrate their understanding of the various properties of Air and Water and build the Water Cycle.

3.1[7] identify air as a gaseous substance that surrounds us and whose movement we feel as wind

3.2 identify water as a clear, colourless, odourless, tasteless liquid that exists in three states and that is necessary for the life of most animals and plants

3.3 describe ways in which living things, including humans, depend on air and water (e.g., most animals, including humans breathe air to stay alive; wind generates energy, disperses seeds; all living things need to drink or absorb water to stay alive; water is used for washing and bathing, transportation, energy generation)

3.5 identify the three states of water in the environment, give examples of each (e.g., solid – visible as ice, snow, sleet, hail, frost; liquid – visible as rain, dew; gas – visible as fog, water vapour), and show how they fit into the water cycle when the temperature of the surrounding environment changes (e.g., heat – evaporation; cooling – condensation and precipitation)

Level 2: Conservation of Water and Air

In this level the students have to demonstrate their understanding of how the world conserves or doesn't conserve air and water.

1.2 assess the impact of human activities on air and water in the environment, taking different points of view into consideration (e.g., the point of view of parents, children, other community members), and plan a course of action to help keep the air and water in the local community clean

[7] Curriculum expectations are taken from the Grade Two Ontario Curriculum. However, this can be applied to any strand of the science curriculum at any grade level.

1.3 assess the impact of human activities on air and water in the environment, taking different points of view into consideration (e.g., the point of view of parents, children, other community members), and plan a course of action to help keep the air and water in the local community clean

Level 3: Problems in the world with Air and Water

In this level the students have to demonstrate their understanding of global issues that relate to air and water.

3.6 state reasons why clean water is an increasingly scarce resource in many parts of the world

1.1 assess the impact of human activities on air and water in the environment, taking different points of view into consideration (e.g., the point of view of parents, children, other community members), and plan a course of action to help keep the air and water in the local community clean.

In addition to the Science curriculum this unit also connects with other curricula. I will not go into exhaustive lengths of these curriculum expectations however, through this unit, I was able to assess, reading, writing through the centers and planning development of their game. The movie that the students made covered my Media program. In addition, there are many spatial reasoning and geometry expectations. As you can see this technology enabled me to enhance the learning of my students and also enhance my assessment practices.

Sample of student work

Unfortunately, due to the nature of Pocket Minecraft I am not able to show you any of my students' finished work. However, I can showcase some of the pictures of my students working together and some of their final movies. Overall, my Grade twos absolutely loved this activity.

Not just because they got to use tech but because of the actual project. They were thoroughly invested in the task because it was relevant and current to their situation. It allowed them to explore science concepts while developing computer thinking skills and engaging them in a program they all loved. Through the use of technology all my students were able to demonstrate their knowledge of air and water. It was amazing to see all of their creative process as they delved into Minecraft. In addition to the creative process we noticed an increase in engagement and an increase in collaboration. When a student figured out a solution or had an interesting idea they were so excited to share it and explain their thinking. It allowed a platform for all students to be engaged in. Furthermore, because of the collaboration and built in inquiry, students' communication about the project increased dramatically. This was the biggest observation and one of the most important for us in Grade Two. Being a predominantly ELL school, communicating in English is often a struggle for our students. Due to all the practise and explaining students did in the unit this was not the case. Students thrived and were able to talk about all of the science content. In the pictures you can see my students working on their iPads and also using non-tech items for their research. I have also included a link to my students' iMovies.

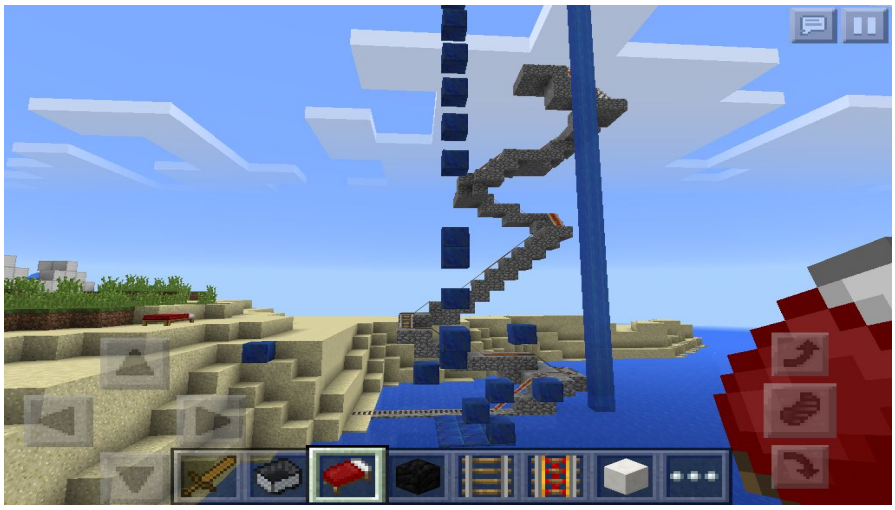
Student outcomes and designs:

Overall, Keri and I were amazed at the learning the students demonstrated. Students were able to create working models of the water cycle, they developed an understanding of how pollution can affect the land and the water around them and they also increased their science vocabulary. This last one was a big focus for us as our school is close to 100% English Language Learners (ELL). Throughout this process we noticed students collaborating, demonstrating and

exploring all of the science curriculum. It is activities like this one that demonstrate the potential that students have to develop into 21st century learners. If we take a closer look at the student's' work you will notice how creatively they demonstrated their learning.

the water cycle.

Making it rain was a little challenging for the students as rain doesn't naturally occur in Minecraft; however, to complete the water cycle they need it to rain. To solve this challenge the students built a large tower and dropped water from the top, thus creating rain. In addition, students used ice blocks to show condensation forming in order to then form rain clouds. Some of my students even built a railway to bring you through each level of the water cycle. Along the way they had signposts that described the experience. Some students linked the signposts to google docs for more information.



effects of pollution and water wastage on the world.

This was a big interest for our students. Many of them were intrigued by how much pollution we as humans let into the world and the damage that it creates in our world.

Students built large sinks that showed how much water we use when we leave the tap running versus when we turn it off. Or they built a house that was often flooded with water because the owner left the tap running or the shower running. The challenge for other students was to figure out what was wrong.

Some of the students wanted to show oil spills and their effect on the ocean. For this students used black carpets for oil and built ships to show how oil can spread along the sea top but not go deeper. They also put "ducks" in the oil and had them stuck in the spill. The challenge here for other students was to figure out a way to clean-up this mess.

Finally, students also created factories that would dump pollution into the water or spew carbon smoke into the air.

building factories or showing deforestation.

The last section of the project was to discuss some of the effects humans have on the environment. Here students explained the polar ice caps melting and the impact that is having on the world; they also explored the impact of deforestation. To solve these problems students put up signposts telling their gamers to plant trees or cut down carbon emissions.

here is a playlist of my grade two's iMovies.

https://www.youtube.com/playlist?list=PL2wmd99i7F0es80IWr5PZEAMpLnM0bMu8

Concluding thoughts for implementing Minecraft into your classroom

Using Minecraft in the classroom might seem a daunting task but it can be done. The platform itself does not take that much time to learn and most of the students already know many of the attributes inside of the game and can be your experts. In fact when we decided to use Minecraft we didn't know much about the tool except that it was something that the students were already talking about and engaging with. We counted on the fact that our students knew the game or could teach the game to other students. To learn more about the game I did turned to resources such as:

1) Liam O'Donnell blog. How those Minecraft books got my students reading. http://liamodonnell.com/feedingchange/2014/08/01/how-those-minecraft-books-got-my-students-reading/
2) The Minecraft Books
3) Minecraftedu Site. Retrieved from: http://minecraftedu.com/
4) Minecraft in Education. Retrieved from: https://sites.google.com/site/kidsnetsoftminecraft/home

I have also created a quick "how to" presentation: www.bit.ly/nfominecraft. It was through watching and reading that I saw the huge potential in the game for all strands not just science. Finally, we want our students to be engaging, thoughtful and critical students. Using technology like Minecraft allows students to engage with all of these skills in a meaningful and purposeful way. It forces them to communicate their thinking, collaborate with their peers to learn and think critically about the information they read and include in their game. In addition, to this students are forced to find creative and imaginative ways to represent the information they have been

learning around air and water. Finally, by playing and interacting with one another's games they are learning character education and digital citizenship. It is true that students could have researched and reported on these facts without technology but because of it they are more engaged and going deeper into the learning of the concepts. Students saw a purpose for their research and learning and it wasn't just to please the teacher or get a final grade. Technology is a way to connect the students to the real world and make learning meaningful.

Assessing with Technology

Assessment is a reality for any educator. Technology is great, but in the end we do need a mark for the report card system. So the question becomes how do we assess projects like this? Very simply: the same way you would assess any project that you would do without technology. I know this may seem like a trivial comment but one of the founding principles is that nothing replaces good pedagogical principles. Growing Success (2010) states seven foundational principles for assessment:

> • are fair, transparent, and equitable for all students;
> • support all students, including those with special educational needs, those who are learning the language of instruction (English or French), and those who are First Nation, Métis, or Inuit;
> • are carefully planned to relate to the curriculum expectations and learning goals and, as much as possible, to the interests, learning styles and preferences, needs, and experiences of all students;
> • are communicated clearly to students and parents at the beginning of the school year or course and at other appropriate points throughout the school year or course;
> • are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for students to demonstrate the full range of their learning;
> • provide ongoing descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement;
> • develop students' self-assessment skills to enable them to assess their own learning, set specific goals, and plan next steps for their learning (Growing Success, 2010)

When teaching through inquiry all of these principles are met. At the beginning of the unit students are provided clear learning goals and expectations. They are also provided with a rubric that has clear expectations for their learning. In addition, an inquiry project has multiple entry points for all students to access the information. Essentially, working through inquiry allows you as an educator to effectively assess students' products and conversations and evaluate their understanding of the curriculum.

Furthermore, Growing Success mentions three types of assessment: Assessment for learning, as learning, and of learning. Once again teaching through Inquiry allows you to effectively use all three levels of assessment. Throughout this project, I was able to discuss, observe and mark their final products in order to understand the level of knowledge that my students demonstrated. Ample and on-going opportunities to assess students provided a clear picture of my students' capabilities. Now you may notice that not once have I discussed technology, that is because once again I want to emphasize that nothing replaces good quality teaching. Just because you are using technology doesn't mean you should stop using effective assessment practices. However, throughout this resource I have stressed that in order to effectively use technology you must also maintain careful and thoughtful planning; the planning will also allow you to set-up opportunities for good quality assessment.

Various Other Lessons for Integrating MindCraft in the Science

Minecraft is one of the most versatile resources that I have ever used and one that has endless possibilities for any curriculum. That being said here are some additional ideas that you can use inside of the program:

Building Replicas:

Once very simplistic idea is having students build replicas of various machines that can demonstrate their understanding of simple machines (gr.2 and 4); bridges (gr. 5); or solar panels, wind turbines, and other energy sources (gr.5); or structures both natural and man made (gr1 and gr5). The range of simple to elaborate designs can showcase students' understanding of any science concept.

BioDiversity:

Minecraft has various worlds and various biomes. This naturally connects to any of the environmental sciences in the curriculum. Grades four and six students can discuss habitats and various plant life within the game system. Students can also add wildlife and see what happens to the world as they confine or increase the space the animals live in. In addition to this, vegetation can be planted and grown within the game. Students can explore what plant life needs in order to grow and how it grows in various situations. For example, plants and food will not grow without light and water, neither will they in the game. Because the game is about survival and creating things, as students play the game they can learn about how humans impact the world around them. As they build roads and buildings they will notice that grass and trees will stop growing. The world around them starts to change and a great discussion can be created from this.

Designing Cities and Roller Coasters:

Students can work with basic physics skills by building a variety of structures such as cities, towns, buildings, and roller coasters. Students can explore how mine carts react to forces acting upon them, as they design various lengths of wooden roller coasters.

Rocks and Minerals:

Minecraft is primarily about mining and building with resources. Students have to dig and find resources in the earth. This lends itself perfectly to the grade four science curriculum where students can explore how rocks are formed and created. They can create the rock cycle and demonstrate a working volcano. They can also showcase how humans impact the world to find precious stones and materials or how humans use these materials to make objects.

Red Stone:

First, I would like to preface that Red Stone can be used only in the computer version. It can create circuits for students to demonstrate their knowledge of electrical engineering principles.

Building Rube Goldberg Machines:

These fun filled kinetic and potential machines are very hard to make in real life. In Minecraft this is a very easy principle. Using various blocks and switches (once again Red Stone needed) students can create a machine that demonstrates the power of transformation of energy.

Conclusion

Minecraft is an amazing entry point for using technology as part of your teaching practice. This extremely flexible tool can integrate with any strand of the science curriculum providing opportunities for the development of deeper understanding of content, concepts and how they apply in the real world.

Yes, this project could have been completed without the use of Minecraft but what this has done is engage the students in a meaningful way. Teaching through inquiry and using any piece of technology allows you to develop all of the 6 C's of a 21st century learner (Fullan, 2015) at the same time. Students collaborate, create, communicate their thinking and really think

critically about what they are incorporating into their game. At all stages of the project not one child was off task and all were discussing science concepts. It was interesting to see normally shy students come out of their shell and actively participate in the content. All students understood the concepts and were excited to be learning science. In fact many of them often would say that this was not science, even though it was.

As you have read this resource you may have thought: I know nothing about any of these tools. I encourage you to remember that nothing can replace good quality teaching. A tool is a tool but it's the teaching that makes it magical. Good pedagogical practices are still needed and must be used. These practices include: thinking about the big ideas and curriculum expectations and then using these ideas to plan a quality lesson that is engaging, builds on students' prior knowledge and gives students opportunities to be actively learning. In addition, good practices also allow for student voice and choice and opportunities for quality assessment.

This resource is just one possible tool that you can use in a science classroom. It has multiple ways of being incorporated but it is only one tool. I encourage you to think of multiple ways to use technology in your classroom. Good luck on this amazing journey; enjoy the ride!

Who am I?

My name is Jonathan So. I have been teaching in the K-6 division for the past ten years in the Peel District Board of Education, and I am currently a Grade Six teacher. My passions lie in teaching through inquiry and technology and harnessing the power of technology to open the classroom doors to the world. Feel free to connect with me via twitter @MrSoClassroom.

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The Minecraft Handbooks

Appendix A

Minecraft Project:

Your job is to create three different Levels/ Worlds with your partner.

Using your Graphic Organizing Planning and the things you have learned about science create three worlds for others to solve.

1) World 1: Water Conservation

- in this world you should have three challenges that show your learning about how we use and conserve water

Possible topics:

1) How we should use water at home
2) How we should protect water in the world
3) How we conserve water at school
4) Why it is important to save water
5) How we use water in our everyday life

2) World 2: Pollution in the world

- In this world you should have three challenges that show your learning about how humans can and do pollute the world.
- your audience should be challenged to help the environment or think about how our waste affects the planet.

Possible Topics:

1) Water pollution from oil spills
2) Pollution from factories
3) Acid Rain
4) Building homes on top of watersheds
5) How we all depend on the water
6) Effects to our ground water

3) World 3: Your choice

- This is your choice to talk about any issue that deals with water and air. However it needs to be about water and air. Use the strategy identifier topics if you want or make your own; it's up to you.

Success Criteria

A level 3:

- Challenges contain proper scientific language and vocabulary
- Challenges display correct stats and information
- Challenges deal with the issues of water and our three big ideas
- All three challenges are complete
- You worked well as a group
- Your world has both the activities and the signs to give information
- Each challenge has five facts to show your learning
- Each challenge shows where the next challenge is
- The challenges follow a story flow