The Experience of Students and Teachers in Project-Based Learning

Lindsay Goodridge

Vancouver Island University
# Table of Contents

Abstract ........................................................................................................................................ 5

Chapter One: ................................................................................................................................. 6

  Introduction ................................................................................................................................. 6

  Purpose of This Study ................................................................................................................. 7

  Justification of This Study ......................................................................................................... 10

  Research Question and Hypothesis ......................................................................................... 12

  Definition of Terms .................................................................................................................... 12

  Project-Based Learning ............................................................................................................. 12

  Student Engagement .................................................................................................................. 13

  Assessment for Learning ........................................................................................................... 13

  Facilitator ................................................................................................................................. 14

  Brief Overview of the Study ..................................................................................................... 14

Chapter Two: Review of Research and Applicable Studies ....................................................... 16

  The Process of Project-Based Learning .................................................................................... 16

    Pre-Planning ............................................................................................................................. 16

    Introducing a Topic .................................................................................................................. 17

    Creating a Driving Question .................................................................................................. 17

    Choice and Voice .................................................................................................................... 18

    21st Century Skills .................................................................................................................. 19

    Inquiry .................................................................................................................................... 20

    Feedback and Revision .......................................................................................................... 20

    Publically Presented Product ............................................................................................... 21

    Assessment ............................................................................................................................. 22

Review of Research Literature ................................................................................................... 23

Case Studies .................................................................................................................................. 25
Case Study One: Grade 9 Biology, Nutrition Project ...................... 25
Case Study Two: Grade 8 Geography, Human Rights Unit .............. 29
Case Study Three: Grade 8, Volcano Unit ................................ 34
Summary ................................................................................. 38

Chapter 3: Research Methodology and Methods .......................... 41
Description of Research Design ..................................................... 41
Description of the Sample ............................................................ 42
Description of the Instruments Used ............................................. 43
Explanation of the Procedures Followed .................................... 45
Discussion of Validity .................................................................. 48
Data Analysis ............................................................................... 49

Chapter 4: Findings and Results ................................................ 51
Table 1: Student Responses to Question One on the Reflection Questions, “What level of personal effort did you put into your project?” .................. 52
Table 2: Student Responses to Reflection Question 2: “If you were to redo your project, what would you change about it?” ........................................ 54
Table 3: Student Responses to Reflection Question 3: “The next time that you do a project, what skills/ strategies did you learn that you will take with you?” .......................................................... 56
Table 4: Student Responses to Reflection Question 5: “Did you enjoy participating in this project? Why or Why not?” ................... 58
Table 5: Student Responses to Question 6 of the Reflection Questions: “What did you like/ dislike about learning through this project?” .............. 59

Chapter 5: Discussion and Conclusions ..................................... 65
Discussion .................................................................................. 65
Response to Research Question .................................................. 68
Limitations and Suggestions for Further Research ....................... 69
A message for teachers wanting to try project-based learning .......... 71
THE EXPERIENCE OF STUDENTS AND TEACHERS IN PROJECT-BASED LEARNING

Implications ............................................................................................................. 73
Conclusion ............................................................................................................. 77
References ............................................................................................................ 79

Appendices:

Appendix A: Student Reflection Questions ......................................................... 81
Appendix B: Engagement Rubric ........................................................................ 82
Appendix C: Project Planner ................................................................................ 83
Appendix D: Tubric ............................................................................................. 84
Appendix E: Group and Individual Class Task List ............................................. 85, 86
Abstract

This study uses action research to examine the experience of students and teachers as they participated in a project-based learning unit. The literature suggests that project-based learning can increase the involvement of students in the learning process and develop 21st century skills such as collaboration, problem solving and time management (Larmer & Mergendoller, 2010a). The students involved were in Grade 8 and were studying Optics. My hypothesis was that if students were engaged in self-directed learning through project-based learning, they would report being more engaged and achievement would increase. The students completed reflection questions at the summation of the project, which indicated an increase in effort applied to their work, an enjoyment of the project autonomy and the development of time-management skills. As the teacher, I completed engagement rubrics during each class on which students reported high levels of engagement. I also kept a journal that I wrote in after each class, which I coded for themes at the end of the research. Three themes emerged from this journal: uncertainty surrounding what an engaged classroom should look like, anxiety regarding students being self-directed in their learning, and a correlation between my cognitive energy and the perception of the lesson. The results of this study suggest that while students experience increased engagement and achievement, an emphasis needs to be placed on providing teachers with opportunities to learn and experiment with project-based learning.
The Experience of Students and Teachers in Project-Based Learning

Introduction

I am a Biology and junior science teacher at a high school in urban British Columbia. I began my teaching career relying on the resources of others, which consisted mainly of overheads and notes with some activities to reinforce the delivery. I found myself so disengaged with this method of teaching that within my first two years I was looking for another job. I was hopeful that there could be a way to teach that would provide my students with the necessary information while keeping myself engaged as well. I had no idea what to call the type of learning that I wanted to do with my students, I just knew that I wanted learning to be exciting again. I felt that the way I wanted to teach did not match up with the teachers around me so I started to experiment in my classroom with activities that students could do that they could learn through. However, this was exhausting, and I continued to be doubtful about my long-term involvement in this profession.

One day in the photocopying room a colleague talked to me about assessment for learning and how he was using it in his classroom. He also mentioned a Masters program where teachers explored inquiry-based learning and he thought that I would be a good fit. This started my journey to learn how to create a more engaging classroom and a more engaging career. Through the process, I have learned that what I want to do cannot be placed into one category, nor do I believe that any teacher can teach through only one method. Most of what I have been experimenting with is a hybrid of Inquiry, Backwards Design, Assessment for Learning, and Project-Based Learning. Understanding this has been very overwhelming and I feel that there is
a gap between what we want teachers to be doing, and what we prepare them to be able to do in
teacher education programs. Developing skills to implement these strategies in everyday practice
takes time - something that teachers do not have in excess. I asked myself how I could move my
practice towards something that I could enjoy without trading my personal time, my mental
health and my cognitive energy? I experimented for one year with assessment for learning, and
backwards design before recognizing that I was doing project-based learning in an elective
Leadership class that I had been teaching for two years. My question then became, how could I
use these skills in a science classroom which was more curriculum and assessment-driven than
the elective class? I knew that it would not be easy, but I also knew that in answering this
question I would help not only my own practice, but the practice of many other teachers as well.
Thus, I endeavored to discover whether the process of inquiry is worthwhile for my students.
Would I see an increase in student engagement? Would it be possible for me to accomplish this
as a teacher with my schedule and other demands?

**Purpose of this Study**

The purpose of this study was to examine the experiences of students and teachers while
participating in project-based learning. Project-based learning is defined as an instructional
method that affords authentic learning tasks grounded in the personal interests of learners (Grant,
2009). Many studies look at the motivation and educational impact that project-based learning
has on the student (Dumont et al., 2010; Hattie, 2010). This study seeks to look at both the
experience of the student as a participant in project-based learning, and also the teacher as the
creator of the project-based learning environment. Twenty years ago, teaching practices that
allowed student mobility, choice, group work and complex tasks were perceived to result in a
breakdown of the effective classroom-teaching model (Mergendoller et al. 2010). Now we are asking teachers to utilize these strategies as regular practice in the best interest of their learners (BC Ministry of Education, 2013). Therefore, the recognition that student-centered learning produces better results has been made, however, there has been little support for teachers to implement a different system than the one they experienced growing up. Project-based learning has also been described as a constructivist teaching approach, in which the student receives support, engagement and motivation through the creation of authentic learning experiences opposed to tests and essays (Ravitz, 2010).

The project-based learning experience in this study was born out of my desire to try implementing project-based learning in a science classroom. I had observed increased student ownership and engagement in elective classes using the project-based learning model, and sought to create this experience within the science classroom. The current study will be used to guide the creation of professional development sessions for teachers in project-based learning, as well as provide an on-going cycle of inquiry for me in my own classroom as I seek to improve my practice.

Project-based learning introduces the student to a real-world problem in which they explore a real-world issue from a perspective designed to maximize personal interest. Students then proceed through a process of inquiry, finding answers to an ongoing cycle of questions in the creation of a project that answers the initial real-world problem. Teacher support takes the form of scaffolding necessary skills either prior to embarking on the question, or interspersed throughout the unit. These skills are designed to help the students address the problem from different perspectives without providing the answers for them. The process of creating a project-based learning opportunity for students, as it exists now, is time consuming for the teacher. I
have often perceived the effort required to instruct in an integrative, deeper level is worth it for the reward of seeing the students more engaged, however have associated it with a tiresome amount of background leg work. The specific impact of the different elements of project-based learning and its implementation still need to be explored.

Michael Grant (2009) suggests that the success of project-based learning is more complicated than simply taking into account the experience of the teacher and the student. Grant found that part of the success of the experience is determined by intrinsic and extrinsic motivations on the part of the student. In particular, he found that students believe that they enter the project with a particular skill set and that they use primarily or exclusively these skills in order to create a successful project (Grant, 2009). Additionally, his study found that extrinsic factors like the amount of time allowed to complete the project and the perception of control over grades will influence the outcome of the project (Grant, 2009). If time is short, then the student will default to the skills that they feel are most successful, repeatedly utilizing the same skills or strengthening the skills they already possess. Directing the outcome of the project, the teacher needs to co-create the criteria for a successful learning experience with the students. If the purpose for implementing project-based learning is to engage students in the development of 21st century skills such as collaboration, inquiry and problem-solving, then the entire process of project-based learning needs to be examined for its potential (Larmer and Mergendoller, 2012b). In project-based learning this is often demonstrated by reflection journals or project updates allowing the teacher to assess the whole process in an assessment for learning strategy. In my experience, integration of assessment for learning prior to embarking on project-based learning is essential for supporting the learners’ ongoing growth and development of skills. If these skills
are not integrated, students maintain an attitude where the emphasis remains on the final project rather than the process of creating the project.

This study builds upon current research investigating how project-based learning can be implemented into the classroom. It also seeks to look at the role of the teacher and how the process can become easier for the average teacher with seven classes and a school that may not be on board with project-based learning yet. Larmer and Mergendoller emphasize that project-based learning is easier on the teacher when there is support from administrators and colleagues. Support from schools in the form of time to collaborate, plan, critique lessons and exchange resources can be the difference in successful project-based learning communities. When a school has support, the facilities, materials, and technology are readily available and shared projects can happen without conflict. Timetables can be modified or other teachers may be more flexible with their teaching blocks (2012b).

This study explores strategies that can increase the chances of success for teachers who may by the first to implement project-based learning in their school. The results of this study will be used to influence professional development sessions for teachers who are curious about implementing project-based learning in their classroom, but not ready to “give up control” just yet. If successful, teachers will view it as a way of guiding students towards better self-management and self-learning, and not as a way of giving up control.

**Justification for the study**

The conversation in education today seems to be around self-directed and authentic learning. Teachers are also well aware of the concerning trend of high school graduates that are
not prepared for the “real-world” when they get to university or “real life”. In response, the BC Ministry of Education recognizes a need to transform the public education system and is looking at modifying teaching practices in order to address these issues. The Ministry reports that while the province continues to perform well, there is recognition that the current system was designed based on the perceived needs of a different era of learner. The Ministry is looking for a teaching and learning style that is more focused on helping students learn through collaboration, flexibility and personalization. The Ministry of Education also recognizes that the common stand-and-deliver method of teaching is not producing students with the skills required to be successful in today’s society (2013, p. 6).

The model of project-based learning that incorporates teaching 21st century skills appears to present one model of shifting teaching methods towards the needs of students. The idea that learning-by-doing results in higher retention is not something new as illustrated by these well-known maxims:

*I hear and I forget, I see and I remember, I do and I understand.*

~ Confucius, 450 BC

*Tell me and I forget, Teach me and I remember, Involve me and I will learn.*

~ Benjamin Franklin, 1750

*There is an intimate and necessary relation between the process of actual experience and education.*

~ John Dewey, 1938, p.7
Providing these opportunities to learn by involvement or doing falls to the creativity, willingness, and time of teachers. How are teachers to learn these skills without the opportunity to first learn and explore themselves? This study hopes to outline some basic principles for teachers hoping to implement changes such as project-based learning into the classroom. Known as project-based instruction, many schools are offering pre-service teachers the opportunity to experiment with project-based learning as a teaching tool in the role of the teacher on their practicum (Marshall et al., 2010). A study by Marshall et al. (2010) suggests that while student teachers are being exposed to project-based learning through learning experiences, many of them are hesitant or unsure if they have correctly implemented it in the practicum experience. Just as students need to have scaffolds through the process of inquiry, so do teachers.

**Research Question and Hypothesis:**

The current study has sought to answer the following question: What is the experience of students and their teacher who participate in a project-based learning curriculum? My hypothesis is that students will indicate that they feel increased engagement. The researcher also hypothesizes that the teacher’s experience will feel both rewarding and uncomfortable.

**Definition of Terms:**

**Project-based learning.** Blumenfield et al (1991) define project-based learning as, “…a comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problems” (p.369). Project based learning is believed to have its roots in constructivist approaches to instruction which supports meaningful and engaged learning situations for students where projects are created to represent learning (Blumenfield, 1991).
Current support for project-based learning comes from a desire to foster 21st century skills in students (Larmer & Mergendoller 2010a). The assessment of student learning is based on criteria that are set out prior to the implementation of the project scenario. Grant (2009) suggests that project-based learning should have the following critical elements, (a) a Driving Question or an authentic problem to be solved, and (b) the production of one or more artifacts as a representation of learning. Larmer and Mergendoller (2010a) agree and suggest that project-based learning should also include (c) some degree of student choice and voice, (d) a process for revision and reflection and (e) a public audience. For the purpose of this study, project-based learning is defined as the unique inquiry process taken on by the teacher and students beginning with the development of a Driving Question through to the creation of a product. The process of project-based learning is the emphasis of project-based learning; therefore, elements of reflective assessment for learning are at the heart of the experience.

**Student engagement.** There are many definitions of student engagement. Parsons and Taylor (2011) define student engagement as increasing achievement and positive behaviors. Visible Learning (Hattie, 2008, p. 192) cites Kumar’s meta-analysis in defining engagement as the effective time within allocated class time that a student actively participates in learning – experimenting, attending, participating in discussion, questioning, answering, and taking notes. For the purpose of this study, and to incorporate my original goal, which was to increase teacher and student enthusiasm for teaching and learning, I have chosen to define engagement as the observation of student enjoyment and purposeful activity that increase student achievement and positive classroom learning behaviors. Engagement was measured through observations by the researcher with the aid of a rubric designed by Paige Fisher (Appendix B).
Assessment for learning. Assessment for learning is formative assessment that functions to provide evidence regarding student achievement, which can be used to make decisions about the next steps in instruction. It usually takes the form of feedback whereby the teacher can address the course of the students learning (Dumont, Istance & Benavides 2010, p. 148). The intent of assessment for learning is to encourage students to use feedback to build on their knowledge and gain confidence in themselves as learners. The process encourages students to build effort strategies surrounding learning rather than results-oriented learning.

Facilitator. In many of the case studies, the role of the teacher is defined as a facilitator in that the teacher is “hands-off” in their role while students are self-directed in their learning (Chin & Chia, 2004, Lee & Bae, 2007). The definition adopted by the teachers here is to scaffold or guide learning where they see their questions as guiding the outcome of student learning. In a case study by Grant (2009), the teachers also defined themselves as facilitators and viewed their role as more methodical whereby the teacher had achievement indicators for each day that dictated the course of the students learning on a daily basis. For the purpose of this study, I see the role of the teacher is seen as a facilitator; however, facilitator is defined as the tool that students can learn from in order to scaffold their learning. The role of the facilitator is dynamic in that the course of learning is adapted to the needs of the students, whether that be the whole class or an individual student. I see the role of the facilitator not as a hands-off role, but as a co-creator of learning, adapting the learning experience with the students.

Brief Overview of the Study

My study aimed to examine the experiences of students and teachers in a project-based learning environment. Student engagement was a key exploration, as was my experience in the
role of the teacher in my attempt to further understand the barriers to implementing project-based learning. Twenty-two grade 8 students participated in this study. Students entered the class in January 2013, and the project-based learning assignment was integrated in March 2013. Students were participating in a Science 8 Optics Unit, culminating in Human Vision, which was where the project-based learning was introduced. I used tools provided by the Buck Institute website to develop a timeline, provide project logs for students and check off essential project components (Buck Institute of Education, 2013).

Students were asked to complete reflection journals for the duration of the project, outlining their process of project creation. These reflection journals were used to assess for themes in student engagement and experiences throughout the process. Students were also asked to complete an open-ended questionnaire in which they were asked to express their opinion on the project relating to engagement and potential for improvement to increase learner engagement. The answers to the summative questionnaire were collated and themes were highlighted in order to direct them in moving forward with future project-based learning.

As the teacher, I used an engagement rubric to evaluate the engagement level of the class. I also used reflection journals to evaluate my experience as a teacher implementing project-based learning.
Chapter 2: Review of Research and Applicable Studies

In this section, I present the process for project-based learning that I intend to utilize in this study. Following that, I will present a review of the research literature and a selection of case studies that offer insight into how project-based learning is implemented, and the experiences in the classroom by both teachers and students.

The Process of Project-Based Learning

I used materials from High Tech High and The Buck Institute to guide the process and understanding of implementation of my project (Larmer & Mergendoller, 2010a; Patton, 2012). These resources highlight the key components in developing project-based learning with the introduction of a topic, creation of a Driving Question, the importance of student voice and choice, integration of skills required in the workplace of today, the inquiry process, plenty of feedback and revision, and a publically presented product (Larmer & Mergendoller, 2010a; Patton, 2012, p. 42). As the current study seeks to examine the experience of the teacher and student while introducing a project-based learning environment into a traditional public-school classroom, this review will emphasize the implementation of project-based learning into the classroom from the teacher and student perspective.

Pre-Planning for project-based learning is perhaps the most daunting task for beginning teachers. Backwards Planning or backwards by design is a method of asking what you want the students to know prior to creating a project (Patton, 2012, p. 42). There will inevitably be criteria that must be integrated into the project, and creating a project with these criteria in mind helped me to develop the project as well as determine what was important to assess. Alex Patton, from High-Tech High suggests that making a list of the things that the students are expected to have
learned can help you create an effective project and also help with later assessment (2012). By placing the problem first - at the beginning of developing a unit – both the teacher and the students know why they are learning what they are learning (Chin & Chia, 2004). There are many resources available at the Buck Institute of Education and High-Tech High that can help with the planning process. For the purpose of this study, I chose to use the planning template provided by The Buck Institute (Appendix C).

**Introducing a topic** is defined as instilling a “need to know” in the learner while also ensuring that you are incorporating important curricular content (Larmer & Mergendoller, 2010a). For the project to be meaningful, the students need to have a personal connection to the work and perceive it as relevant (Larmer & Mergendoller, 2010a). One method that teachers can use to instill a “need to know” in students is to stage an entry event that will invite them to ask questions. The introductory event can be anything that gets the students thinking about the topic and drives them to ask questions. It is important to keep in mind the end vision for the product or presentation when developing the entry event (Larmer & Mergendoller, 2010a).

**Creating a Driving Question.** The term Driving Question is a term coined by the Buck Institute to reflect the question that captures the heart of a project and gives students a purpose and a challenge (Larmer & Mergendoller, 2010a). High Tech High’s Alex Patton refers to this as an essential question (2012). For the purpose of this study, the term Driving Question was used. A good Driving Question should be provocative, open-ended, complex and linked to the educational purpose (Larmer & Mergendoller, 2010a). Patton, with High-Tech High, has established three criteria for creating a compelling Driving Question. He states that it should be a question that people would ask in the “real world”, it should not have an easy answer so as to stretch the student’s abilities, and it should be a question that ignites the imagination of students.
Often this question is designed by the teacher in the pre-planning stage so that the goal of the project is clear. With the project focus being on the Driving Question, it serves to focus the students’ work and deepens their learning by framing important issues, debates, challenges or problems (Larmer & Mergendoller, 2010b). As project-based learning is about student-led learning, Patton (2012) suggests that real student-led inquiries could have the students generate their own Driving Question based on areas of a topic that they are passionate about. The Buck Institute has developed a tool called a Tubric that helps students in the development of a Driving Question that is compelling and leads to real inquiry (Appendix D). The Tubric was used in this study to help students generate their Driving Question.

**Choice and Voice.** The ultimate goal of project-based learning is to engage students through increasing *choice and voice* in how they learn and represent their learning. In order to make learning more meaningful for students, the more choice and voice that they have in how they present their learning the better the retention of information will be (Larmer & Mergendoller, 2010a). The teacher as facilitator can manipulate the complexity of the project by putting restraints on criteria or leaving the project more open to choice. There are a number of options open to the teacher during the developmental stages of the project. In a limited-choice project, learners can select what topic to study within a teacher-generated Driving Question or choose how to design and create their own projects (Larmer & Mergendoller, 2010a). A middle-ground option may be to give the students a menu of options from which to choose creative products from. This would prevent students from becoming overwhelmed by the choices available to them (Larmer & Mergendoller, 2010a). With some experience or if the students and teacher are comfortable, the project can be developed with plenty of choice in topic and products created. The students can design as much of the project as possible from the resources they use,
to the way they present the material and even the timeline within which they propose to complete
the project (Larmer & Mergendoller, 2010a). In one case-study, students were encouraged to
mind map based on the issues that were of interest to them. Students then brought their ideas and
questions with them to the first week of the project in order to decide as a group what the focus
should be (Chin & Chia, 2004). The more the students control the direction of the project, the
more it allows them to express their own learning in their own voice which is linked to increasing
students’ educational engagement (Larmer & Mergendoller, 2010b)

21st Century Skills. The Buck Institute refers to the integration of workplace and life
skills into projects as 21st century skills (Larmer & Mergendoller, 2010a). These are defined as
skills such as collaboration, communication, teamwork/teambuilding, oral presentation skills,
reflection, and problem solving (Larmer & Mergendoller, 2010a). The current shift in education
is from learning information to learning skills that will help graduates after they complete formal
education. In order to give them opportunities to learn these skills, they need to be incorporated
in the projects that are facilitated by teachers. Larmer and Mergendollar (2010b) argue that if we
want to graduate students who can solve real-world problems, manage their time and collaborate
with others, then we must give them opportunities to experience these within their school
experiences. Scaffolding these skills can be in the form of a “Need-to-Know” worksheet or a
goal setting worksheet where students are prompted with questions such as “What do you know?
What do you need to know? How can you find out what you need to know?” (Chin & Chia,
2004). From here students can set up task allocation, or use their product goals to focus their
research for each class as an individual and as a group (Buck Institute of Education, 2013; Chin
& Chia, 2004).
Inquiry is a process whereby students follow a spiral of questions and answers that starts with their own questions and leads to a search for resources that will help them discover their answer. In the discovery of the answer, students ultimately end up developing more questions, testing ideas and drawing various conclusions based on their process (Larmer & Mergendoller, 2010a, p. 3). The questions that are raised by the students while they are researching activate their prior knowledge, help to focus their learning effort and develop an understanding of new concepts (Chin & Chia, 2004). The teacher’s job is to facilitate the students’ learning through the process of inquiry, which can be facilitated by establishing a classroom culture that values questioning, hypothesizing and an openness to new ideas and perspectives (Larmer & Mergendoller, 2010a, p. 3).

Feedback and Revision. Within the classroom project-based learning culture there needs to be a formalized process for feedback and revision. The feedback and revision process makes the learning meaningful for the students because it emphasizes the expectation that project products and performances are meant to be high-quality (Larmer & Mergendoller, 2010a). The process could involve teacher feedback or peer feedback and could be started at the beginning of the year with smaller sample projects. If students understand the benefits of multiple drafts and peer critique early on then it will make a difference later when larger projects are introduced (Patton, 2012). The feedback process can be critiques of other group work using exemplars and rubrics or it could be meeting with a teacher or facilitator to check research notes and monitor progress (Larmer & Mergendoller, 2010a). While it is difficult to integrate multiple drafts into the timeline of a project as teachers often feel the pressure to fulfill the curriculum requirements, establishing a culture of feedback and revision and then building it into the project timeline is important (Patton, 2012). The benefit for the student is that these feedback sessions become
learning opportunities or lessons in themselves because they present opportunities for the teacher or peer groups to introduce concepts and skills that students may be lacking (Patton, 2012). Checking in with students is also beneficial for the teacher also, as it provides an opportunity to ensure that students are on the right track and offers them the chance to address any misconceptions at a point where corrections can still be made (Patton, 2012).

With regards to assessment, having ongoing feedback sessions with students can be a valuable tool in personalizing the assessment for each student as revisions provide the means to assess a final project as well as the path that the student took to get there (Patton, 2012). Students are encouraged to create an ‘archive’ of feedback or a portfolio on the progression of the project (Patton, 2012). Critique sessions can take various forms during the course of the project and can be both formal and informal (Patton, 2012). Ron Berger suggests making a set of ground rules with the class prior to engaging in any peer-to-peer critique session, such as Be Kind, Be Specific, Be Helpful (Patton, p.74). The first critique session can be introduced as a way for students to co-create criteria for project evaluation. This could be accomplished by having an exemplar or a model of excellence where students can have a discussion about what makes it excellent (Patton, 2012). An example of a peer critique could be a work-shop group where students are grouped with specific questions about the product. Students then take turns presenting their product to the other students in their workshop group, discussing the questions and receiving feedback as a way to improve the product (Patton, 2012). The understanding here is that students see the success of the class wrapped up in the success of all projects not just their own (Patton, 2012).

A publically presented product has less to do with the showcase and more to do with the motivating factors behind the student’s drive to complete a project that is high-quality
The public exhibition will have a significant impact on driving up the standard of student work as it forces them to stand beside their work answering questions that will be harder than those of their classmates and teacher (Patton, 2012). A public audience makes the projects that students are creating feel real and meaningful rather than projects that are strictly for the teachers eye, or “make-work” projects that are typical in school. Many students feel that they can go through the motions of project creation; however, when they are requested to stand by their project and present it to an authentic audience external to the classroom, the project becomes significantly more meaningful. The presentation of projects to an external authentic audience increases the effort put in by the student as well as increases the motivation of students to create something authentic for the situation.

**Assessment.** The assessment piece of project-based learning loops back to the pre-planning stage where the planning was done ‘backwards’ from your list of learning goals and it can take many forms (Patton, 2012). It is important to emphasize that students should be involved in the creation of the assessment strategy so that they are aware of what they are being asked to produce (Patton, 2012). Patton simplifies assessment by developing “power standards” which are defined as a combination of what students need to know and what they will be penalized for not knowing (2012). If you are designing a project inclusive of curricular standards, this method can be helpful when the content is heavy (Patton, 2012). These curricular bench-marks can also be incorporated through lessons that are interspersed in the project timeline. Some teachers might find “Spaced Learning” helpful (Patton, 2012). Spaced Learning is a formula for teaching students a large amount of information in a short amount of time and can easily be incorporated into the timeline of a project (Patton, 2012). The formula for Spaced Learning is to have the teacher give a presentation on information for 10 minutes, usually by
PowerPoint or some other medium. Following that 10 minutes of instruction the students are given a 10 minute activity break before coming back to do another 10 minutes related to the first 10 minutes of instruction – perhaps the same PowerPoint but with numerous fill-in-the-blanks for students to interact with the information. Following that is another 10 minute break and finally an application or recall activity with the idea being that the information learned remains in the long-term memory after seeing it and manipulating it (Patton, 2012). The information that is presented on the topic can either be assessed through its incorporation into the project or by a test or quiz assessed by the teacher (Patton, 2012). Another alternative if you are looking to incorporate a number of aspects of a curriculum is to have students teach each other their projects and have the formal assessment cover the material of all students (Patton, 2012). Assessment throughout the project using reflection journals can help teachers ensure that students are learning what they need to learn while also constructing great artistic products (Chin & Chia, 2004; Patton, 2012). As the teacher in problem-based learning, it is important not to wait until the end to assess the whole product as the understanding is found in the process developing the project (Patton, 2012). While the project is often a group project, finding a way to assess individually as well through self-reports, peer evaluations or teacher observations is important (Chin & Chia, 2004; Patton, 2012).

Review of Research Literature

Newton, Mark & Gamoran, (1996) highlight that there is a general agreement that in order for our students to succeed, we need to be helping them develop 21st century skills. These 21st century skills create the foundation of project based learning, using authentic situations, and intellectually challenging tasks to increase achievement indicators. The use of project-based
learning practices have also been found to predict student achievement better than looking at students’ prior achievement or other background factors. The use of authentic learning situations increases the engagement of students, which in turn increases their motivation to learn (as cited in Dumont et al, 2010, p. 200). Dornyei (2001) describes motivation of the student as highest when students are, “…competent, have sufficient autonomy, set worthwhile goals, get feedback and are affirmed by others” (as cited in Hattie, 2010, p. 48). Dornyei’s definition of engagement links closely with the definition of engagement in the present study, which was defined as increasing the positive behaviors and achievements of students and recognized in the observation of enjoyment and purposeful activity. According to Dumont et al., the use of project-based or inquiry learning in the classroom is often poorly understood and others are quick to judge the process as unstructured (Hattie, 2010). Perhaps self-directed learning can appear to be unstructured if there is not an appreciation for the roles of scaffolding and ongoing assessment as a method of guiding student’s learning. It has been shown that when teachers lack this appreciation then the benefits of implementing project-based learning decrease (Hattie, 2010). However, when the teacher has taken time to understand the implications of these practices, and learn the value of scaffolding and assessment for learning, then the achievement gains seen in students can be substantially increased.

Project-based learning is defined as a means of making learning more accessible and readily applied to the world. The efficacy and popularity of project-based learning has wavered, with critics rejecting it for being too unstructured for the classroom and the belief that projects are only applicable to vocational training (Dumont et al., 2010). However, research into the benefits of project-based learning conclude that while teachers may fear otherwise, students actually experience gains in factual learning that are equivalent to those engaged in traditional
forms of instruction (Thomas, 2000, as cited in Dumont et al., 2010, p. 205). Mayer (2004) found that guided discovery learning leads to better learning outcomes than direct instruction (as cited in Dumont et al., 2010, p. 53). The research seems to suggest that the knowledge acquisition is similar if not better among those students learning through project-based learning. The true benefits of this method can be seen when the project is coupled with assessment for learning where the students receive feedback on the process of their learning, rather than the product. Comments on progress rather than final grades reinforce the reality that learning is a dynamic state contingent on the effort level in the task at hand (Dumont et al., 2010). As students receive feedback on their process of learning, it builds effort strategies for the student and they have more confidence in their ability to learn. The gains of inquiry learning in the science classroom are seen in the process of learning rather than the production of a product (Bredderman, 1985; Shymanksy, Hedges and Woodworth, 1990 as cited in Hattie, 2010, p. 209). It is important to realize that it is the process of project-based learning that is powerful, not the end product.

Case Studies

The following case studies examine the experiences of project-based learning in the classroom. They have been chosen to reflect the various methods teachers select to approach project-based learning in the classroom and an evaluation of the effectiveness of different strategies. Additionally, motivations on the part of the student have been examined to provide insight into the teaching strategies that result in the largest impact through project-based learning. They have been chosen as learning tools to evaluate the current study and to inform direction for future project-based learning experiences.
Case Study One: Grade 9 Biology, Nutrition Project. Chin and Chia’s (2004) study of a Singaporean grade 9 girls’ biology class investigated how self-generated questions directed students’ learning. They sought to investigate the reaction of students to project-based learning and the problems that were involved in the process, both from the teacher and the project perspective. Chin and Chia (2004) conducted observations, field notes and interviews with students and teachers as well as using student work samples and audio recordings of group dynamics. The authors observed the class over the course of the year, focusing their time on the period when students were engaged in project-based learning. The process of project-based learning in this scenario was developed for a nutrition unit in a Science 9 classroom. In stage one of the study students were broken into groups of nine and given case studies on a range of topics related to nutrition. Students then mind-mapped the issues and wrote down their ideas, which resulted in a group topic that reflected something that would happen in real life. In stage two of the study students were asked to establish a project-planning outline by filling out a “need to know” worksheet answering the questions, “What do you know? What do you need to know? How can you find out what you need to know?” During stage three of the study, students collected data to support the question through searching the internet, field investigations, surveys and interviews. Stage four of the study was on-going as students put the information together throughout the process, continually updated project task allocations, recorded what they had learned and planned the next step of their process. In stage five, students presented their findings through oral presentations and use of technology. Groups also submitted a file documenting their findings and the details of their inquiry process (Chin & Chia, 2004).

The outcomes of the study determined that the students that were involved reflected a number of the suggested positive learning outcomes associated with project-based learning.
Students were able to use a variety of research methods in approaching their inquiry question and were also able to present through a variety of creative methods such as taking on the role of an expert. In addition to presenting in a variety of ways, students were able to steer their investigations in whatever direction they chose, integrating resources from other disciplines. This illustrates a real-life integration of all subjects and aspects of reality. The course of their learning was steered by the question that the group came up with, indicating student-centered learning (Chin & Chia, 2004).

There were several limitations to this study when examining the outcomes through the lens of project-based learning as mentioned above. Of note is that the process of project-based learning, as defined by the literature in Chapter 2, was not followed in this study. Firstly, the reader was not informed of any pre-planning on the part of the teachers for the creation of this project. Additionally, there was no mention of an entry event to encourage the students to become engaged in the material. Regarding the project process, each group was teacher-defined and given an assigned topic, which limits the students’ choice and voice. There was no mention of the development of a Driving Question and the exhibit was delivered to the rest of the class rather than to the experts that were involved in the development process. The final assessment of the projects was also missing from this study. A limitation of the study design was the lack of pre- and post- assessment of student’s engagement and learning. While indicators showed that a number of students were found to enjoy the process, work well with group members and use multiple sources of information to answer their questions, there were no reference measures on students’ ability to work in a group or search for material prior to engaging in the project. In fact, a number of students reflected that they felt that a limitation was in their oral presentation skills and that the project was a waste of time. These issues address a limitation in the application of
the project scaffolding process, which was never referenced in the procedures of developing a delivery process (Chin & Chia, 2004).

An important conclusion of Chin and Chia’s (2004) study is the importance of scaffolding the students’ skills prior to engaging in the process. This is a large part of the pre-planning stage of project-based learning and is a cornerstone to the process being effective. Without group skills, time management strategies and curricular planning, the process of project-based learning becomes less beneficial. Poor introduction to group skills can lead to students having unhealthy group dynamics such as disagreements about next steps, what to include in presentations, and the amount of work to be delegated to group members (Chin & Chia, 2004). Additionally, time management skills on both the part of the teacher and the student are important. Students found that they had difficulties meeting outside of school time and some students waited until the last minute to work on their project (Chin & Chia, 2004). Having ongoing reflections or project check-ins would counter this issue, as students would need to set goals for their personal and group completion for that class. Within the process and pre-planning of project-based learning, the student responses showed that there was a lack of student ownership in the projects, potentially due to a lack of choice in material. Students also reported that topics were too narrow and developing a question led them towards too narrow of a path (Chin & Chia, 2004). This pre-planning phase is what makes project-based learning less appealing to teachers as the process of pre-planning is laborious for teachers and students (Chin & Chia, 2004). It is also apparent how important the role of the teacher is in project-based learning. While the project design is geared to be student-led, the teacher must be comfortable being the facilitator and effectively direct the students (Chin & Chia, 2004). As the facilitator, how hands-off or hands-on should you be? How can you guide the questioning without steering it for them? There needs to be a belief in the
process and effectiveness of project-based learning in order to make the time investment worth it for the teacher. Time must be invested into the pre-planning phase, the development of appropriate skills, such as collaboration and research, and facilitation of projects (Chin & Chia, 2004).

Chin and Chia’s study relates to the current study in several ways. One limitation was the lack of time-management skills developed in the process. In the current study students were encouraged to create project timelines and to demonstrate learning goals and reflect on the accomplishments of the day. Another limitation was that students were given the material that they were expected to conduct research on. In the current study students were encouraged to form groups based on their interest in the subject and then find a Driving Question that was of interest to all students in the group. Chin and Chia’s study provided some empirical data to support research into student motivations and attitudes towards project-based learning; however it called for more information on the formation of a project plan and implementation within an average public school environment.

Case Study Two: Grade 8 Geography, Human Rights Unit. Case study two explores the student perspective in project-based learning. In particular, Grant examines what motivations students had in the creation of their final projects. The basis for asking this question was to examine the process of using projects as the final assessment of learning. If these projects are meant to be the representation of knowledge acquisition, then understanding how students are making choices about their projects and the creation of the projects is important. The primary research questions were, “from the perspective of students engaged in project-based learning, what influences their project work and learning” (Grant, 2009, p.2).
The case study examines a grade 8 Geography class in a private day school in South Eastern USA. There are 15 students per class who had ongoing access to technology through a bring-your-own device initiative. The researchers in this study co-created a lesson with the teacher of the class, and then conducted interviews with students, observations of the classroom and students and collected student artifacts. The lesson that was created was designed surrounding a Human Rights unit where the teacher and researchers designed a webquest to guide the students through an exploration of human rights over the course of 10 weeks. The design structure began with an introduction through an emotional anchor or mission, which was not specified. Following that was a definition of the learning task, the outline of procedures for the investigation and a site of suggested resources available to the students that had been filtered by the teachers. The creators also built in scaffolding mechanisms, opportunities for collaboration, reflections and opportunities for transfer activities (Grant, 2009).

The outcomes of the study suggested five themes that influenced students project creation. The five themes were, (1) internal influences, (2) external influences, (3) beliefs about projects, (4) tools for technology-rich environments, and (5) learning products (Grant, 2009, p. 1).

Internal influences were defined as a student’s perception of their personal abilities, persistence and motivations. Researchers concluded that students made personal evaluations of their own abilities and the amount of effort that a task would require. Students chose projects partially based on these equations, trending towards something they perceived themselves to be good at and that would take less time.
External influences were defined as things such as the teacher, grades, time and logistics. The primary external influences were the teacher, specifically in that a lack of teacher engagement negatively impacted the learning environment. It was found in this study that when a teacher begins to get frustrated with the process of project-based learning, they often flip from facilitator of inquiry to didactic methods of teaching. Grades were also experienced to be an external influence, as students felt that they were strictly within the teacher’s domain. What it takes to get “good grades” affected the choices they made about their learning projects, therefore, students were creating projects for the teacher rather than to represent their learning. There was an over-arching belief that project work was easier than a test, and therefore if students were to complete their project then they would do well. There was very little motivation for students to attempt something outside of their comfort zone as abilities determined the course of their projects, grades were perceived to be out of their control and there was an uncertainty in how the process of learning was to be evaluated.

This study also demonstrated that students accessed their previous understandings of projects when creating their products. They entered into the project creation with a preconception that projects should be colorful, involve the audience, and be engaging. They understood that the final project was meant to be a representation of their learning, but felt that the aforementioned factors would lead them to a better mark. As grades were a motivator, this led to more projects being made with their previous beliefs about projects in mind, rather than a showcase of understanding. The students involved appeared to understand that there was a choice in how they presented information but did not understand how the integration of knowledge and other disciplines could fit into their prior knowledge. Many of the students
reported that the knowledge acquired through their project felt less meaningful than when they were given the information through didactic teaching (Grant, 2009).

The school in question was interested in incorporating technology into the classroom in an effective way, much like the situation in the current study. The students were informed that their project product needed to incorporate the use of technology in any way they saw fit. As long as technology was utilized in the creation of the project then it would be considered fulfilling requirements. The teacher and researcher chose to consolidate all resources onto a webpage for the students to reference. Computers were then used mostly as tools to increase productivity. The researchers found that this did indeed lead to a reliance on technology (Grant 2009). Unfortunately, this meant that if the power went down then students could not continue on their projects. Additionally, students were found to stick to programs that they were familiar with and already comfortable with when creating their projects.

This leads into the learning products that the students created. As mentioned above, the students were asked to create a product that incorporated technology at some stage of the creation. This was limiting in that students had different understandings of different programs, as well as differing levels of access to computer programs.

Important conclusions that came from this study surround the student development of projects and how they arrive at the project idea that they present. If the premise of project-based learning is that students utilize a project to represent the knowledge they have acquired, then acknowledgment of the motivating factors behind project creation need to be kept in mind when the teacher is developing a project. Primarily, identifying the intrinsic and extrinsic motivations behind a student’s choice is valuable insight into the creation of a project-based learning scenario.
Scaffolding other skills could help with this issue; however, the recognition that students will still lean towards areas they perceive to be skillful in has implications for project design. Additionally, the role of the teacher cannot be ignored. If the teacher is asking students to embark in unfamiliar territory, then they must make the effort to do so enthusiastically and also make an effort to reinforce their role as the facilitator rather than as a didactic teacher.

Another important conclusion made in this study is that the use of technology does not appear to be an advantage unless students are given the opportunity to learn skills in which technology-driven projects can be created. While the outline followed by the teacher and researcher seemed implicit, one of the outcomes revealed by this study is the quantity of time required for in-depth inquiries and how challenging that can be for teachers (Grant, 2009). The authors mention the necessity of the teacher to shift from the role of didactic instructor to hands-off facilitator and suggest that when a teacher is first implementing project-based learning, a hybrid method may be most effective. Understanding why it would be helpful for students to produce a project may help with the development of the learning scenario. In this study, students were asked to write an essay on a topic and then create a museum artifact that represented their own learning. Referring back to the criteria of learning, is the project is necessary? If learning has been shown through an essay, then what value is the project unless it is tied to an element of choice to supplement their learning or be an alternative to traditional essays and tests?

The limitations of this study are multiple. While measuring the five themes that influence student project creation, there was no empirical data to support the trends that were found as researchers relied upon interviews and self-reports of data, which is open to personal interpretation. As the study was developed to examine the use of technology in the classroom there was a major oversight in not providing students with equal access to computer programs
and tutorials for the development of projects. To assume that students are at the same
developmental level with relation to the ability to create projects through technological mediums
ignores the importance of scaffolding. To that end, many of the processes of project-based
learning were overlooked during this study. The students were not given choice or voice over
their project as the resources and the topics were assigned for them. Students generated the
knowledge, but in a structured format designed by the teacher. Additionally, reflections on
learning were not made during the process of this study. The results pertaining to students’ choice
of project development method may have been much different if there was some credit given to
the creative learning process. The emphasis on the reflection piece is a large component of the
project-based learning curriculum as it both helps students to learn from their experiences and
teachers to assess the process rather than just the product. Additionally, the assessment piece
could have been made with the students input so that students felt less like they were creating a
project that fulfilled prior expectations of projects, and more that they were free to explore, create
and potentially fail at something as long as they were challenging themselves.

Grant’s study is relevant to the current study in that it highlights that the development of a
project is dictated by the students’ perceived abilities and their perception of time and effort. As
the current study seeks to assess students’ motivation and engagement, there needs to be a
recognition that the students are coming into the experience with varying degrees of intrinsic and
extrinsic motivation. Students must be given enough time to complete a project that may be out
of their comfort zone. Scaffolding in assessment for learning may help students to feel more
comfortable experimenting with different outcomes, so as to minimize the fear of grades and
failure. The assessment for learning practice should focus on the process of the creation of the
product which requires the teacher to have ongoing conversations with the students to educate
them as to which groups are working outside their comfort zones and to allow for process evaluations rather than product evaluations.

**Case Study Three: Grade 8 Volcano Unit.** The final study also reflects a science classroom. Lee & Bae (2007) represent a grade 8 classroom studying volcanoes. The classroom was a cosmopolitan, mixed-race classroom with 30 students registered in the class. Researchers in the other two studies were predominantly interested in the students’ perspective; while this study examined the roles of the teacher in the implementation of project-based learning. Researchers asked the question, “In what ways did the teachers facilitate students learning about volcanoes using PBL? (p. 1) This study took place in a school where project-based learning was encouraged to be a culture of the school by teachers and administrators. The teacher of this class sat down with a student teacher to re-develop a project-based learning experience for the volcano unit. The teacher observed in this study had created his own approach to project-based learning after having experimented with it over the years and fine-tuning aspects so that he felt comfortable implementing it into the class. While a fair amount of scaffolding was done around group dynamics and assessment, the teacher chose to implement a structured project-based learning scenario where students were guided through parts of the project each day with goals of completion expected at the summation of each class. Students were asked to solve a real-world problem acting as scientists and engineers and then come up with a solution that they would present to a fictitious city board, which was represented by the two teachers (Lee & Bae, 2007).

The researchers’ intention was to conduct a naturalistic case study in which they studied the actions of the subjects in the school environments that was not altered or contrived in any way. General school observations and field notes were made prior to the research period in order to set a baseline for the climate of the school. During the project-based learning, the investigators...
were inside the classroom each day. They also collected documents from the teachers, their planning sheets, the list of resources and copies of student folders. The interviews with teachers and students were transcribed to assess for themes.

The researchers found that teachers’ questions and student group dynamics had the largest impact on the students’ course of learning. The teachers in this study had three major concerns. The first was the heterogeneity of the classroom in terms of abilities, needs, and academic levels. As a result of this, student groups were arranged by the teachers based on the perceived needs and abilities of the students to work together and to support the learning of each student in the group. The second was mastering the steps of project-based learning, and the third was covering the required concepts required by the curriculum. Through interviews, the researchers came to understand that the teachers identified with the role of facilitators who helped with the directions of the group. They did this by asking questions to guide students rather than instruct students.

As mentioned above, the project was arranged with specific guidelines and was therefore a structured project-based learning scenario. The teachers introduced the project and gave students goals that were to be completed each day. They found that with their specific guidance, students built up more evidence collaboratively, and understood material at a deeper level than if they were to list terms and simple facts about volcanoes. The teachers also passed out rubrics for students in an attempt to ensure that students knew exactly what they were supposed to do and master. The structured design allowed students to be more focused on their work and their course of learning was driven by their self-generated questions within those guidelines. The teachers did experience some tension between their ideals and the implementation of project-based learning at this point. When this occurred, the teachers were observed to slip back into their traditional teacher role of focusing on scientific facts about volcanoes. The pressure of
standardized tests and an uncertainty whether students would perform well on them also created pressure for the teachers. They were certain that students were internalizing more information and knowledge through the project; however they were unsure if they could reproduce this on an exam.

An important conclusion that can be made from this study is that there is no “right” way to do project-based learning. The teacher of this classroom designed a process that worked well for him. Some may be hesitant to call it project-based learning due to the structure of the daily goals; however his hybrid model is one that worked for him in his classroom. The teacher needs to be aware of what skills they are hoping to teach the student if they are to adopt a more structured project-based learning scenario. For the purpose of learning real-life skills, this method takes away from the students’ development of time management skills and other real-life skills that are only learned through the process of applied learning.

Limitations of this study are such that there is no measure of what the students learned through this process. If the teachers and authors are concerned for the students’ ability to write standardized exams, furthers studies examining whether or not there is a difference would be beneficial. The teacher in this classroom was not providing an experience for students that encouraged voice, choice and ownership over their learning. In order for students to experience the true value of project-based learning, teachers need to develop confidence in implementing this methodology. Potentially this can be attributed to current methods of teacher education programs and perhaps more opportunities for learning and growth need to happen through this method in order for teachers themselves to feel more comfortable.
In this study there were two facilitators, a teacher and his student teacher who were being observed by researchers that were routine visitors to the school and classroom. The teachers felt that they were facilitators or guides to the correct answer rather than encouraging the inquiry process of asking more questions. The overall structure was designed more for specific outcomes to be reached rather than encouraging the inquiry process in students. While this is often a requirement of teachers to ensure that the subject material is covered, in the current study the teacher was hoping to follow a more open-ended and self-directed approach to project-based learning. The uncertainty surrounding what the students are going to learn, or if they are going to learn has been a common thread in literature. It would appear that the uncertainty of the teachers in this study resulted in an idea for a project that ended in structured scaffolding to the correct information. In Case Study Two, the authors noted that when a teacher is uncomfortable with the process of project-based learning, they return to their old methods of teaching (Grant 2009). This is apparent in this case, where the idea of project-based learning was there, however, uncertainty surrounding the outcomes for students and how it would reflect on the teacher resulted in the teachers relying too much on structure and less on independent learning. This case study reminds the teacher in the current study that there will be uncertainty in the delivery of the learning experience. Ultimately, the goal of the study is to observe the results when student own their own learning and in order to do that, the teacher must relinquish some control.

**Summary.** The studies reviewed in this project reflect a need for further research into the development of project-based learning scenarios for students and the expected outcomes of project-based learning. Both Chin and Chia’s study of a Biology classroom and Lee and Bae’s study of a Volcano unit found the path of students learning was determined by the questions that they asked themselves and that the teacher asked them. Here we see the importance of the teacher
role in being a coach or facilitator (Lee and Bae, 2007; Dumont et al., 2010). The more that the teacher believes in the importance of this role, the more effective they can be in developing knowledge through authentic learning experiences (Hattie, 2012, p.23). The process of learning through project-based learning also provided students the opportunity to explore and integrate interests outside of the typical syllabus creating more authentic learning experiences, which can be applied outside of the classroom (Chin & Chia, 2004; Newton, Mark & Gamoran, 1996 as cited in Dumont et al., 2010, p. 200). Chin and Chia’s study (2004) indicated that most students self-reported an enjoyment of the process of project-based learning; however, there were indications that further attention and research could be applied to the areas of scaffolding skills required for successful group work, time management and project scope. It is interesting to point out that other research has also come to the conclusion that including these facets of learning into the project-based learning experience is important (Mergendoller et al, 2006; Dumont et al, 2010). Both the Chin and Chia study as well as the Lee and Bae study followed a more structured approach to project-based learning, which could stem from an uncertainty on the part of the teacher as to the efficacy of self-directed learning. The research suggests that a teacher’s belief in the model shows a correlation to the success of the experience, which could have increased the learning experiences of the students (Hattie, 2012, p.23). Lee & Bae (2007) concluded that the current teaching environment makes it difficult for the teacher to integrate innovative instructional approaches; however, teachers will likely experience uncertainty in any new teaching methods introduced into their classroom and meta-analyses provide the confidence teachers need to see that development of this as a teaching skill and learning avenue can create positive achievement indicators in students (Marshall, 2010). These positive achievement
indicators are increases in engagement, motivation and achievement (Dumont et al., 2010; Hattie, 2012; Chin & Chia 2004; Lee & Bae, 2007; Grant, 2009).

Micheal Grant’s (2009) study outlined the development of a project-based learning unit for grade 8 students and looked at the motivations behind student project choice. He suggests in his study that, among others, the perceived intrinsic and extrinsic motivations of students are actually what drive the completion of a project (Grant, 2009). Motivation of the student is highest when they are understood, their level of competency is high and the learning process is upheld (Dornyei, 2001, as cited in Dumont et al., 2010). Of importance is the recognition that all of the learning and decision making process is not evident in the creation of a final product. In order to truly assess student learning, the process itself must be assessed (Grant, 2009; Dumont et al., 2010). The role of the teacher was examined by both Grant (2009) and Lee and Bae (2007) in the project-based learning classroom. Both studies noted that when teachers experience frustration or their plan goes off-track, they often revert back to their previous method of teaching (Grant, 2009; Lee & Bae, 2007). The research and this study agree that the teacher shapes the course of the learning and steers the outcome of the learning experience (Grant, 2009). The process of project-based learning coupled with research on the teacher’s role in the classroom helped guide the current study in my attempt to understand the interconnectedness of the students, the teacher and the project-based learning experience.
Chapter 3: Research Methodology and Methods

Description of the Research Design

The current study was designed to look at the experiences of students and teachers in a project-based learning, inquiry environment. Specifically, it sought to assess whether students’ engagement in the learning process was increased, and what difficulties students and teachers experienced with the process of introducing project-based learning. This study also aimed to add to the literature and resources for teachers on implementing project-based learning into the classroom by providing a look into the classroom, the students and the role of the teacher.

The research design of the study was action research. Action research is any systematic inquiry in the teaching and learning environment that seeks to gather information about how schools operate, how teachers teach and how well students learn (Mills, 2011). Action research places the teacher and classroom at the center of the research as opposed to traditional educational research where a top-down implementation often leads to a separation between theory and action and between research and practice (Efrat et al., 2013, p.10). The goal of action research is to gather understanding about a unique situation with complexities, ambiguities and nuances such as the teaching classroom (Efrat et al., 2013, p.7) The reason for conducting action research is to gather information to make educated decisions about teaching and learning processes. Mills emphasizes, “…action research is done by teachers for themselves…” (Mills, 2011, p. 5). The process of action research follows a process of identifying an area in which the educator wishes to focus and collect data that they will analyze and interpret to develop an action plan (Mills, 2011, p.5). The process of action research is very personalized as educators seek to explore their own practice, reflect on their process and develop their skills from these results.
(Efrat et al, 2013). Many educators engage in informal action research each time that they bring a new learning strategy into the classroom. It is a method for teachers to reflect on a process and use that reflection to influence the decisions that they make in the future (Mills, 2011).

In this study I saw a classroom where drive for achievement was high, while engagement in learning was low. The students began in my class in January 2013, and I felt that high achievement and low engagement in learning was particularly prevalent. I decided to experiment with project-based learning in the classroom and give the students an opportunity to learn some of the skills of project-based learning prior to engaging in a full project. During the project, daily goal and reflection sheets were used to monitor student progress and would be used at the summation of the project as research to address themes. I also wrote my own reflection journals and made note of changes that took place over the course of the inquiry in response to both the students’ and my needs. Part of my reflection journal was an engagement rubric to assist me in objectively assessing my perception of student engagement in the classroom while they were working. The reflection journals of both the students and myself were utilized at the end and coded for themes to include in the research. Additionally, students were asked to complete a post-assessment of the project, responding to open-ended questions that were coded for themes and grouped into appropriate categories.

**Description of the Sample**

The study took place in a grade 8-12 high school located in British Columbia, with a population of approximately 1300 students. The classroom that was utilized for the study was a grade 8 science classroom with myself as the teacher. The students were all enrolled in a mini-school which streams for science and math. The mini-school enrollment is based on an
application process, which includes interviews and an assessment of the students’ academic standing. The mini science program at this school is an accelerated program having students graduate a year earlier than their non-mini-school peers. Given the nature of the program, it would be fair to assume that this group of students would be more academically engaged and mostly free of learning challenges. The predominant ethnic background of students is Vietnamese, however within the science classroom there was a heterogeneous mix of ethnic backgrounds. The sample selected was 22 students from the grade 8 mini science class. All of the students in the science class engaged in the same project-based learning process and were given the opportunity to participate in the study. Only those students who filled out a consent form were included in the research findings. I was both the teacher and the researcher in this study and am in my fifth year of professional teaching. This was my first attempt at implementing a project-based learning scenario into a science classroom, however I had previous experience with project-based learning in an elective classroom. These students were not participating in any other project-based learning classrooms at the time of the study.

**Description of the Instruments Used**

To ensure that the results of the current study were meaningful and to direct further teacher practice, student perception of skill development and reflection on the process were guided by looking at similar reflection examples (Larimer, Mergendoller, 2010a). I was looking for themes related to skill development and learner engagement as well as feedback for further projects.

The students participating in this study were asked to complete open-ended reflection questions at the summation of the project exhibit. The survey consisted of six questions relating
to their perceived level of personal effort, skill acquisition and development, self-reflection during the project process and suggestions for further project-based learning (Appendix A). Question one asked, “What level of personal effort did you put into your project?” This question was designed to elicit student engagement in the project through the commitment they were willing to show in the creation of a product. Question two asked, “If you were to redo your project, what would you change about it? Why would you change it?” This question was designed to encourage the reflection and revision process in the project creation along with the third question, which asked, “The next time that you do a project, what skills/strategies did you learn that you will take with you?” The hope was to help students become aware of skills that they would utilize in similar situations in the future, thereby re-enforcing the development of 21st century skills. The fourth question asked, “What did you learn most about yourself in this process?” as an invitation to self-reflect and grow. Question five and six were designed to measure engagement, with the hope of eliciting what aspects of the process students found enjoyable. Question five was, “Did you enjoy participating in this project? Why or Why not?” and question six was, “What did you like/ dislike about learning through this project?”

The responses to the questions were collated and categorized into over-arching themes. The engagement rubric could be referenced each day to gauge the students’ engagement from day to day as they were working on their project.

The resources used to conduct the study came primarily from the Buck Institute of Education “Do-it yourself PBL” website (Buck Institute, 2013). Timelines for creating a project, important factors in creating a project and many templates were modified or used from the Buck Institute’s “Do-It-Yourself PBL” website for teachers and can be found in (Appendix E).
Explanation of the Procedures Followed

I began this project by seeking ethics approval through the Vancouver Island University (VIU) Research Ethics Board, which was granted February 28th, 2013. Approval from School District #39 and the Principal of the High school was approved in November 2012 once the preliminary ethics submission was made to VIU. Due to extenuating circumstances unrelated to the project, participating students were transferred to me in January of 2013. The students were informed that they would be a part of a research study designed by myself and motivated by my desire to explore how students learned through projects. I sought consent through mail-home letters sent with students interested in participating in the study. Translations of letters were offered as an option for those families that needed a translator. The letter illustrated the aims of the study and how their child’s experiences in the study would be reported. All parents were offered contact information in the case of any questions. Parent/Guardian consent forms were then returned to an unmarked mailbox in the office for the survey administrator to collect in February 2013. All forms were placed in an envelope in the administrators safe to be destroyed in September 2015.

During the period of the research study, students were involved in researching and presenting on a topic surrounding Human Vision. They watched a video on the Bionic Eye as an entry event and then created a mind-map of questions to consider as a class. Students then grouped themselves according to the question that resonated with them the most, creating approximately 13 groups of one to four students. The students then took the question in whichever direction they wanted, with the goal being to teach others about their question and represent it in a creative way. This project was linked to the BC Ministry of Education Prescribed Learning Outcomes for grade 8 Science.
The students were introduced to the process of feedback and revisions through a lab report where students were asked to co-create the criteria for marking a lab report prior to completing the lab. As was discussed in Chapter 2, the emphasis on reflection and revision in project-based learning is a key tool in its success as a learning strategy and I wanted to ensure that it was something the students were familiar with prior to embarking on their projects. After completing the lab, students were then asked to hand in their best possible example of a lab report, and bring it to class where they gave feedback to their classmates in workshop groups. At this point students were invited to hand in their reports and I made recommendations and gave feedback by referring to the co-created rubric and handed the assignment back to students. There were no grades assessed during the process, simply feedback and reflection on assignments. The students then had the opportunity to make changes and hand-in the revised assignment for further assessment noting the changes that were made. Informal conversations with students and subsequent assignments illustrated to me that the students quickly adapted to this method of handing in assignments.

The students embarked on their projects in March 2013. They were reminded that all students would be completing the same learning projects; however, only those students who had submitted consent would have their reflections used in the study. Students were again reminded that their participation in the study was voluntary and that they could withdraw at any point. At this point in the unit, the students had experienced lessons on light and light waves through a hybrid method of instruction including both notes-based instruction, small projects and exploratory lab experiences. The culminating unit for the Science 8 Optics unit is Human Vision and was the unit used for this study. The planning of the project-based learning unit was done
using backwards design using the prescribed learning outcomes for grade 8 Science as defined by the BC Ministry of Education. The timeline was constructed using materials from the Buck Institute. The students were introduced to the topic through an Entry Event, showing them a video on the Bionic Eye. Students were then asked to individually mind-map all the questions that came up for them through the process of watching the video and learning about the human eye. They were given 15 minutes to brainstorm their questions and then as a class, they used a wall-sized white board to write the three questions that they were the most interested in discovering more about. As a class, the students and I then categorized similar questions, talked about the difference between topics that would lead to multiple answers versus topics that could be answered with a “yes” or “no”. The students were then asked to write down the question on the board that resonated with them the most and met with other students that were inclined towards the same question. These formulated the student project groups.

The following class, students were asked to get into their project groups and design a Driving Question for their project. The Driving Question was facilitated by the use of a Tubric designed by the Buck Institute. The idea behind the Tubric is to help students create a Driving Question that leads to a substantial inquiry process and a robust product. The students were then given worksheets that would allow them to fully define their Driving Question and outline the steps to completing this task. Each day the students were asked to fill out a goals worksheet that would outline for themselves and the group what tasks needed to be completed that day in order to move them towards their project goal. For the last 15 minutes of each class, students were asked to reflect on what had been accomplished that class, and what factors had lead to successful completion of their goals, or had impeded their goals. They were also asked to envision the next steps of action needed for their project so that they could use them in goal-setting the next class.
The students used workshop groups to facilitate student feedback and had access to technology during class periods where project work was being worked on. Technology access at the school was limited, so students were encouraged to bring their own devices to school.

I actively took on the role of facilitator during this process. This meant ensuring that students were moving in the right direction with development of their question and assisting the groups as they made their way through their inquiries. I also reflected upon my experiences daily and at the end of each class made modifications for the following class that would incorporate information or skills that I perceived the class to need.

The final products were assessed based on a rubric that was co-created by myself and the students. Students were given a copy of this rubric at the beginning of the assignment so that they were aware of the protocol that was required in their final product. An emphasis was placed on creative expression of knowledge.

At the end of the unit students were given the open-ended reflection questionnaire.

**Discussion of Validity**

Validity of the study was carefully considered when constructing this study of students’ experience of project-based learning. The classroom context is vastly different from a controlled laboratory; therefore, issues of validity are difficult to address. External factors are impossible to eliminate; however, the measures were taken to offer a relatively unbiased and objective sense of the students’ responses. Given that I was both researcher and teacher in the classroom, the threats to internal validity were examined and attempts were made to minimize their impact.
Given that this is action research, the external validity is weak as transferability of results to other populations and environments would need further support.

Ensuring the anonymity of the respondents minimized threats to the validity of the reflection questions. The reflection questions were assigned to be completed without me there, were collected by the administrating officer, the Vice-Principal, and had not been a part of the research. Validity was enhanced as I did not receive the reflection questions from the students and they were further locked in the safe of the administrator to be disposed of at the end of the research period.

**Data Analysis**

At the conclusion of the research period, the reflection questions, teacher reflections and student engagement rubrics were collected and analyzed. The reflection questions addressed the six questions that were explained above in the description of instruments used (Appendix A). As these questions were open-ended, the response to each question was recorded separately and coded for similar themes. Themes related to perceived effort, the construction of the product, 21st century strategies learned, self-reflection, group work and suggestions for further projects. Emergent themes were recorded by myself, as well as the frequency with which these themes arose. Data is presented in Chapter 4.

The data was collected in this manner as it was thought that it would be the most effective method for assessing the whole picture of project-based learning and an effective tool to dictate further research in the area of project-based learning.
I also used an engagement rubric and engaged in reflection journals, which were coded for themes. The results of the rubric and the themes found in the journals are discussed in Chapter 4.
Chapter 4: Findings and Results

The purpose of this study was to explore the experiences of students and myself, their teacher while participating in a project-based learning program. The participating students were enrolled in a grade 8 science class studying Optics in a Metropolitan area in British Columbia and participated in the project for four weeks. At the end of the project, students were asked to respond to reflection questions relating to their experiences participating in a project-based learning environment. All students who participated in the study completed the reflection questions. The questions were open-ended and were coded according to the themes of the answers. The six questions that students were asked were, 1. What level of personal effort did you put into your project? 2. If you were to redo your project, what would you change about it? 3. The next time that you do a project, what skills/strategies did you learn that you will take with you? 4. What did you learn most about yourself during this process? 5. Did you enjoy participating in this project? Why or Why not? 6. What did you like/dislike about learning through this project?

The responses to question one were all reported in a percentage form. As illustrated in table 1, the most significant finding was that most students perceived their personal effort on the project to be in the range of 80-100%. Engagement for this study was defined as the observation of student enjoyment and purposeful activity that increases student achievement and positive classroom learning behaviors. With 73% of student’s students stating that their personal effort levels were at 80-100%, the results would imply that students perceived themselves to be engaged in their learning. High effort can also imply that students were engaged in the process of learning as well as the product. Weakness in the process of project-based learning was in the 27% of students that reported an effort level less than 80% with 9% of students reporting levels
less than 50%. As no definition was given for the term *effort*, it would be interesting to conduct further studies examining the responses of students reporting lower effort levels. One student reported that they left the project until the last night and therefore rated their effort as low. Evaluating the student responses to the subsequent reflection questions may provide the teacher with feedback on how to adapt the project to encourage the effort levels of the remaining 27%.

Table 1

*Student Responses to Question One on the Reflection Questions, “What level of personal effort did you put into your project?”*

<table>
<thead>
<tr>
<th>Perceived Effort</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100%</td>
<td>1</td>
</tr>
<tr>
<td>80-89%</td>
<td>9</td>
</tr>
<tr>
<td>70-79%</td>
<td>2</td>
</tr>
<tr>
<td>60-69%</td>
<td>1</td>
</tr>
<tr>
<td>50-59%</td>
<td>1</td>
</tr>
<tr>
<td>40-49%</td>
<td>1</td>
</tr>
<tr>
<td>30-39%</td>
<td>2</td>
</tr>
</tbody>
</table>

Question two was designed to make the students think about what skills they would bring to their project if they had the chance to do the project over again. Students were asked, “If you were to redo your project, what would you change about it? Why would you change it?” The
results, as seen in Table 2 show that all students would choose to change an aspect of their presentation. The aspects of their presentation ranged from addressing the creativity of the product that they presented to changing the presentation itself. Many students did not answer the second part of the question asking “Why would you change it?” However, those that did responded with references to other class products. For example, one student responded that they would change the amount of background information that they had given on the eye. The student gave the reason that one of the other projects had a lot of information and it made it all more interesting and easier to understand.

The results here reinforce the importance of feedback and the revision cycle. With regards to the classroom, it would suggest that students who were involved in multiple project-based learning units over the course of the year would benefit from the scaffolding of project outcomes. It may also be beneficial for students to see a prototype as a measure of excellence in order to guide their product creation. Responses from students indicate that seeing other students’ projects led to realizations and reflections on their own work. This establishes the importance of the showcase at the end of the project, where students learn from examining other student’s final products. One group included details about the eye and how it worked in their final project, which led to a number of student reflections suggesting that they would change the amount of detail about the eye that they would present in a future product.
Table 2

*Student Responses to Reflection Question 2: “If you were to redo your project, what would you change about it?”*

![Graph showing student responses to reflection question 2]

Question three asked students to comment on the skills and strategies that they would take with them from their experience in this project. The question read, “The next time that you do a project, what skills/strategies did you learn that you will take with you?” Most student responses were coded as related to time and time management strategies (43%). One of the scaffolding tools that was introduced into the project was a goal-setting and time-management form that can be found in (Appendix E). Forty-three percent of students responded that the use of the goal sheet to create structure for planning their project daily and over the course of the four weeks was helpful and that they would use this as a skill moving into future projects. Students also found that they developed skills regarding teamwork (24%) and how to make an effective presentation (24%).

These results reflect the impact that scaffolding can have on the students’ experience. In this study, it suggests that scaffolding students in the area of time-management was effective.
Conversely, a study by Lee and Bae (2007) showed that too much teacher support in time management can actually detract from the students’ development of time-management skills. In this case, the use of the goal-setting worksheets appeared to positively influence the students’ ability to transfer time-management skills to other areas of their lives, suggesting just the right amount of scaffolding. A reason for this may be the autonomy experienced by the students in deciding what the goals were for each class. In the study by Lee and Bae, students were prescribed goals and timelines set out by the teacher.

Students were not given any scaffolding in effective presentations; however, 24% of students responded that they would take the skills that they learned in making presentations with them into the next project. This implies that students either taught each other how to make presentations or they took lessons from the presentations of other students. Again, this implication points to the importance of sharing your learning as a class in order for other students to gain from the experience. Twenty-four percent of students also mentioned that increased group skills were something that they would take with them to subsequent projects. Group skills were also not something that was facilitated by myself in this study. The reflection questions pointed to the theme that students learned their role in a group through the self-reflection process and also understood the relationship between the roles of different students coming together to complete a project.
Table 3

*Student Responses to Reflection Question 3:* “*The next time that you do a project, what skills/strategies did you learn that you will take with you?*”

![Circle chart showing student responses to reflection question.](image)

In response to reflection question number four, “What did you learn most about yourself during this process? Please explain.” Students reported that they learned the most about presentation skills and their role in a team, which correlates to the responses given in reflection question three. Thirty percent of students stated that they learned about their strength and weakness in creating effective presentations and reported that observing other students do their presentation helped them reflect on what they could have done better in their own presentation. Thirty percent of students also said that they learned about what role they often play in a team situation. The explanations were more varied here, as some students reported that they often take on the leader...
role and in doing so feel like they are often doing most of the work. Other students realized that they were more likely to let other students make their decisions in a group and this led to feeling less ownership of the project.

Reflection question number five asked students, “Did you enjoy participating in this project? Why or Why not? As shown in Table 4, the students responded that they enjoyed working in groups the most (36%). The students also had high responses for the enjoyment of the topic (32%) and that they learned a lot (32%). One student reported that they enjoyed that their group could sit and listen to each other’s ideas before moving forward with an idea. Another student reported that he definitely would not have been able to complete this project without the help of his group.

This question was designed to receive feedback regarding the autonomy of the project as students were grouped according to their interest in the topic. Autonomy in topic selection was the second most reported reason for enjoying the project (32%). This is interesting when coupled with the result that 23% of students reflected that they learned a lot in the project. Together these results display the power of project-based learning. Giving students the opportunity to learn material that they are most interested in through self-directed means is the premise for project-based learning and what advocates return to as evidence of its effectiveness as a learning tool (Dumont et al, 2010).
Table 4

*Student Responses to Reflection Question 5: “Did you enjoy participating in this project? Why or Why not?”*

<table>
<thead>
<tr>
<th>Student Responses</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>8</td>
</tr>
<tr>
<td>Topic</td>
<td>7</td>
</tr>
<tr>
<td>Learned a lot</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>

The final question read, “What did you like/ dislike about learning through this project?” As is demonstrated in Table 5, the answers here were varied. Student reflections were consistent with the previous question in reporting that they enjoyed the autonomy over their presentations, groups and their topic (68%). They reported to enjoy the ability to decide how they presented their material and to a lesser extent, the ability to experience self-directed learning. The students also enjoyed the autonomy over the topics that they chose to research. One student replied that it was nice to have the option of how to present their findings instead of just having to create a
poster or a PowerPoint. With regards to what students would change, 36% of students reported the need for more time to complete their projects. Additionally poor group skills were reported as limiting factors in student perception of the project. A small number of students responded that completing citations and daily reflection logs detracted from the experience for them. Fifteen percent of students stated that they would change nothing about the experience. The high number of students reporting insufficient time suggests the importance of pre-planning and working with the students to ensure that enough time is allocated for each step of the project.

Table 5

*Student Responses to Question 6 of the Reflection Questions: “What did you like/ dislike about learning through this project?”*

<table>
<thead>
<tr>
<th>What did you like about the project?</th>
<th>What did you dislike about the project?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation autonomy (ability to choose how they presented material) (5)</td>
<td>The amount of time to complete the project (8)</td>
</tr>
<tr>
<td>Groups (5)</td>
<td>Poor group skills (5)</td>
</tr>
<tr>
<td>Topic autonomy (5)</td>
<td>Citations (1)</td>
</tr>
<tr>
<td>Project increased their understanding of the topic (3)</td>
<td>Daily reflection logs (1)</td>
</tr>
<tr>
<td>Self-directed learning (3)</td>
<td>Nothing to change (3)</td>
</tr>
<tr>
<td>Use of iPads (1)</td>
<td></td>
</tr>
</tbody>
</table>
I used a rubric designed by Paige Fisher to rate student engagement over the course of the project (Appendix B). Using the rubric, the students were ranked as Emerging, Developing, Applying or Extending. The majority of class reports were assessed to fall in the Applying category, which was defined by observable indicators of engagement. In instances where a group member was reporting in Emerging or Developing, I attempted to facilitate the student towards Applying by addressing the reason for disengagement. My goal was to have students average level of engagement be in the Applying category in which students would consistently be participating in learning opportunities, recognizing their own strengths and challenges as a learner, using tools and strategies to demonstrate understanding or contributions, and showing a growing sense of responsibility for the product that the groups were co-creating.

At the end of each class I reported my own experiences through a reflection journal. These reflections were collated and coded for themes at the end of the research period. The following themes emerged from the journals: uncertainty surrounding what an engaged classroom should look like, anxiety regarding students being self-directed in the their learning, and a correlation between my cognitive energy and the perception of the lesson.

The first reflection was written during the planning phase and depicted some of the elements illustrated in the literature such as planning for scaffolding and skill development. There were also questions about how I would ensure that the students were learning what they were supposed to be learning. Unsure of where to start, I obtained some resources from the Buck Institute that helped to scaffold my own development of a project through backwards design (Appendix A). The subsequent reflections were written for 10 minutes after the class with no prescribed topic.
Many of the themes of my journal entries reflected a lack of confidence and how to deal with that uncertainty. The uncertainty revolved around whether or not I had pre-planned the project in a way that was useful for the students. There was also a feeling of a “right” way to do Project-based learning that I was consistently trying to emulate. An example was the day that the students were developing the Driving Question. I was uncertain on how to scaffold a Driving Question properly. An excerpt from my journal is presented below.

“I didn’t know what a good Driving Question would look like much less how to teach others how to write one. I did what anyone would do and went to Google. What I got was a Tubric. It’s a tube of questions like a slot machine using different words that help create a good Driving Question. The best part is that there were no instructions so they had to figure out how to make it themselves. There were mistakes. Some chose to start over, others chose to adapt their mistake into something else. It look a lot of the stress off.”

Uncertainty was also apparent in how I felt a project-based learning classroom should look. My entries alluded to the dynamics of the classroom as being “…haphazard, but full of energy!” The following observation was made on March 1st,

“Walking through the group and it doesn’t look a lot different from other projects. There are students off-task and talking about unrelated information. The difference is that no one is on Facebook, every student has notes on their sheet in front of them and some of them even have extra questions written from information they’ve
found. Honestly, they seem so driven, but I feel hands-off … in general, I feel like I should be more engaged. They’re even teaching each other about their topics!”

The uncertainty mentioned in the research is apparent in my questioning of my role in the classroom and what sort of environment would be conducive to learning (Dumont et al. 2010). Project-based learning is a far stretch from a classroom where a teacher can control what the students learn, when they learn it and what prescribed learning outcomes they have met. Relinquishing this control and really adapting to the idea of a student-centered classroom was a challenge. This is evident in the following reflection,

“The classroom was LOUD – what does learning sound like? They were all on topic while I was walking by their groups. It was hard to get them to do work after their workshops. They all wanted to talk… Interrupted them – had them pull out their rubrics to ensure that they knew what was required of their project. I have a fear that they won’t produce something of the quality I’m looking for. This is definitely an exercise in letting go.”

One of the challenges of project-based learning is the amount of time and energy it can take to implement at the beginning. The preparation of the project takes work, and the role of the facilitator, while rewarding, is not a hands-off role. The case study by Grant (2009) highlighted the uncertainty of teachers and the desire to revert back to more traditional teaching styles in the face of uncertainty. The same was exhibited in this study as I experienced the fear that I was a
bad teacher if I could not have them perform well on their projects and tests. Grant (2009) also highlighted the role the teacher plays through questioning in directing the students learning. There was definitely a fear that what I brought to the classroom that day would influence their learning, and questioning whether that was fair or not.

“Totally exhausted today. Did a heart lab with the Biology 12’s, had last-minute Pink day organizing, my student teacher had a TOC-exchange day, and there were other student fires to put out. So much going on that I think I rushed through things and I don’t know if it made sense. I might have to go over it again next class. I don’t know what I’m doing!”

The engagement rubric combined with the students’ perception of their effort and enjoyment of the learning process are what won me over. Being able to report that students were engaged in self-directed learning is ultimately the reward that myself and other teachers are looking for in their classroom when they go searching for more student-directed instruction styles. The following reflection illustrates the satisfaction that can come from the process. It is a powerful reflection when coupled with the student reflection questions stating that many students perceived a 80-90% effort level was given to their project:

“The quiet during reflection time is amazing. Is it just because they’re grade 8’s? Mini? It honestly wasn’t that hard to instill this routine – quiet independent writing time. Of course it doesn’t last long once another teacher enters the room… but it’s awesome to see them writing about their learning.”
The results from the current study seem to match the research that has been done on project-based learning for both students and teachers. The student’s acquisition of knowledge through project-based learning is shown to match that of directive teaching while also increasing the development of 21st century skills, motivation and engagement (Dumont, 2010). The self-reflection questions asked of students reflect the findings that were found in the research, with most students applying 80-100% of effort to their project and learning from the experiences of their classmates in developing projects and other learning processes such as time management. The engagement rubric findings suggest that student reflections and teacher feedback on the learning progress of students increased their motivation to learn and authenticated the process of learning.

Educational research is predominantly in the area of the role of the teacher in relation to the students and the classroom and less on the experience of the teacher when implementing project-based learning. The current study does reflect the uncertainty of teachers as referenced in the literature as I became unsure of what learning would look like and sound like without reassurance of a positive outcome. For myself, this reaffirms the importance of scaffolding the teacher’s introduction to project-based learning and highlighting the importance of seeking support in the process.
Chapter 5 Discussion and Conclusions

Discussion

Using action research to explore the experiences of students and myself as their teacher was a valuable tool of reflection to examine those aspects that worked and those aspects that will need further exploration.

The outcomes for the students in this study were overwhelmingly positive and reflected the outcomes found in the literature. Students were found to report a high level of effort in creating their products, stipulating a high level of motivation and engagement. This has been found in other research and could also be attributed to the students’ level of choice in their topic selection (Larmer and Mergendoller, 2010a). Being self-directed, the fear is that students will be off-task; however this action research study confirmed that students were on-task and used the time-management tools provided effectively. In tune with true project-based learning, the students were guided through an authentic learning situation about Optics and developed the inquiry process of addressing their Driving Question through the use of 21\textsuperscript{st} century skills and workplace skills. Specifically, the students were effectively using 21\textsuperscript{st} century skills such as collaboration, problem-solving and teamwork as well as workplace skills such as presentation skills and time management (Larmer and Mergendoller, 2012a). They used the feedback from the teacher as well as their own feedback as they collected information to direct their learning. The feedback of all students suggested that they would change the outcome of their products. As Grant (2009) mentioned in his study it could be argued that the students utilized their self-perceived skills and abilities when creating the projects in an attempt to maximize positive achievement and minimize project creation time. This would serve to suggest that more of an
emphasis could be placed on providing an exemplar and scaffolding a variety of skill
development in future project-based learning units.

One of the indicators highlighted in this study was an increase in student engagement,
which was evident in the engagement rubric and teacher reflection journals. Through the use of
project-based learning, this study confirmed the research literature stating that the students were
seen to use time purposefully learning and engaging in the process of inquiry (Larmer and
Mergendoller, 2010a). Patton’s (2012) research regarding the benefits of feedback or workshop
groups was also evident as students reported that peer feedback was something that they took into
consideration during the project and that they would apply after the project in subsequent
experiences. Overall, the data in this study appears to support the literature that students are more
engaged and achievement is higher when the teacher uses project-based learning in the
classroom.

The study also explored the experience of the teacher in the classroom while introducing
project-based learning. The three themes that were found in my reflection journals were feelings
of uncertainty regarding what an engaged classroom should look like, anxiety surrounding self-
directed learning and its effectiveness and a correlation between cognitive energy and the
perception of the lesson. Research suggests that teachers’ experience with project-based learning
increases their ability to see results in their students (Dumont, 2010; Hattie, 2012). However,
current research has not adequately addressed the difficulty teachers’ face in learning the skills to
effectively implementing project-based learning as an effective teaching strategy. Reflecting my
desire to adapt the way I teach, the BC Ministry of Education has stated that the old way of
teaching students does not produce successful results, and that there should be a shift towards
student-centered learning (BC Ministry of Education, 2013). Although it is encouraging to hear
that some teacher education programs are providing their students with opportunities to learn and instruct through self-directed learning, it appears that there are limited opportunities for teachers to experiment with this process prior to having their own classroom or while in their own classroom. Many pre-service teachers reported that while they were taught methods of self-directed learning, they were still unclear whether it was effective and how to best involve students in the process (Marshall et al., 2013). It is recognized that the efficacy and ease of implementing project-based learning in the classroom is increased when there is collaboration or professional learning communities devoted to implementation (Larmer and Mergendoller 2012b). This is also the case for in-practice classroom teachers. Once teachers leave the pre-service learning situation, there is often an understanding that they enter the profession with all the skills required to be successful. My belief is that this is one of the reasons why many great teachers leaving the profession in the first few years. By providing a continuation of mentorship and upholding the value of collaboration once teachers enter the practice, we can begin to develop a learning environment similar to the one we champion for our students. This would be far more conducive to successful student-directed learning tools such as project-based learning.

There is still a fear that self-directed learning will not elicit the same achievement levels in students as traditional teaching methods (Newton, Mark & Gamoran, 1996 as cited in Dumont et al., 2010). The Nature of Learning (Dumont et al., 2010) suggests that these fears are a result of the uncertainty of teachers regarding what self-directed learning can look like and question the effectiveness of an unstructured learning style. These sentiments were echoed in my own study through my reflection journals despite the fact that I was familiar with the research stating that students performed equally if not better when they are engaged in through project-based learning (Thomas, 2000; Mayer; Newton, Mark & Gamoran, 1996 as cited in Dumont et al., 2010). The
conclusion that I draw from the current study is that scaffolding is a critical component of teacher education, and that teachers must be given more opportunities in safe environments to practice implementing project-based learning.

**Response to Research Question**

The question that I looked at through this study was, “What are the experiences of the students and their teacher in a Project-Based Learning and Inquiry classroom?” My belief was that students would report an increase in engagement, which was found to be true. I also hypothesized that the teacher would feel both uncertainty and reward from the process. I believe that I felt uncertainty from the process; however, reward may not be the correct word to use. Although, what I created in my classroom was a rewarding experience for my learners, it left me with many more questions about how to successfully implement project-based learning than I did when I started. I began this study with hopes of improving student engagement and exploring how I could change my practice to encourage student involvement. The question that prevails reflects the origin of, and consequentially how to address, the uncertainty that teachers experience when looking to start their own journey into project-based learning. The generous free resources provided by the Buck Institute and High-Tech High were what I relied upon to support the backbone of my planning and my process. I believe that having those guidelines in place provided a structure for me so that I could then evaluate to determine the importance of each step. Had I not had that structure, I am certain that there would have been elements of the learning process that I would have over-looked and the experience of engagement may not have been as effective for my students.
Limitations and Suggestions for Further Research

This study was designed to explore the experience of students and teachers embarking on project-based learning. Additionally, it offers extensive reflection into what I would choose to do differently if I were to repeat the experience.

Limitations to this study include the number of students involved and the type of student used for this project design. The number of students involved was 22, which can be considered low. The students that were in this class were selected based on their application to an accelerated science program. This requires the students in this class to have a higher than average mark and an aptitude for science and math as well as a desire to apply for the program. Replicating this study in other classrooms with a larger sample size would be beneficial in order to determine whether there is a reproducible effect of learning through project-based learning.

The scaffolding involved in the project delivery had the potential to skew the data reported in the reflection question pertaining to the skills that students learned and would take with them. Since time-management and goal-setting were skills that were developed through the project, the students may have been biased towards reporting these as skills developed in the learning process. While this was not highlighted to students as a skill that the project was seeking to develop, future studies could provide interesting information on the correlation between teacher scaffolding and the students’ perceived acquisition of a skill.

A further limitation pertains to the language used for the student reflection questions. As the student questions were open-ended, the answers that students provided were limited to their understanding of the question. In future studies, students may be given exemplars to choose from
that could adequately represent their learning experience. This would remove the ambiguity of word definitions.

Given that this is an action research study looking into the experiences of my classroom in this environment, the teacher results are largely based on reflection journals written and coded by myself, the sole researcher. While engagement was recorded using a rubric, the implications of my reflection journals may only pertain to myself and my perception of my classroom. Future studies would benefit from additional observers in the classroom.

There are many opportunities to explore further research on the experience of students and teachers as they participate in project-based learning. Regarding students, exploring the roles students play in the development of the project would be an interesting avenue to investigate. As this study was conducted in a mini-school the results may be skewed by the demographic of students being generally high-achievers with minimal learning concerns. In this study, 100% of students reported that they felt they would improve their product if they were to do this again. The question for further research would be whether this is a reflection of the class being a mini-school class where achievement and competition are high or if this is a reflection that all students would have upon experiencing the showcasing of products.

The engagement of students was visible during the course of this project. Further studies may want to address whether this was also a result of the type of class, as mini-schools are typically appealing to more academic students. Further pre- and post-tests would be ideal for understanding the engagement levels of students in a pre-project-based learning setting, during the project and post completion. I would also like to examine the link between scaffolding and motivation. For those students who chose to use the abilities and skills that they felt comfortable
with in Grant’s study (2009), would those results change if student were given scaffolding on
different product presentation styles? If scaffolding happened, would the students’ motivation to
use alternate presentation styles increase?

Regarding the teacher, further studies would be beneficial regarding the role that the
teacher plays in the classroom. While there are numerous studies on the climate that the teacher
creates, it would be interesting to see the relationship between experience in conducting project-
based learning and how that affects student engagement, achievement, and motivation. As many
teachers would interpret the steps of project-based learning differently, examining the approaches
that teachers take in the project-based learning classroom would be interesting in order to elicit
effective strategies. This would help teachers looking to implement project-based learning as it
would provide an emphasis on certain facets that may be more influential in the success of
students. Based on the conclusions of this study, the examination of the role of different styles of
project-based learning professional development would be of interest. If teachers were given the
opportunity to engage in the process themselves, would it increase their effectiveness in the
implementation of project-based learning? The study by Marshall et al (2010) speaks to the
importance of facilitating learning opportunities for teachers at the pre-service level. Future
studies could combine the two topics, looking at intrinsic and extrinsic motivations of both
teachers and students in the experience of project based learning. If the motivation of students is
influenced by their feelings of competency then the same could be extrapolated to apply to
teachers and the question becomes, “How can we increase teachers feelings of competency in
implementing project-based learning?”
A message for teachers wanting to try Project-Based Learning

Keep in mind that the decision to implement project-based learning in your classroom may feel different and complicated, but is no different from the process that you are hoping to take your students through. In order for you as the teacher to see your efforts as worthwhile, you need to see this project as meaningful, feel connected to why you would want to do this work and why you feel that it is relevant. These are the same recommendations outlined for students in Chapter 1 by Larmer and Mergendoller (2010).

Newton et al (1996) indicate that student achievement goes up (as cited in Dumont et al, 2010, p.200). Project-based learning develops 21st century skills in students (Mergendollar et al., 2006). Results from this study reinforce these outcomes, and also suggest that students commit a high amount of effort in an inquiry situation. Presumably, these are all outcomes that we are hoping for in our classrooms. The BC Ministry of Education would like to see a movement towards student-centered learning (BC Ministry of Education, 2013), and school districts in British Columbia are moving towards assessing the process of learning rather than grades. However, as the teacher in the classroom, you need to have your own connection to why this would be important for you to do. If you are thinking of exploring the effectiveness of inquiry and project based learning in your classroom, I would ask yourself the question, “Why is this important to me? Why would I want to do this?” You are going to need to come back to that question a number of times at the beginning when you are not sure what you are doing!

So you know why you would want to do this. Do you know what a successful project will look like? I found this to be an important step that I often overlook in the planning process. In not answering this question, I have no criteria to assess whether my project implementation
was beneficial or not. Part of this can be reflections during the progress of the project. If the emphasis is on the product, then it is very easy to dismiss the entire process as effective or ineffective. If projects are beautiful, the students may or may not have learned about the inquiry topic. Conversely, as illustrated by the case studies (Grant, 2009; Lee & Bae, 2008; Chin & Chia, 2004) you can have poor quality products created from a learning-rich project-development process where students really pushed themselves. I have news for you, the same can be said for your practice! If you pay attention solely to the end products created by your students how will you know what skills they developed? Remember that they, as well as you, are driven by motivational factors that are unrelated to the project such as the perceived skills brought to the project and their perceptions of success. The reflection process of this study was monotonous and irritating at the time; however it provided a rich source of feedback for me at the summation of the research and has helped me direct my professional development.

Implications:

At the summation of this study, I wrote the following journal entry,

“What I want and what I think other teachers want is some certainty about starting this process. This is evident in my reflection journals, and is also echoed in conversations with colleagues. If teachers are to try and implement something new into their profession, then they want to know that the time spent on that change is going to be worth it, and they don’t want to waste time searching for the right way to do it.

They want it to be easy. They want it to work. They want it to be safe.
How can we make it safe for teachers to integrate PBL into their classroom?
Give them resources? Give them Pro-D? Give them mentors and a safe place to ask questions? Give them the scaffolding that we would take students through if we were *doing* project-based learning in our classroom?!

Even sitting in conversations with other teachers that are doing inquiry in their classroom, I start to sweat and I’m not sure why I’m sitting there, I question if I’m out of my league. Am I really doing this “Right”? Maybe what I’m doing isn’t really inquiry. Maybe I relied just a little too much on the textbook. Maybe the kids didn’t learn what they were supposed to (but I covered my bases, they took a test… they knew it… but that was probably because I did a hybrid lesson and a review sheet and they’re mini-school.) … We’re not different than our students, we need scaffolding, we need someone to give us small skills to work into our practice until one day we have them all and then we’re still not pleased because we’re still asking ourselves how we could have done something else better… or this class is different than the one you had before, so it doesn’t make sense to do that here and research how to do it differently so that you cover the stuff that this class needs.

If someone were to ask me right now I would probably say, “If you were to help a student in your classroom, what would you say? What would you do? Approach the integration of project based learning into your classroom in exactly the same way, how would you start if you were scaffolding someone else?”
In light of the last paragraph, my conclusion from this study and the research literature is that teachers need the opportunity to engage in professional development that takes them through the process of project based learning from a learner’s perspective, but also allows them opportunity to practice it from a teacher perspective - just as we would do with our students. It is my belief is that there is strength in creating professional development opportunities that will engage and scaffold educators through the steps of project-based learning just as we scaffold our students. Ironically, my experience of most inquiry professional development is predominantly a stand and deliver format. My general experience is that I show up with some other enthusiastic colleagues (this alone means we may start off more engaged than our students). We sit and listen to a presenter talk about their experiences at their school and highlight the projects that they have done and the resources that they used, which often link to technology in some way. We have an overwhelming desire to produce these projects and results in the classroom as we go to coffee break. We are hooked, we are discussing, we are generating ideas. The professional development speaker got us hooked with their entry event! Often this follows with a chance to collaborate with teachers, generate your own topics and create Driving Questions for those topics. You are able to report out on your ideas and everyone becomes more excited learning from the ideas of others, jotting down those that pertain to the curriculum that they teach. In general, we are animated, passionate and feel fantastic about what we are going to do in our classroom when we get back. The professional development session ends with a question and answer period and then we all go back to our schools to plan. For me, this
is when I realize I lack everything but the Driving Question, a product and an entry
event.

This process makes project-based learning nothing different from a project. You can add some
*feedback and revision* in there and you can add some student *choice* into the project product and
feel more like you are following due diligence and really developing self-directed learning. As
educators we know that students need a bit more scaffolding. We also know that creating criteria
at the summation of a project does not serve the learning process of the student. If project-based
learning is about the process of learning, then we need professional development developing
skills in creating and evaluating the process. Teachers who are given more experience and
confidence in providing self-directed learning opportunities are shown to elicit better results from
students, leading me to conclude that professional development opportunities need to take
teachers through project based learning and allow them to apply it themselves with the same
scaffolding that we would give students.

I would encourage the scaffolding of teachers in developing project-based learning skills
to look more like what the literature states needs to be in the classroom. Continue to hook
teachers with projects that other kids have done in their classroom and have them discuss as a
group what they liked about it and what they want to explore on their own classroom. From there,
help them to develop a plan. Have prescribed learning outcomes for the different curricular
subjects on hand to help enable teachers to plan what they want to assess in their projects. What
do kids need to know? What other skills do you want to teach? For your first one maybe it is not
a whole unit, but a chapter within a unit and you build it in through a hybrid model similar to the
teacher in Grant’s (2009) study. This method would allow teachers to start slowly by introducing
assessment for learning on a couple of labs, essays or reports that students complete. Experiment
with not giving learners a grade, but instead giving them feedback and the opportunity to make changes. Students (and teachers) need to feel comfortable with the climate of feedback and the emphasis on process over product.

Once teachers know what they want to try in their classrooms, have them get into small groups with similar interests. Give them a project development sheet (Appendix C) where they can collaborate and pre-plan while bouncing ideas off of each other. Have teachers think about how they are going to assess the process of learning and what project-based learning might look like and sound like in their classroom so that they are comfortable with the process also. Encourage teachers to think about what they are going to be looking for and potentially have them create a Driving Question of their own for this experience. Likely it will look something like, “How can I increase student engagement/ understanding of ______ through project-based learning?” Encourage other teachers to question and facilitate the understanding of all the teachers at the table.

One final step, which I believe to be the most important: mentorship. The facilitation of the learning experience should not stop when the teacher leaves the professional development session. This would be akin to introducing a project on building a functional greenhouse and then letting your students work on it at home for two weeks without any further skill development or scaffolding. I believe that as teachers begin the process of experimenting with project-based learning, the real questions arise and the real scaffolding is needed. In a collaborative setting teachers can bounce ideas off each other, however not all teachers have that and the ability to leave a session with a mentor may be the safety that a teacher needs.

Conclusion:
The students that were involved in this study did exhibit increased engagement and motivation levels, thus supporting the study’s hypothesis. Interesting results were found when the role of the teacher was examined. While the efficacy of project-based learning is supported by substantial research, the role of the teacher is just beginning to be explored. A culture of learning through feedback and process needs to be developed not only for students, but also for teachers. I believe that this process begins at the skill development level and that there is potential to witness large improvements in student achievement if we start by giving teachers the tools to become effective, inspiring teachers. This culture of learning needs to begin at the pre-service level in order to develop a model of collaboration and scaffolding, which reinforces the importance of supportive professional communities. A student’s education should not be limited by a teacher’s lack of opportunity to develop a skill or their fear of not meeting benchmark criteria. However, until the structure of the education system changes, teachers need support in finding a way to negotiate their way successfully within the current education system and its prescribed learning outcomes, in order to best understand the requirements for a successful classroom.
References

Motivating project-based learning: Sustaining the doing, supporting the learning.
*Educational Psychologist, 26*(3), 369-398. doi: 10.1207/s15326985ep2603&4_8


Ravitz, J. (2010). *Beyond changing culture in small high schools: Reform models and changing instruction with project based learning*. 85, 290-312.

Appendix A

Student Reflection Questions

Student Name: ___________________________________________ Reflection Date: _________

Project Name: __________________________________________ 

Looking at your final project, reflect on the process. Use your goal sheets and your project reflections to answer the questions. Reflections can be submitted electronically or on a separate piece of paper.

1. What level of personal effort did you put into your project?

________________________________________________________________________________________

2. If you were to redo your project, what would you change about it? Why would you change it?

________________________________________________________________________________________

3. The next time that you do a project, what skills/strategies did you learn that you will take with you?

What did you learn most about yourself during this process? Please explain.

________________________________________________________________________________________

4. Did you enjoy participating in this project? Why or Why not?

________________________________________________________________________________________
5. What did you like/dislike about learning through this project?

---

<table>
<thead>
<tr>
<th>Engagement in and commitment to the Community of Learners</th>
<th>Emerging</th>
<th>Developing</th>
<th>Applying</th>
<th>Extending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participates in learning opportunities with direct support.</td>
<td>May need prompting and/or guidance to participate in learning opportunities.</td>
<td>Consistently participates in learning opportunities.</td>
<td>Participates in and contributes to learning activities; often takes on extra responsibilities.</td>
<td></td>
</tr>
<tr>
<td>Self assesses to recognize strengths and challenges as a learner with direct support.</td>
<td>Identifies some learning strengths and challenges. May need support to set goals.</td>
<td>Recognizes own strengths and challenges as a learner and sets goals to improve learning.</td>
<td>Recognizes own strengths and challenges, sets goals for continuous improvement, and supports others.</td>
<td></td>
</tr>
<tr>
<td>Can describe and monitor own learning only with guidance and direct support.</td>
<td>Developing ability to describe and monitor own learning processes. May need support to self regulate.</td>
<td>Recognizes some of the benefits of participation in a learning community. Needs some prompting or encouragement.</td>
<td>Shows a growing sense of responsibility to the community of learners (i.e. gives and accepts feedback, supports others).</td>
<td></td>
</tr>
<tr>
<td>Will participate in and contribute to learning community with only guidance and direct support.</td>
<td>Recognizes some of the benefits of participation in a learning community. Needs some prompting or encouragement.</td>
<td>Shows a growing sense of responsibility to the community of learners (i.e. gives and accepts feedback, supports others).</td>
<td>Demonstrates commitment to the community of learners and extends this commitment beyond the classroom context.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Awareness</th>
<th>Developing</th>
<th>Acquiring</th>
<th>Action/Advocacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community-based consciousness</td>
<td>Demonstrates emerging awareness of local and global issues.</td>
<td>Demonstrates a development in knowledge of, and respect for local and global issues.</td>
<td>Demonstrates an acquisition and beginning position of advocacy in knowledge of, and respect for local and global issues.</td>
</tr>
</tbody>
</table>

Appendix B

Engagement Rubric
* Adapted from Paige Fisher, 2012

Appendix C

Project Planner (Buck Institute, 2013)
Appendix D

Tubric (Buck Institute, 2013)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Wild Card]</td>
<td>[Wild Card]</td>
<td>[Wild Card]</td>
<td>[Wild Card]</td>
</tr>
</tbody>
</table>

How can... I We Build... Create... Make... Real-World Problem

How do... We as... [Roles] [Occupations] Design... Plan... For a Public Audience

Should... [Town] [City] [County] Solve... For a School

Could... [State] [Nation] Write... For a Classroom

What... [Community] [Organization] Propose... Decide... For an Online Audience

How can I build... We as... [Roles] [Occupations] Design... Plan... Real-World Problem

Expected: [Roles] [Occupations] [Town] [City] [County] [State] [Nation] [Community] [Organization]
### Project Work Report: Group

<table>
<thead>
<tr>
<th>Project Name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Members of Group:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td>For the Time Period:</td>
<td>Day(s): Week:</td>
</tr>
<tr>
<td>During this time period we had the following goals for project works:</td>
<td></td>
</tr>
<tr>
<td>During this time period we accomplished:</td>
<td></td>
</tr>
<tr>
<td>Our next steps are:</td>
<td></td>
</tr>
<tr>
<td>Our most important concerns, problems or questions are:</td>
<td></td>
</tr>
</tbody>
</table>
### Project Work Report: Individual

<table>
<thead>
<tr>
<th>Project Name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Name:</td>
<td></td>
</tr>
</tbody>
</table>

**For the Time Period:**

<table>
<thead>
<tr>
<th>Day(s):</th>
<th>Week:</th>
</tr>
</thead>
</table>

**During this time period I had the following goals for project work:**

1. 
2. 
3. 
4. 
5. 

**During this time period I accomplished:**

1. 
2. 
3. 
4. 
5. 

**My next steps are:**

1. 
2. 
3. 
4. 
5. 

**My most important concerns, problems or questions are:**

1. 
2. 
3. 
4. 
5.