Providing Opportunities for *Flow* Experiences and Creative Problem-Solving Through Inquiry-based Instruction

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Abstract

In order to compete globally in the 21st Century, students must have the skills to design their own projects and understand how to navigate the wealth of information available at their fingertips. One of the most important tools is to be able to investigate ideas and implement a plan of action in order to answer questions that have not been explored. These creative problem-solving skills are essential when students design problems and projects during student-driven inquiry. Using action research, instructors evaluated student perceptions and responses to a student-driven inquiry project in an eighth grade honors language arts class. Using interviews and observations, instructors investigated students' attitudes and experiences throughout the thirteen-week unit of study, focusing on student perceptions of the instructional environment. Students described engagement with topic and process due to choice and authenticity. They described experiencing *flow*, the state where students become completely engaged in their work, when challenge, motivation, desire, and drive come together to produce optimal outcomes. Themes emerged in how choice influenced the experience of *flow* during the creative process and how the classroom environment nurtured overcoming obstacles through creative problem solving.

Keywords

Introduction

Understanding how to authentically complete research is an essential tool for students to understand. For this student-driven inquiry project, instructors gave students at least one class period over the course of thirteen weeks to work on individually-designed projects based on a passion or interest. Students created guiding questions to craft a proposal for their projects. The proposals included a purpose, intended audience, resources, and a timeline that students pitched to the class before launching their investigation. Throughout the process, students worked with mentors, conferenced with teachers, conducted scholarly research, and reflected upon their setbacks and successes. In a culminating celebration, students shared final products in several formats and gave presentations for parents and interested community members.

Students worked on real-world problems and

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topics. One student studied research about the brain looking at the role of brain injuries similar to the one experienced by Phineas Gage. Another sought to create an outdoor habitat for his bird in order to alleviate symptoms from a

small indoor enclosure. One girl looked at the health benefits of knitting while she learned the process herself. As a result, she made plans to start a knitting class at a local retirement home where she volunteers. Other students investigated issues such as problems in public education, the relationship between Alexander Hamilton and Aaron Burr, and the validity of climate change.

While completing the project, students were able to examine the world around them and reflect on the different stages they moved through in order to create a final product. They assessed their progress on a weekly basis through emails with the instructors or through surveys designed by the instructors. Students were asked to address specific topics such as overcoming obstacles, understanding the role of creativity during the unit of study, how *flow* can influence production, and the effect of being able to select their own topics to investigate.

This study is important to consider in terms of global education. Inquiry-based instruction has the potential to help students work in real-world ways solving real-world problems. With pressure to prepare students for standardized assessments, educators may be fearful of instructional methods that allow for choice, creativity, flexibility, and student-directed decision-making. With inquiry-based instruction, standards are often embedded throughout the unit of study and addressed individually rather than being delivered through whole group direct instruction. With the demands of high-stakes testing, educators must

be confident that providing authentic learning opportunities will render outcomes essential for helping students be successful in life and those measured on tests. Inquiry-based instruction provides skills to help students not only evaluate and solve personal dilemmas, but also issues that impact the community, the environment, and future problems yet unknown (Barron & Darling-Hammond, 2008).

Literature Review

Inquiry-based instruction is the method behind programs that have emerged over the past several years such as Genius Hour, Passion Projects, and 20% Time (Krebs & Zvi, 2016). These programs advocate the allotment of regular class time devoted to a research study based on student-selected topics (Katrein, 2016; Krebs & Zvi, 2016; Rush, 2015; Simos, 2015). Students are expected to gather information from a variety of sources and analyze the data before designing a final product to showcase what they have learned. The inspiration for these programs came from Google and other corporations' initiatives to allow employees time during the work week to explore personal interests, cultivate new ideas, or master new skills (Krebs & Zvi, 2016).

Inquiry-based instruction allows students to engage in individual research based on personal interests. Students select a topic they would like to research, and the instructor serves as a facilitator, guiding the learning process. Problem-based learning (PBL) and Project-based learning (PjBL) are closely related to this method. In PBL, the teacher designs an unstructured problem for students to explore and a stakeholder role for students to assume during the investigation (Gallagher, 2012; Gallagher, 2015). In PjBL, students create products to showcase the information they have

learned during a unit of study. In all three methods, the instructor provides structure to the experience with check-in points in order to ensure students are gaining a solid foundation of the topic.

Creating authentic learning environments has long been a recommended method for serving high-achieving students in gifted education. One model, Renzulli's Schoolwide Enrichment Model (SEM), includes three stages where instructors provide opportunities based on students' readiness, interest, and ability (Renzulli, Gentry, & Reis, 2014). In Type I and II activities, the instructors offer exposure to different topics, creative problem-solving, and creative thinking. In Type III activities, students work through authentic problems. Products are shared locally and globally. During this process, students develop research skills, problem-solving skills, creative thinking, and decision-making skills (Renzulli & Reis, 1994). Using SEM has also produced positive results for entire school populations, including culturally and linguistically diverse learners (Allen, Robbins, Payne, & Brown, 2016).

When schools implement SEM or instructors use tools such as inquiry-based learning, PBL, or PjBL in the classroom, they are seeking outcomes beyond the mastery of curriculum. As students investigate answers to their own questions they are immersed in the creative process as they brainstorm issues, navigate the learning process, solve problems, and produce final products. Providing opportunities for students to engage in the creative process and to deal with ambiguity in situations allows students to understand how experts maneuver this terrain (Gallagher, 2015). Ultimately, schools using this method intend to help students understand how to approach a complex problem with the skills to address it

with confidence from having worked through the process numerous times themselves (Gallagher, 2015; Katrein, 2016).

In addition, these methods provide differentiation for students as they work through a similar process but with different levels of materials and varying scaffolding provided by the instructor (Simos, 2015). As students move through the process, teachers can encourage students to consider what sources they use and how that source contributed to their understanding of the problem (Rush, 2015; Simos, 2015). This provides the opportunity to understand the research process. Instructors can maintain a close connection with each learner by holding individual conferences, communicating through emails, and by having students self-assess using Google forms. Whole-group mini-lessons allow the instructor to provide guidance in areas where students have gaps in conducting research.

While facilitating these learning experiences, instructors should be aware of the stages students move through during the creative process and allow them the opportunity to spend time in these stages. Students are designing the learning experience while they are immersed in it. Wallas (1926) noted four stages in the creative process: preparation, incubation, illumination, and verification. The learner is in control during the preparation stage (Doyle, 2016) as he or she focuses on the problem and begins to prepare for how to investigate it. During incubation, time is needed to consider the possibilities. This allows for moments of clarity and insights which lead to illumination where the individual has a moment of insight or clarity about the problem. Verification occurs as the learner determines outcomes and evaluates solutions in an intentional manner (Wallas, 1926). For teachers, allowing students to have

the time to step away from learning can be uncomfortable, but it is essential. Understanding motivation and emotion within in these contexts is critical (Doyle, 2016).

An important component in these methods is student choice of topic, product, or process. Over the past 50 years, several facets of the creative process have been defined. Rhodes (1961) noted four "Ps" being Person, Process, Press, and Product. Person describes traits such as openness to experience and tolerance of ambiguity. Process involves divergent thinking and brainstorming. Press describes the environmental conditions and stimulation. Product looks at the tangible output. Gallagher (2015) outlines how other researchers have added to this initial list with Potential (Jauk et al., 2013), being Prepared with a deep knowledge base, having a Preference for inquiry-oriented thinking, and being skilled at Persuasion (Simonton, 1990). Sternberg and Lubart (1966) added Purpose or motivation to the list. Gallagher (2015) includes a final "P", that of Passion. Passion about the topic prompts emotional engagement, allowing the person to feel encouragement in the face of challenges or obstacles.

During an inquiry-based investigation, certain issues may arise. The driving questions students ask may be too narrow or too broad (Krebs & Zvi, 2016). The instructor should not solve problems for the students, but should use questioning skills to help them make their own decisions (Rush, 2015). This aligns with growth mindset, research from Dweck (2006) that describes the attitudes and dispositions necessary for overcoming obstacles. Opposite of a growth mindset, is a fixed mindset where individuals abandon tasks that prove challenging. At the foundation of this theory is the power of belief that an individual will acquire

the skills to be successful if he or she devotes time and energy to grown and learn, especially in the light of potential failure (Dweck, 2006).

If the learning environment is ideal, students may have the opportunity to be in *flow*, a state where an individual is immersed in a challenging activity, losing awareness of time and place, with attention completely on the task itself (Csikszentmihalyi, 2000; Doyle 2016). In this capacity, an individual is intrinsically motivated and less likely to experience negative or critical self-talk. Distractions fade away because the desire to gain information or to experiment or to build and create is so strong. The level of productivity is influenced by focus and attention (Csikszentmihalyi, 2000; Doyle 2016).

Method

The purpose of this study was to explore the student perspective of this type of instructional environment. The following research questions guided this study: 1). What are student perceptions of the instructional environment during student-driven inquiry? 2). How does student-driven inquiry influence creative problem-solving? and 3). Does student-driven inquiry allow for experiences of *flow* for students?

Thirty students in an eighth grade honors language arts class, English I, in a southeastern school in the U.S. were participants in the study on student-driven inquiry. The requirements to be in this class included high performance on standardized tests (80% or higher), strong teacher recommendation, and high grades in prior classes (A/B). Taking this course provided students the opportunity to earn high school credit while still in middle school. Of the students, 13 were male and 17 were female ranging in age from twelve to fourteen.

Motivation levels varied among the students. For several of the students, this was the first advanced class they had taken. The assignments, expectations, and autonomy could be daunting at times. Other students had been served in advanced settings throughout their school years and yearned for continuous challenge. The majority of students were Caucasian with one Black female and two Hispanic males. One male student struggled with anxiety issues and challenges in written expression connected to issues with Autism Spectrum Disorder. Another male student received services for hearing loss. Approximately half of the population at the school is eligible for free or reduced lunch. Overall, these students worked well together and could be described as curious, creative, social, and opinionated about personal beliefs and world views.

An action-research approach was used for this study, a method that allows the researcher to evaluate and reflect throughout the research process (Berg, Lune, & Lune, 2004). Data was gathered through observations, discussions with students, student reflections, individual interviews, and focus group interviews. The instructors reflected on their observations throughout the unit of study and met twice a week to talk about their insights. Discussions with students occurred in both a formal way, during class where the instructors monitored progress, and informally at other times throughout the unit of study, notably in the mornings where seven of the students met with one of the instructors during a time devoted for students to write the school's literary magazine. Students assessed their progress and analyzed

the structure of the process through weekly emails to the instructors and through Google Forms where they answered questions about engagement during class time. The instructors interviewed 18 students individually and 12 students in small groups of 2-3 students.   These interviews were conducted the week after students gave final presentations to their parents and the community. They were interviewed before school or during class for English I or Literary Magazine. Students addressed the following questions during the interviews and focus groups:

1. How did you determine what question to explore during this investigation?
2. Was your final product what you envisioned at the beginning of the process? What occurred along the way? Did you overcome obstacles?
3. How engaged were you during class time? What helped you be engaged or prevented your engagement?
4. Did you use creativity throughout the project? If so, can you describe this in more detail?

The study took place over a thirteen-week period. Instructors launched the unit by introducing the idea of exploring one topic in great depth. Students brainstormed lists of topics they were curious about, ideas that they wanted to explore, and questions that could not easily be answered. After taking time to narrow down ideas, students created driving questions for their investigations. A list of the students' driving questions with pseudonyms are described in Table One.

Table 1

List of Driving Questions

Pseudonym	Driving Question / Project Description
Michael	How do you build a house?
David	How can I create a two-dimensional platform (video game)?
Mark	What type of instrument do people enjoy the most after listening to the chorus of a song on each one?
Susan	How can I create videos for a Youtube channel?
Rebekah	What causes sleep disorders?
Alice	How do you design an animation?
Jeremy	How can I learn Greco- Roman style Wrestling?
Brian	How can I learn to play a song on the guitar?
Alex	How do head injuries impact the brain and personality?
Larry	How can I create a better habitat for my pet bird?
Marie	How can I help others in need?
Aaron	Is Climate Change real?
Luke	How can I create an App about football teams?
Warren	What is the best airplane design?
Gretchen	Which coconut water is the best?
James	How can I design something using aeronautical engineering?
Christie	What benefits are there for knitting?
Lisa	What is the Mandela Effect (alternative universes and time travel)?
Kelly	How is power balanced in our government?
Sarah	Is dance a sport?
Natalie	How can we improve the environment?
Ashley	How can we improve public schools?
Lori	How can I design and market my artwork-inspirational bible quotes on canvases?
Carlie	How can I learn about graphic design?
Josh	How can I write a short story about the human mind?
Cynthia	How can I learn to take professional-style pictures?
Selena	Why were Burr and Hamilton enemies?
Isaac	Is Common Core Math better than prior Math methods?
Patricia	How can I create my own cook book?
Melissa	How do I launch my own Youtube channel?

Instructors created a designated time period every week for students to spend on their topics, approximately twenty percent of their instructional time. Students made their own decisions about how to spend this time in class. They were given access to technology with laptop computers available. Instructors worked as facilitators during this process, asking students questions about their progress and helping students when they asked for guidance. The Media Specialist provided two lessons for the students on the research process: how to evaluate quality sources and how to use MLA to properly cite sources. On a weekly basis, the instructors asked students to either complete a Google form or send an email assessing their progress. The instructors continued to use email exchanges to help students solve problems, to offer ideas, and to provide scaffolding for students who were struggling with the process or creating final products. Questions asked on one of the Google Forms can be found in Table Two.

Table 2

Genius Hour Survey

1. How well do you understand the Genius Hour Project?
2. How many high quality, reliable, helpful resources do you have?
3. How well do you understand what makes a source high quality, reliable, and helpful?
4. Where do you get your sources?
5. Do you understand what a database is?
6. Do you have notes (from sources) that are helping you to answer your driving questions?
7. Do you know exactly what you are working towards doing/learning/creating?
8. What ARE you working towards (what is your product, outcome, impact)?
9. What will your digital element be? Check all options that you are interested in using during this process. (Google Form, Prezi, Google Slides, Youtube, Pictochart/Other Infographics, Haiku Deck, Other.)
10. Do you have a clear, solid plan for how to present your final project?
11. Do you have a bibliography?
12. How creative do you believe your project is?
13. Have you encountered any challenges? What did you do to overcome them?
14. Have you experienced *flow* while working on your project? (*Flow* is a feeling of energized focus, full involvement, and enjoyment in the process of the activity.)
15. How well are you accepting feedback and being willing to make adjustments as a result?
16. How much do you feel you are learning/growing as a result of Genius Hour?
17. What mini-lessons would be helpful to you at this stage? Check all that apply. (Creating a driving question, Using databases, Evaluating sources, Note-taking, Making a bibliography, Using a specific digital tool, Writing skills, Presentation skills, Organization, Time Management, Other.)
18. Any final questions? Comments? Concerns?

Toward the end of the thirteen-week study, instructors provided a lesson on how to complete the required annotated bibliography and process paper. In the process paper, students addressed the following questions:

1. How/why you created driving question/project. How did you come up with your idea? What was your outcome/impact? Why was it important/interesting to you?
2. Explain your research process. What did you research? How did you find trustworthy, relevant, and useful sources? What did you learn about databases and bibliographies? What methods did you use to take notes and organize information? Did you collect any data?
3. Reflect on the obstacles, problems, and challenges you encountered. What parts of the process were the most difficult/confusing? What did you do when you felt stuck? Did you quit, adjust, change course, overcome, problem-solve? Why? How?
4. Share your learning, insights, and the lasting effects. What lessons did you learn? How will this experience help you in the future? Consider academics but also life lessons and skills.
5. Offer recommendations, suggestions, and advice to future 8th graders. How can you be successful? Consider what you would do differently or change about your own experience.

With the purpose of this unit of instruction being to promote intrinsic motivation and curiosity, students were only graded on certain components: bibliographies, process papers, and written reflections. Together, these accounted for twenty percent of the total grade for the class. Table 3 shows the rubric used for grading the process paper.

Table 3

Rubric for Process Paper

	10	8.5	7.5	6.5	0
TITLE PAGE (spaced properly) title (about 1/3 of the way down the page) student name genius hour course name teacher name due date	PERFECT 0 mistakes	1 mistake	2-3 mistakes	4-5 mistakes	>5 mistakes
PARAGRAPH 1 how/why you created driving question/project. How did you come up with your idea? What was your outcome/impact? Why was it important/interesting to you?	WAY ABOVE AVERAGE Thoroughly answers all questions intelligently and thoughtfully	ABOVE AVERAGE Answers all questions intelligently and thoughtfully	AVERAGE Answers all questions	BELOW AVERAGE Does not answer all questions	NO ANSWERS
PARAGRAPH 2 Explain your research process. What did you research? How did you find trustworthy, relevant, and useful sources? What did you learn about databases and bibliographies? What methods did you use to take notes and organize information? Did you collect any data?	WAY ABOVE AVERAGE Thoroughly answers all questions intelligently and thoughtfully	ABOVE AVERAGE Answers all questions intelligently and thoughtfully	AVERAGE Answers all questions	BELOW AVERAGE Does not answer all questions	NO ANSWERS
PARAGRAPH 3 Reflect on the obstacles, problems, and challenges you encountered. What parts of the process were the most difficult/confusing? What did you do when you felt stuck? Did you quit, adjust, change course, overcome, problem-solve? Why? How?	WAY ABOVE AVERAGE Thoroughly answers all questions intelligently and thoughtfully	ABOVE AVERAGE Answers all questions intelligently and thoughtfully	AVERAGE Answers all questions	BELOW AVERAGE Does not answer all questions	NO ANSWERS
PARAGRAPH 4 Share your learning, insights, and the lasting effects. What lessons did you learn?	WAY ABOVE AVERAGE Thoroughly answers all questions intelligently and thoughtfully	ABOVE AVERAGE Answers all questions	AVERAGE Answers all questions	BELOW AVERAGE Does not answer all	NO ANSWERS

How will this experience help you in the future? Consider academics but also life lessons and skills.		intelligently and thoughtfully		questions	
PARAGRAPH 5 Offer recommendations, suggestions, and advice to future 8th graders. How can you be successful? Consider what you would do differently or change about your own experience.	WAY ABOVE AVERAGE Thoroughly answers all questions intelligently and thoughtfully	ABOVE AVERAGE Answers all questions intelligently and thoughtfully	AVERAGE Answers all questions	BELOW AVERAGE Does not answer all questions	NO ANSWERS
PROCESS PAPER WORD COUNT	495-505 words	490-494 OR 506-510 words	475-489 OR 511-525 words	400-474 OR 526-599 words	<400 OR >600 words
BIBLIOGRAPHY / WORKS CITED	5+ sources and all are scholarly	>5 sources	5 sources	<5 sources	no sources
ANNOTATIONS Kind? How did you get it? Verify reliability/relevance? Teach/help you to understand?	Way above average (it is obvious student put effort into the research process and learned from it)	above average	average	partial	none
MLA FORMAT (OVERALL) 1 inch margins center & capitalize your title alphabetized bibliography use tab to indent paragraphs double space readable, professional, consistent font size 12 throughout proper header	PERFECT 0 mistakes	1-3 mistakes	4-6 mistakes	7-9 mistakes	≥10 mistakes

For final presentations, the students chose a variety of formats to convey what they had learned. Some chose to give motivational/educational speeches, while others created videos or offered hands-on demonstrations. Students practiced in small groups and then presented final products to parents and school personnel during a celebration hosted in the evening two weeks after the unit was completed.

Results

Students described engagement with topic and with process due to choice and authenticity of the project. They expressed desire to explore their questions outside of school time and noted how they used creativity throughout the process and in final products. Themes emerged in two areas: 1). how choice influenced the experience of *flow* and the creative process and 2). how the classroom environment nurtured overcoming obstacles through creative problem-solving.

The Impact of Choice on *Flow* and the Creative Process

Throughout the process, students described what it was like to choose their own topic and driving question to explore. Their enthusiasm was apparent in the classroom as they inquired when they would have time to work on the project every week and through conversations outside of the classroom where they shared details with friends. During class discussions, the instructors explained what it meant to be completely engaged in a topic where an individual may lose awareness of the passage of time as he or she follows a line of curiosity that is challenging, not passive. They defined *flow* as a state where an individual becomes completely engaged in his or her work, when challenge, motivation, desire, and drive come together to produce optimal outcomes. One student described how she felt her level of engagement during class time was directly linked to ownership over the topic. Selena shared:

> When you are researching a topic that you are interested in and have the amount of freedom we did, it is extremely easy to get in the *flow* and enter a state of being completely consumed in the topic and experience. It was up to us what we did, so it felt like everything we did had a purpose. Pretty much every class period, I enjoyed what I did, and got in the *flow*. I felt educated enough/prepared enough to just go off and do my own thing. I could do what I needed, which made the process easier than when a teacher gives you guidelines and rules.

Selena went on to describe how the driving question about a topic of high interest was the most important component during the project. She shared:

> *Flow* is the most important part of this project (in my opinion), and I think I've experienced *flow* during every session we've worked. *Flow* is important because it goes along with picking the right driving question. I picked a topic that I love in my free time (I was interested in it before this project started), so *flow* was never really a problem for me.

Students described the role of enjoyment and how it related to *flow*. One student described how gratifying it was to be fully engaged, working to capacity, without reoccurring thoughts that she needed to work harder. Lisa said:

> *Flow* is very needed in the process. It's always nice to get stuff done without actually thinking, "I need to work harder". I've experienced lots of *flow*, especially in the beginning of the project. Sometimes the hour flies by really fast, and I would have a ton of stuff done.

Although grades were not assigned for how students spent their class time, several described how being completely engaged in a topic could result in higher grades because of the amount of energy and attention a student gives to the topic. For these students, the role of choice influenced the amount of *flow* resulting in higher-level final products. Gretchen described this impact of being in *flow*:

> *Flow* is needed in your project, because if you don't have *flow* it'll be really hard for you to pay attention to your project. If you don't even like the thing you're doing the project on, and you also don't have *flow*, then it'll be almost impossible to do the project and get something out of it. For example: if you're working on something in class and you have no interest in it then you probably won't do very good on it and will hate having to do it. If you have *flow*, then you'll enjoy doing the project even more and will probably get a better grade on it.

Understanding this on a metacognitive level became apparent in how the students described their experiences. Students explained the connection between enjoyment of topic and

level of focus sustained during the process and the subsequent impact on learning. Christie commented, "*Flow* is commonly experienced to a point that we don't want it to end. We are not bored because we are researching what we want to learn about so we experience *flow* a lot." Kelly said:

> *Flow* fit into this project because a lot of the time when I was working on this in class I would get so into it and kind of just block everything else out. Also I was able to put my focus into something I enjoyed and really stay focused on it and not just having my mind wander while a teacher was talking.

Other students described how the level of engagement created the desire to continue the project outside of class time. Larry said:

> *Flow* fits in because the project you are doing is most likely something you are interested in, so you are able to stay focused and enjoy what you are doing, and you want to work on it outside of school and get into a rhythm. Enjoying your project also gets you to go deeper in research about it or to do whatever it is you are doing so you get better at it and learn new things.

Students described how *flow* allowed for increased creativity during the project and when working on other assignments. Cynthia said:

> It is important to have *flow* while working on our projects. Having *flow* during class or while working on the project at home not only improves the quality of the project, but can also lead to new ideas that can make the project much more creative. I usually have *flow* in class, being around other people inspires me to work hard at my task.

The Influence of Environment on Overcoming Obstacles through Creative Problem Solving

During the interviews, students made many comparisons between student-driven inquiry and teacher-directed assignments. Several explained that the intensity of their interest helped them work at a faster pace than normal and to work through problems. Susan shared:

> I experience *flow* every time we work on this project. I tend to get a lot of work done and focus better than I normally do. Experiencing the *flow* allows me to work through the challenges I face with my project. The *flow* helps me work at a faster and more constant rate than normal.

Students were encouraged to handle obstacles along the way and work through their struggles by conducting further research, contacting experts in their topic or asking the instructors for help. One girl described how she worked through her problem areas. Sarah shared:

> This project is going to have obstacles and turning points. It's part of the process. With any creativity idea or project, there is going to be back fires and road blocks. The brain encounters these because we have to create ideas and there may be, like an algebra problem, a missing variable. Like your evidence or just part of the project. When I encounter a problem and I don't know what to do, I have to take a minute. I usually come up with solutions to problems when I'm doing something else. Like simply listening to music, or even in a completely different class. If I really do a have an obstacle that I can't overcome I usually go to a teacher or my Mom/Dad for solutions or to just help to solve the problem. I usually don't like it that much when someone gives me a straight answer. The inspiration for the solution is what helps.

Specific points of the student-driven process required that students use creativity, specifically with crafting the guiding question, with planning how to investigate the topic, and with the deciding how to display the final product. Isaac, who tested math equations, shared, "The creativity comes from choosing what and how we are going to make that project. From my project I used creativity in creating my equation and how I was going to test that equation on people." Other students described how they used creativity in designing items. Carlie said:

> Creativity is the biggest piece in this project. Your project comes from your passion and what you want to do with it, so you need to explore different creative sides. With my project, I have to use creativity to do my graphic designing. When I make the posters and other things, I have to be in full creativity mode. Watching other projects, it is so cool to see the creativity being used, such as animation and unique areas of research.

Several students described how ownership over the decision-making process was influenced by creativity. Rebekah explained, "Creativity is very important for this project. There aren't many guidelines to follow and that leaves most of the project up to you. You need to figure out what you're doing your project on and how to present it." Alex said:

> You can do whatever you want to do for the project, and there are no boundaries. I started doing something, and I changed my mind on what I wanted to do. There is no one to tell me what to and not to do during the project, And I appreciated that.

Students recognized how creativity allowed them to work through issues when conducting research. Jeremy said, "There are some class periods where you are completely stuck, and if you just do something related to your topic, you will find a solution to your problem." Patricia shared:

> You also have to be able to make changes and be able to work around obstacles and changes you weren't expecting. You might not be able to find a vital piece of information you were counting on, and you will just have to find something close enough and change that component of your project.

Many students described how they used creativity in determining how to present their final products. Sarah said:

> Creativity is one of the most important values you need to use for this process. You have to use creativity on how to present the project, what your target question was, and how to find and get the results of what you're looking for. People don't want to see the same thing. This project gives you a chance to experiment. With the resources you have it's possible to let your imagination run wild. In a regular class you don't get to do that as much. I was creative by having to find facts and not just opinions about dance being a sport, also in the way I'm going to present.

Students expressed their overall understanding of how to have faith in the problem-solving process. In a final reflection, Cynthia wrote:

> The process is a longer project than standard assignments. The longer the process, the more obstacles may be present and the more turning points may occur. When students encounter obstacles and turning points, they might start to feel less confident in their projects. Most will find ways to overcome the obstacles by themselves and benefit from turning points. I personally have overcome obstacles throughout the process. Some of my obstacles included citing sources incorrectly, not knowing how to present

my project creatively, and not knowing where to start (in the beginning). One of my friends was having trouble sticking with a specific topic. She had many turning points over the course of the project about her topic and overcame many obstacles along the way.

Another student shared his feelings about overcoming obstacles during the project and in other areas of life. Lisa said:

Everyone needs obstacles, pretty much in everything because they make you stronger. I've had obstacles trying to figure out how to present my project. I figured them out and I feel pretty confident on how I'm going to present my project. I really hope I can blow everyone's minds.

Discussion

This study examined how students perceived an inquiry-based project that spanned thirteen weeks. Students designed their own research problems and projects to explore. While working on these projects students described being in *flow* due to their personal connection with the topic of study, an important component in the creative process (Csikszentmihalyi, 2000; Doyle, 2016). This type of instruction allowed for creativity on a daily basis. Students developed an understanding that being creative does not mean working only with arts and crafts, but instead can be seen in all realms of thinking and producing (Doyle, 2016).

Struggles that educators face in traditional classroom settings are often associated with students' attitude toward topic and students' ability to maintain focus. In this study, students described a high level of engagement. Choice created the opportunity for sustained attention resulting in the possibility of higher commitment to topic and higher quality final products. This corroborates Gallagher's (2015) description of passion as an important process with creative production. Helping students develop a sense of

awe and wonder about the world around them can be overlooked in educational settings. Curiosity is important to promote. Students can lose this over the years if assignments do not include personal choice.

On a metacognitive level, students were able to explain how they overcame obstacles. They described the use of creative problem-solving during many stages of this project from creating an engaging question to explore, to designing research strategies, to determining an appropriate final presentation format. Being able to reflect on this and verbalize how to overcome challenges can help students develop confidence when they encounter problems during the creative process (Gallagher, 2015). This has the potential to affect how these students handle setbacks in the future potentially helping to develop growth mindsets (Dweck, 2006).

During this unit of study, students worked on individual projects where all outcomes were a reflection of their own strengths and weaknesses. They crafted driving questions that had no predetermined answers, were open-ended, and required critical thinking, essential facets for inquiry (Bailin, 2015). They sought guidance from instructors, peers, parents, and experts in the realm they studied, but time management was determined by the individual. Students were not working for grades during this time only satisfying their curiosities as there were no correct answers to produce. In addition, assessments did not take the form of a multiple choice test or exam. Students addressed standards in research and presentation of information through an authentic method. These tools will be valuable for these students in both personal and professional contexts (Bailin, 2015).

Limitations and Recommendations for Future Studies

Research for this study was conducted with an English I eight grade honors language arts class, a class typically offered in ninth grade. Although motivational levels of students varied, a majority of these students are highly motivated. In addition, these students earn high grades in school and score well on standardized tests. In future studies, students of varying ability levels should be included. This may be especially important for instructors working with learning disabilities and with students struggle in traditional classroom settings. Understanding how personal choice impacts these individuals is important for designing appropriate and impactful curriculum.

Conclusion

This study contributes to the research on the benefits of inquiry-based instruction for providing students opportunities to learn essential problem-solving skills. The results show the importance of allowing students choice in assignments. Students expressed appreciation for being in control of their research and the decision-making process. While spending time on their projects, they described the power of experiencing *flow*. They worked on assignments outside of class and continued to invest time and energy on their topics after their final presentations. Beyond understanding the power of pursuing a passionate topic, students also focused on overcoming challenges. Knowing how to solve problems is an important skill; one that will serve students in all areas of life. As educators work to meet the needs of todays' learners, allowing for authentic opportunities can provide the pathway for students to acquire the skills to solve local, national, and global issues.

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