

EDUCATIONAL RENEWAL THROUGH FEWER RESOURCES

BY MEANS OF GOING LEAN

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Fall 2014

ABSTRACT

A graduate student at Colorado State University while in the Masters Program, Educational Leadership, Renewal, and Change worked with students in the Art Department at Fossil Ridge High School. The graduate student considers applying Lean into the classroom in a high school setting. As research develops it becomes evident that there is a lack of student voices, which leads to the collection of thoughts and opinions directly from the students in two different art classes. The students are provided opportunities to voice their thoughts and opinions on their experiences in the classroom, their voice in the classroom, and on how they feel about the concept of adding-value to and eliminating waste from their education. You wouldn't believe the leave of answers the students provide!

SECTION I

Background

The United States Education System has undergone many changes since its conception, and there are ongoing arguments and opinions about what needs to happen. What if all we needed was to tweak an old idea enough to be effectively implemented in our schools as they are today? Such an old idea could be as simple as looking at the Toyota Production System and the implementation of Lean, doing more with less resources (Liker, 2004; Ziskovsky & Ziskovsky, 2007). Why not just renew the structure we have today, updating it to our current societal demands? The implementation of Lean, specifically the tool of continuous improvement, can help renew our school system through the correct implementation (Akers, 2012).

Lean Thinking may be a newer term, but Lean Production is not a new idea. After World War II, many companies and countries were hit with a need to do more with fewer resources. Japanese manufacturers, which were rebuilding after the war, had “less human, material, and financial resources” (Emiliani, 1998, p. 615) at their disposal. They quite literally had to do more with less. It was Toyota who took this to heart and began the long journey of creating the Toyota Production System or TPS, which in the early 1900’s was being referred to as “the world-class standard for manufacturing operations” (May, 2005, p. 33). The Toyota Production System wasn’t created and implemented overnight, a year, or even 10 years. This process took time to develop, but what became apparent to the world was that Toyota could “design autos faster, with more reliability” (Liker, 2004, p.3) while still paying their workers higher wages and keeping the “competitive cost” (Liker, p. 3) of each vehicle. What was more impressive, not only to the automotive industry but also to

any industry, is that every time Toyota showed the slightest fault, problem, or weakness, they would manage to fix it and become stronger than before (Liker, 2004). If you look at Toyota today, their cars are still high quality and they are one of the largest auto manufacturers in the world. So how do they do it? How do they continue to push the bar higher? The secret is within the Toyota Production System, the culture it creates, and the vast amount of knowledge gained and implemented through continuous improvements to add value and eliminate waste (Liker, 2004).

The Toyota Production System is the original source for Lean Thinking, the pioneers so to speak. Lean Thinking is a newer term coined after the Toyota Production System that refers to a thought process that uses fewer resources in order to provide better products with higher quality (Van Til, Sengupta, Tracey, & Fliedner, 2009). There are two central principles that are absolutely fundamental to Lean. These two principles are the “elimination of waste and continuous improvements” (Akers, p. 19). The first step in Lean is learning to see and identify waste, and once you see waste, you see it everywhere. Once you can see the waste, you want to eliminate it through the application of continuous improvement (Akers, 2012). Paul Akers (2012) highlights that “everything in life is a process” (Akers, p. 27), and since Lean Thinking focuses on improving processes it also stands that Lean Thinking can be applied to “every aspect of life” (Akers, p. 27).

We are in a time of technological innovation, which is propelling the workforce industry to new heights with many businesses adopting Lean to accomplish this (Van Til, 2009). It comes to reason that if businesses are adopting Lean; won't they value employees who have the skills and knowledge that are required by Lean Thinkers? So why hasn't this been explored more for education? If our education system is not preparing students for

this demand in the workforce, we will not be producing students that are immediately hireable (Ziskovsky, 2007; Tatikonda, 2007).

Lean is not a new idea created from scratch. It has been taught and implemented into daily operations and production throughout American businesses, as well as internationally. But, why should we try implementing Lean into our education system? Since our education system was created, we have initiated many reforms in attempts to rid the system of the problems that occur. If Lean can be successfully implemented in the classroom and across education, we may very well eliminate the need for reform and create a system of continuous renewal.

Purpose of Study

The purpose of this study is to explore providing students with the ability to reflect on the lesson, unit, or project to find more efficient ways to learn in the classroom through application of a modified version of continuous improvement. This is to be applied to give the students more say and ownership in their education, and also in the classroom. While providing the students with the opportunity to help shape their own education we will hopefully be able to better engage our students, providing them with greater responsibility.

Lean cannot be implemented across our entire educational system from the beginning. We must first start somewhere to further develop the tools and methods to best help our students. Therefore, through this process we will gain valuable feedback from the students' own voices, that will help shape the best way to implement Lean in the classroom. Thus, creating a starting point for applying Lean in education. After all, Lean focuses on all voices in the community, not just one, as everybody has valuable input and ideas.

Research Questions

In the time span of this action research study, it is not feasible for me to look at applying Lean in its entirety in the classroom. Lean doesn't rely on a collection of tools that can be implemented in the classroom as separate entities. Lean focuses first on the culture and environment of the company or classroom, which during my practicum has already been established by the teacher who presides over the classroom. Rather, I will focus on a portion of the system, continuous improvements, by conducting a qualitative research study explaining the experience of learning through student voices.

- How are students more engaged when allowed to format their own learning environment and/or curriculum?
- How does the classroom dynamic change when giving students the ability to participate in continuous improvements?
- What is the learning experience like in the classroom when students have ownership?

SECTION II: LITERATURE REVIEW

What is Lean, Where Did it Start and What is Important?

Lean originated from Toyota's efforts to not only recover, but to also grow with the few resources available. With those few resources, they were able to create and implement the Toyota Production System into "the world-class standard for manufacturing operations" (May, 2005, p. 33). However, there is a warning as Lean Production failed to be successfully implemented in the West during the first attempts in the 1980's (Alagaraja, 2010). This failure was due to the misunderstanding of the "cultural background" (Alagaraja, p. 52) and how central culture is in Lean Production. First and foremost, when implementing Lean, is

developing the “Lean Culture” (Akers, 2012, p. 51), which should be more focused on people and the environment rather than the processes. The culture needs to be developed first, and the elimination of waste and continuous improvements become a very happy byproduct of the culture. The culture must be safe and free of blame, where mistakes are learned from and used to make improvements to prevent its reoccurrence. This culture needs to promote and listen to everyone’s voice as equally as possible; everyone matters and can make a difference (Akers, 2012; Emiliani, 1998; Liker, 2004).

Once the culture has been built, then “the elimination of waste through continuous improvement” (Akers, p. 51) can occur. In Lean there is a saying that , “lowering the water level of inventory exposes problems (like rocks in the water), and you have to deal with the problems or sink” (Liker, 2004, p. 88). It is this need to solve the problems in the here and now that makes Lean such an asset to businesses. It eliminates the wasted time and money spent working and processing products that in the end are useless. The focus is to “minimize the time spent on non-value added operations” (Liker, p. 28). In the Toyota Production System, and across the Lean world, there are eight wastes that are considered to cover all wastes found in production. The eight wastes are: “overproduction, waiting, unnecessary transportation, over-processing, excessive inventory, unnecessary movement, defects, and unused employee creativity” (Liker, p. 28-29). The application of minimizing wastes or non-value adding operations can and is being applied to any process in “manufacturing, information, or service” (Liker, p. 27). In fact, it has even been applied to the education industry already, but for one reason or another has not been implemented across the entire industry (Emiliani, 2004; Tatikonda, 2007; Taylor, 2012; Van Til, 2009; Ziskovsky, 2007; Ziskovsky, 2011).

What is Waste?

We can loosely define waste in education as “when time and effort are expended but students do not gain any new knowledge or skill” (Tatikonda, p. 30). Another form of waste in education is “energy savers” versus “energy wasters” (Taylor, 2012, p. 70). Energy savers are easily explained enough by saving time, where as energy wasters “are things we worry about that are outside of our control” (Taylor, p. 70). By being aware of these forms of energy, we can focus on what we can positively affect. In other words, there is always going to be waste, so we must focus on the waste we can positively affect.

Why not Apply Lean to Education?

If Toyota leaders, against all odds, believed that “if they created the right process the results will follow” (Liker, p. 87), then why can’t we develop the right processes in education to produce the results we want? Lean Thinking in the context with adult education is described as making up the workplace (Alagaraja, 2010). According to Alagaraja’s (2010) research, the employee perspective that “limited potential for creativity and innovation at the workplace” combined with several other factors “contributes to a poor quality of life for workers” (Alagaraja, p. 53). In the setting of education, Paulo Freire (1970) describes our education system as “suffering from narration sickness” (Freire, 1970, p. 71). Narration sickness is the idea that students are more like empty vessels to be filled that have no intelligence or voice to express back to the depositor, which creates a poor learning environment and inhibits our education system as a whole (Freire, 1970).

Without ability to contribute to the place you work or the classroom you learn in, there is no chance of being engaged to your full potential, as you will always have a passive position (Emiliani, 1998). According to Freire (1970) “knowledge emerges only through

invention and re-invention, through restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other” (Freire, p. 72). Lean requires every member of the business or classroom have an active position, which allows innovation, creative thinking, problem solving, and room to reach each person’s full potential (Akers, 2012). Education must also have this environment where both the teachers and the students are “simultaneously teachers and students” (Freire, p. 72) to support the shared knowledge that exists in a Lean environment. The educational industry needs to strive not only to grow the next generation, but also to “continually develop the full potential of individuals” (May, p. 35). In order to develop a person’s full potential, there needs to be an effort to strive for personal improvement and a better performance. For the application in education, Lean will be defined as “a value-added approach to process management of personal and work tasks” (Ziskovsky & Ziskovsky, 2011, p. xiii). According to May (2005), Lean Thinking produces a “higher viewpoint that empowers knowledgeable workers to become independent goal seekers who leverage deeper problem solving skills and critical thinking capabilities” (May, p. 34).

What Research Has Been Done?

Thus far, Lean’s venture into education has mainly been confined to university level course work, with limited application in K-12 education. M. L. Emiliani applied Lean principles and practices to improve a university level business class. Emiliani’s (2004) goal was to improve “consistency between what was taught in the course and how the course was taught, eliminate waste, improve quality and relevance of course materials, and deliver greater value as perceived by students” (Emiliani, 2004, p. 175). Although this article was

focused to be more applicable to university personnel and professors, he has some very applicable points for Lean applied in K-12 education.

Lean Manufacturing focuses on the customer, so if we are going to apply Lean to education we must first define who our customers are. Emiliani (2004) states that the “teaching service is paid for and used by the student” but in most cases, as is true for public education, “the student receives the teaching service but their employer pays for it in whole or part” (Emiliani, p. 177). The student, when being taught in the K-12 system, is receiving the knowledge, but when they graduate their future employer is essentially paying money for their knowledge and what that employee’s education brings to the company. So in education, it makes sense to define our customers as both our students and their future employers (Emiliani, p. 177). In Lean, there is the concept of evening out the workload to allow flow and avoid batch work in the manufacturing industry, which results in waste. In education, batch work can be seen as “assignments due every few weeks” or “having only a few grading opportunities in a semester” (Emiliani, p. 182). These examples could result in wasted time for the teacher and students, as well as providing holes in assessment data. The most applicable data Emiliani shares are examples of ways to implement continuous improvements into the classroom. Some of the examples are to “solicit feedback from students at course mid-point to incorporate voice of the customer,” “respond to feedback whenever offered,” and “apply the scientific method to business problems” (Emiliani, p. 184). However, the biggest part of continuous improvement students need to see implemented is that their suggestions are truly valued, and if a “suggestion cannot be acted upon” immediately the teacher must make sure to “tell the students why not, or give an indication when the suggestion will be incorporated” (Emiliani, p. 182). Without the teacher

or supervisor directly addressing a student's suggestion in some way, it can leave the student feeling unheard, ignored, or lacking value as a member of the community (Emiliani, 1998).

Lean has also been applied to an accounting class at the university level. Tatikonda (2007) refers to the accounting education as representing "yesterday's industry - outdated, fragmented, inefficient, obsolete, and produce poor-quality products" (Tatikonda, p. 27). The same can be said for our public K-12 education system as it too is very outdated and produces below par products, where students are the products. Tatikonda (2007), as well as Ziskovsky and Ziskovsky, compares the education process to a production line (Tatikonda, 2007; Ziskovsky, 2007). In essence, the graduates are an end product from the education process where both students and the employers are the "primary customers" (Tatikonda, p. 29).

Ziskovsky and Ziskovsky, on the other hand, focused more on the K-12 education system rather than the university level. Ziskovsky and Ziskovsky (2007) define the term education as collectively describing, "the system of processes involved in providing and supporting the development of knowledge, skill, and reasoning in a student or student community" (Ziskovsky & Ziskovsky, 2007, p. 10). Processes, after all, are really what make up the education system, so why wouldn't Lean have similar effects for the education industry as it did for Toyota (Tatikonda, 2007)?

Ziskovsky and Ziskovsky (2007) provide some evidence from four studies done in several classrooms at the elementary, middle, and high school levels, all demonstrating successful evidence of Lean being implemented into the classroom (Ziskovsky, 2007). Over all, the conclusions of these studies were that "Lean school cultures promote a positive can-

do attitude, greater involvement and vested ownership in improving processes that support student learning” (Ziskovsky, p. 16). What is lacking in the evidence of the studies is the actual implementation of Lean in its entirety.

What Needs To Be Done for Further Research?

Through the research, that has been done, there are trends of gaps that need to be filled. If Lean is, as Ziskovsky and Ziskovsky (2011) say in their book, “a program of organizational improvement that empowers each and every worker in a school system – from student through superintendent to increase his or her personal performance and job satisfaction through process improvement” (Ziskovsky, p. xiii), then we already have a problem from the beginning. We will first have to overcome the lack of trust or differences that the corporate world had to overcome before Lean can truly be effective (Emiliani, 1998). As required by the Colorado Department of Education, there is a change occurring that will alter how teachers are assessed and will directly affect their job retention. This may be problematic, since the implementation of Lean requires the ability to push boundaries and try new things to find the best improvement to make. Without this ability, there will be a large struggle for all parties to see education implement Lean successfully. Teachers and education leaders need to feel safe in order to push these boundaries, but this is made difficult “due in part to a well-founded fear of retribution” (Emiliani, p. 619). There is always the “uncertainty of success” that often will discourage “faculty from trying new ways of teaching and assessing” (Tatikonda, p. 37), which further widens the gap.

The second gap in the research is the dialogue that is so central to Lean and the lack of studies applied in K-12 education. As Emiliani (1998) stated “dialogue is a powerful way to share knowledge, gain appreciation of others, learn, solve problems, and create value”

(Emiliani, p. 623). Thus, dialogue is integrally important to the implementation of Lean. Knowledge must be shared, as do opinions and observations to find the best solutions to implement. Without this dialogue, there is untapped creativity and genius from our students, co-workers, peers, and anyone else who may encounter knowledge that is applicable to the problem at hand.

SECTION III: METHODOLOGY

Context and Activity Setting (Method for gathering data)

This action research study took place in the Poudre School District at Fossil Ridge High School within the art department. Fossil Ridge is the newest of four comprehensive high schools in the Fort Collins community. This school offers classes for students with special interests, seeking advanced-level courses, and meets any special needs a student may have. The fine art and music programs have extensive opportunities for students, as well as great science and math programs.

Fossil Ridge was first opened in August of 2004 and has now grown to host over 1800 students. For these students, there are 101 teachers available with 54 supporting administrators, including principals, assistant principals, counselors, deans of students, custodial, nurse, paraprofessionals, and food personnel. The diversity within this number of students is low. No matter the diversity of the students, the school is dedicated to achieving excellence as one their goals, which is ingrained in the school's identity.

Fossil Ridge High School is a great setting to implement this study as students and their parents seem to be more actively involved in the school and in each class. Furthermore, Fossil shows signs of looking for a way to improve their school as a whole and push to higher standards and greater success. This may make for a great opportunity to try

the implementation of Lean across the entire school where it might be possible to involve not only students, but also staff and parents.

Data was collected from two classes: one a Freshman level course that is required for all Fossil Ridge Students, *Foundations of Design*, and the other is a mixture of Sophomores, Juniors, and Seniors, *Drawing I*. Both classrooms are set up with tables made up of four desks allowing four students to sit at each table. The classrooms themselves sit adjacent to one another and have few artistic resources posted and with limited student work posted around the rooms. There is however, more student work displayed in the hallway just outside of these two classrooms.

Participants

Within the *Foundations of Design* classroom, which is during period 1, there are 34 students attending. These 34 students consist of 16 female and 17 male students. Among these 34 students, 2 are of Hispanic descent and 2 of African American decent. The rest of the students are Caucasian or White. There are two students that I am aware of that have counseling or difficulty in reading and writing comprehension.

There are 27 students who attend the *Drawing I* class. Within this class there are again 16 female students and 11 male students. Only one is of African American descent. There may be one or two other students of mixed decent, it is difficult to tell, while the balance is Caucasian or White. To my knowledge, there are no students in this classroom that have special needs, counseling issues, or reading and writing comprehension issues.

This setting allows for some diverse needs and backgrounds to have input in this study, which is of great use when trying to collect all student voices. This setting also allows

for student voices varying in age and grade levels to be heard. The study provides a fairly balanced survey of student voices when ethnicity is combined with student gender.

All sampling methods were kept anonymous to allow students to be completely honest with no repercussions. The goal of this study was to get all students' voices heard, therefore no students in either classroom sampled were excluded from the study. All student voices count and should be heard with no biases attached to them.

Study Design

This is set as a qualitative study, in which the purpose was to find out how to better engage students in the classroom, as well as provide students with more ownership in their own education. The strategy of this qualitative study was to get direct feedback from students, providing a means for their voices' to be heard. In this qualitative study, we looked at the students' voices and opinions in order to better implement the action plan, through the use of a questionnaire. Because we looked more at opinions and voices of the students concerning their educational experiences, the qualitative approach is best as there was very little empirical data.

The best way to collect the students' voices is to provide a means for them to give their voice anonymously. This allows them to feel completely comfortable to share openly and honestly. Interviews with a stranger do not particularly provide a safe and comfortable environment in which to share honestly. Thus, an anonymous questionnaire was chosen for a data collection method, which can be viewed in Appendix A.

There is a lack of engagement from students in the classroom, and an even more disturbing result is that our graduates from high school are not work ready (Tatikonda, 2007; Freire, 2005; Alagaraja, 2010). This study is the development of a plan to implement

Lean Culture and Thinking in the classroom to engage students more, and better teach them the necessary 21st Century Skills that are needed to succeed in the workforce.

Data Sources

The students' voices were collected through a questionnaire, see Appendix A, which asked students eight questions. The questionnaires were labeled with the period number and a student number in order to help keep track of the questionnaires and feedback without needing student names. These questions included, but weren't limited to, asking students to reflect and share on past experiences in the classroom where they were allowed to contribute to the culture and curriculum development; as well as, if they had a voice in the classroom, and opinions on preferences between adding value to versus eliminating waste from their education. To view the specific questions and the questionnaire in its entirety, please refer to Appendix A.

Researcher's Stance

In this study, I tried to influence the students' responses as little as possible only giving them the statement that their voice counts, should be heard, and taken into account when discussions of their education occur. I only provided them a reason why I was asking them to do this questionnaire in an attempt to encourage as many students as possible to fill out the questionnaire and hand it in.

From my research I have gained the knowledge that from those who have tried to implement Lean in the classroom, many have come to the decision that it will take someone with years of teaching experience to implement Lean successfully. From my personal experience, I have watched Lean Manufacturing transform a local company, Xylem Design, and its employees for the better. Each employee, including myself, has experienced the

ability to have more ownership and control in our work environment by being given the power to make our jobs easier through Lean Thinking and continuous improvement. In this process, everyone is involved and given the responsibility to see waste and find the best ways to eliminate it. At Xylem Design, where I have worked for the past four years, one of their top values is 'to grow people,' not to grow continuous improvements or eliminate waste. From the Lean Culture that is developed, you not only grow people, but also grow the company because Lean empowers all people to have a voice and responsibility for their job. How nice would that be to experience in our classrooms? But, if we produce educated children that aren't ready for employment, isn't it a waste of the time spent by the students and teachers in the classroom?

I hope that my years of experience with implementing Lean into a local business will allow me a unique insight into how Lean works as a culture, and how to implement it into the classroom and education as a whole. There is no guarantee of this until I try using trial and error through much of the process. I truly believe that Lean Thinking is applicable in education and can benefit the students, teachers, and all personnel involved. If Lean applies to adult education that occurs while in the workforce, which is a place adults are required to go, can't we assume that a similar effect will happen for children who are required to attend school? When we stifle a child's creativity and innovation by never accessing it in the classroom, won't their perspective on school be less likely to be engaged, or for that matter, feel any ownership for their education? Implementing a Lean Culture in the classroom may very well have the effect of further engaging our students by giving them that sense of ownership or, at the very least, being part of a community that continually supports each individual's growth and individuality.

Thus far, I think we have done what we could, but have not made enough progress. It seems every time our education system breaks ground on a new reform, we are behind by the time we reach the goal of each reform. This tends to leave a feeling of always being behind the ball. To accomplish our goal we have to predict or look ahead at where the workforce industry and our democratic society are going, because if we don't we automatically set our students up to be less prepared for life after high school. In addition to a continuing the reform process, there has been an ongoing concern about our students' engagement in the classroom. I believe applying Lean Thinking to the classroom is a means to improve engagement from the students by giving them more ownership, not only in the classroom, but also in their own education, while providing a renewal to our education system. To solve the two challenges with one solution is an intriguing thought; enough so, I have found it to be a subject on which data is needed. Specifically, involving the students' voice in order to find the best ways to engage all students in the classroom.

Validity, Reliability, and Credibility

Lean is a culture in which all members have an equal voice and active participation in the development and improvement of the culture and physical environment (Liker, 2004; Akers, 2012; Ziskovsky & Ziskovsky, 2011). If all members have an equal voice, it comes to reason that our students, who make up a majority of the classroom, should have a voice in the classroom and the education system. Furthermore, if our students are expected to have the cognitive skills and developed opinions to contribute, then we must allow students to do so in a safe environment where their thoughts and opinions can't be used against them. This would allow the students to practice expressing themselves in eloquent and meaningful ways so that they are better prepared for life after high school. We must begin to trust our

students with more responsibility, knowing that they may need a guiding hand along the way, which we can provide.

The gap that is evident in the research is a lack of the students' voice, so it is valid to have a questionnaire or some collection of student opinions on the matter. After all, students and their employers are the customers of the educational system (Ziskovsky & Ziskovsky, 2007; May, 2005). If I had more time in this study, I would try to reconnect and check back with many of the students, especially those that I know didn't turn in the questionnaire to see if there was a possibility to further differentiate the collection of data in hopes of receiving more student voices and opinions. This, in turn, would help improve the overall credibility of the study. I would also try to implement some of the common responses immediately into the class and ask students in real time if it helped them or not. This would further the understanding of the students, and the meaning of the data I collected.

Lean focuses on a collaborative culture where all voices are heard and encouraged to share, not just the fearless leader (Liker, 2004; Akers, 2012). The questions used are valid because they focus on drawing out the students' voices, allowing every student to respond and provide their original thoughts and opinions without undue influence. The questions are also specific enough to guide the students in providing a relevant answer, but the questions could probably be even more directed towards specific improvements in the classroom as the action plan is implemented. However, Question Eight allows for students to give direct feedback on an opinion that is being formed without their input. Some Lean scholars are arguing that Lean applied in education needs to focus on adding-value instead of eliminating waste, but there is no student opinion data to support this matter (May,

2005). Thus, the use of Question Eight becomes valid on a very specific level for collecting data.

Ethical Issues

This study provides no physical harm of the students as they are only asked for their input on the questions given to them. In what I can predict I see no objection from the parents on any of the questions asked of the students. The students also cannot be forced to answer every question or any of the questions; they must be willing to provide an answer.

In asking for input from students, there is still the chance of having a bias towards some students over others. To help avoid this, I left the questionnaires anonymous and made this very apparent to the students so they were also aware that there was no possible bias to be taken. As the action plan is implemented, student feedback collected in an effort to continually improve the classroom and curriculum should be anonymous to avoid bias. This could be accomplished in the form of a Ticket Out The Door or a "journal entry," which is kept anonymous somehow.

Procedures and Timeline

This study was developed over 2 months during my practicum at Fossil Ridge High School. The questionnaires were given out as a classroom assignment and collected the same day allowing for the highest return of questionnaires possible. The data was then analyzed over the next week for the final write up of the action research plan to follow.

SECTION IV: DATA ANALYSIS

Research Outcomes/ Findings

The data for this study was collected via a questionnaire containing eight short-answer questions. The questionnaires were kept anonymous by identifying each student

according to the period and a student number. There were no leads or multiple-choice questions, except for question number eight. With all short-answer questionnaires, there is a variety in responses and opinions. With this in mind, the data analysis is organized by question starting with number one and ending with number eight. Each question is presented in a chart, which is labeled with the specific question asked. Each chart shows the general responses from each period that data was collected. You can find the original student questionnaires and their responses for Period 1 in Appendix A and Period 3 responses in Appendix B.

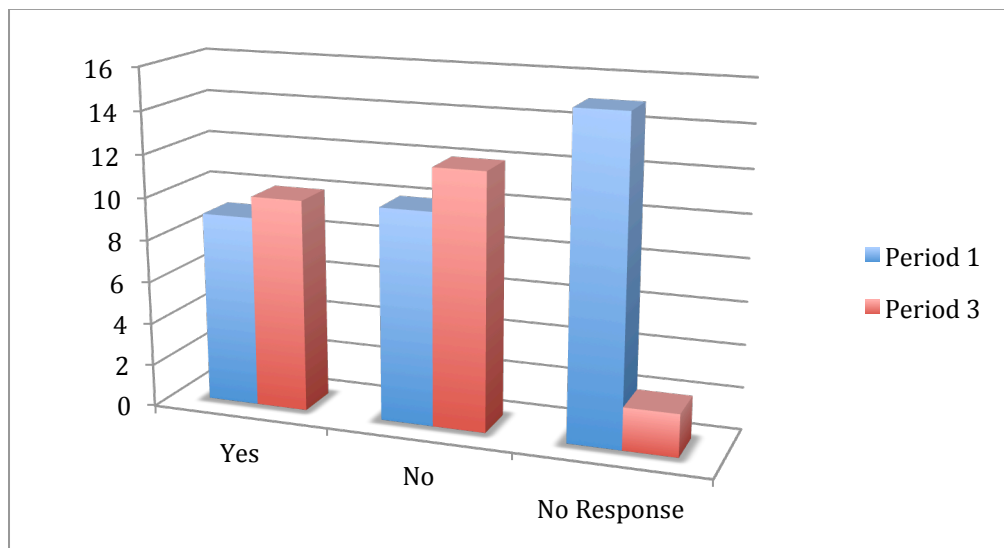


Figure 1: Have you ever experienced a class where the teacher allowed you to participate in creating the culture of the classroom? How did this make you feel as a member of the community? Please provide specific examples.

Question 1. The first question asked students if they had any experience in a classroom where they were able to participate in creating the culture of the classroom (for full question refer to Figure 1). As shown in Figure 1, the majority of the students who answered said they had not had this experience. One student even stated that it makes them “feel sad” that they had not gotten to experience such a class (Period 1, Student #16).

Another student, who has never experienced this environment, stated, “the teacher is equivalent to Hitler” (Period 3, Student 21).

On the other hand, the students who responded yes had nothing but positive statements. A student from Period 3 stated that this experience “allowed for more student choice and made me feel as though each student and their unique traits were taken into account” (Period 3, Student 10). Other students described this experience as being “part of a community” or as simply being “more excited about class” (Period 1, Student 10; Period 1, Student 15). In this type of culture, a student described their experience as feeling “more appreciated and like the teacher genuinely cared about us” (Period 1, Student 14). Overall, students find that it is more engaging and encouraging to participate in the development of their class culture.

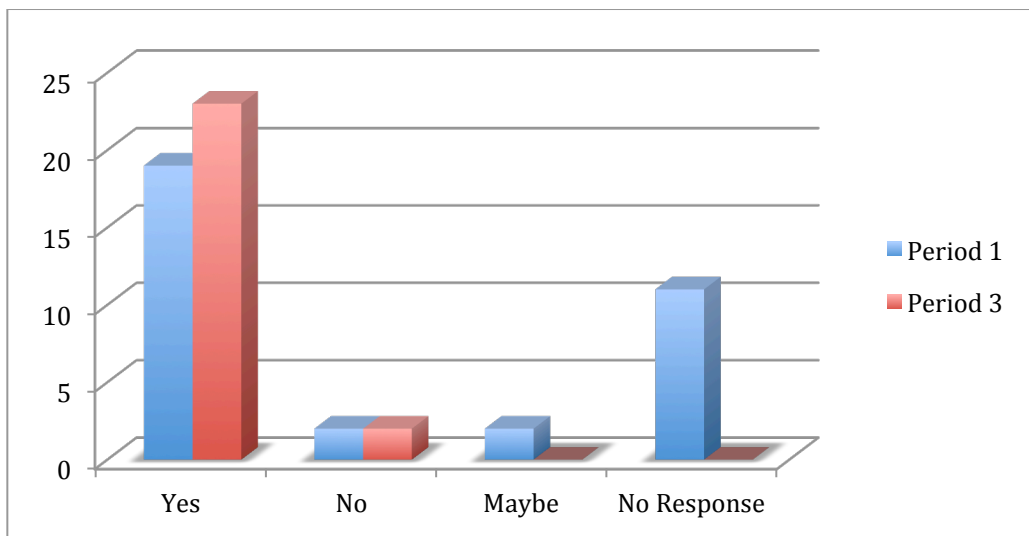


Figure 2: If you were given more opportunities to contribute to how and what you were going to be taught how do you think you would react? Would this help keep you engaged? Please explain why.

Question 2. Question 2 allows students to respond on how their engagement would be affected if given more opportunities to contribute to what and how they were being taught in the classroom. As the chart illustrates, the general consensus was that the chance

to have more opportunities in contributing to how and what they are learning would be beneficial in increasing engagement within the classroom. Students' reactions varied, but several themes appeared repeatedly. The first was an acknowledgement that the student understood they learned differently than others and knew how they learn best (Period 1, Student 24; Period 1, Student 26; Period 1, Student 7; Period 3, Student 12; Period 3, Student 2). The majority of responses from students that felt this would help their engagement in class purely by having the ability to choose, which would allow them to participate in learning something they want to learn about or that they "would truly be interested in" learning (Period 1, Student 14). One student specifically stated that they would "appreciate the freedom of a voice" (Period 1, Student 1). Other students saw at this opportunity as a challenge they would meet by "acting maturely and handle the situation like an adult" and "use the opportunity to share ideas...that would benefit the class as a whole" (Period 3, Student 5; Period 3, Student 10).

On the other hand, there were students who did not feel that being given more opportunities to contribute to what and how they were being taught would be at all useful. Some students responded in opposition of change or more specifically stating that they "don't like options" and that "the teacher should have a plan and be able to teach the plan" (Period 3, Student 21). There were very few students who didn't like this concept, contributing to the data with statements of "not caring" or that they "would continue to be engaged" because they "would like an A" in class (Period 3, Student 8; Period 3, Student 2). One student was not sure and seemed to "like some structure or else I'm lost and not very engaged" (Period 1, Student 18). Even with these mixed feelings, the general consensus is

that students’ feel they would benefit from having more opportunities to contribute to what and how they are learning.

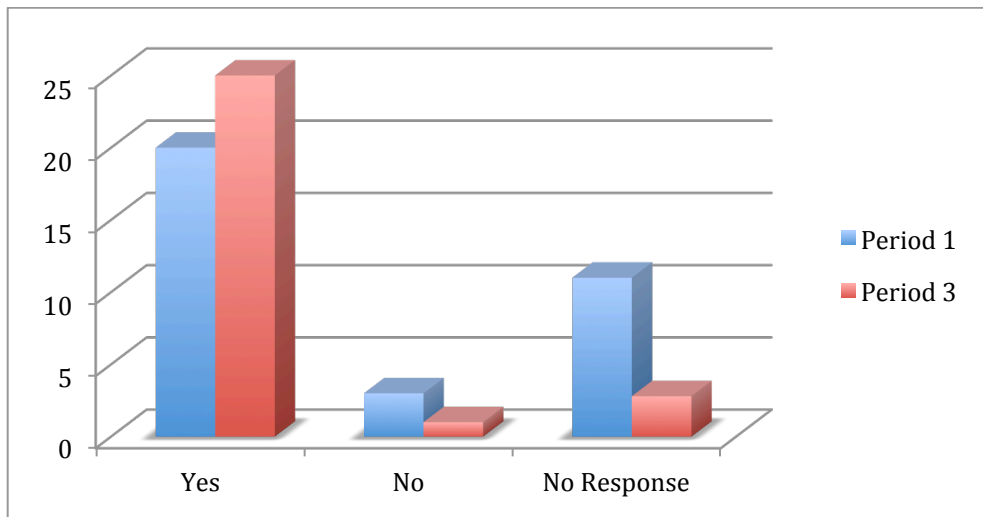


Figure 3: Have you ever felt school was a waste of time or a specific activity was a waste of time? Please explain giving specific examples.

Question 3. The third question on the questionnaire asked students if they have ever felt as though an activity or school was a waste of time. There were a few students who seemed to understand the importance of school. One student stated, “that in order to be successful you need education, also everyone has something to teach you” (Period 1, Student 7). However, the data and chart show that most students have found school or a specific activity to be a waste of time. In some cases, students seem to be very aware of truly wasteful activities, such as suggested by Student 14 who stated, “copying notes is sometimes a waste because I’m not focused on what I’m writing, just finishing the notes” (Period 1, Student 14).

The main theme that seems to appear with most students is a disconnect on the purpose of the courses and content they are being taught. They see no relevancy to their lives or the career path they are set on. One student stated, “in my career, I will not use math and science, so I think it is a waste of my time” (Period 1, Student 29). Another

student stated that they “didn’t know how the activity applied to me or what the point of it was” (Period 1, Student 5). Many students claimed specific classes were a waste of time, the most common being advisory, math, science, and history. These claims all seem to have the same argument that they “fail to see how a lot of things will be relevant in life” (Period 3, Student 9). Another student went as far to state that “up until my senior year in my financial life management class I didn’t know how to write a check or pay a mortgage or even what insurance was” (Period 3, Student 20). These statements all reiterate that the relevancy of courses, even core courses, is either not being taught in classrooms or the students are missing the relevancy when it is being taught.

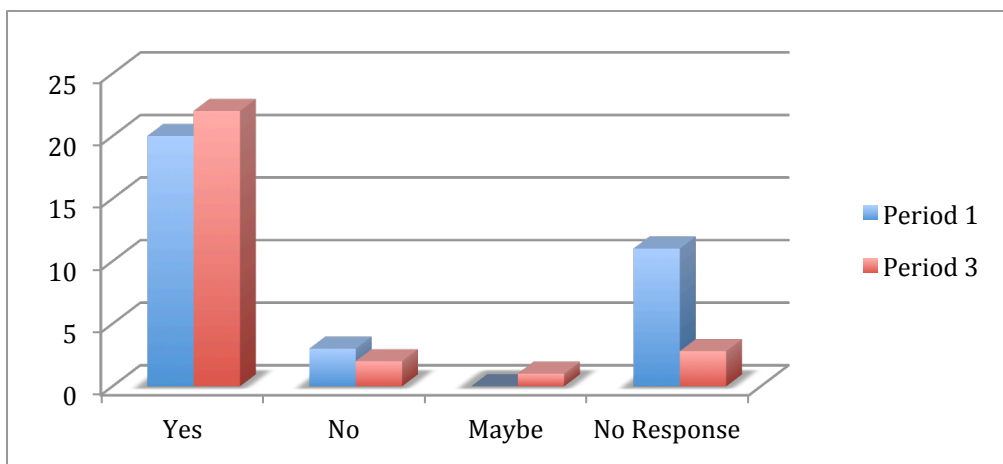


Figure 4: Would you be more likely to be engaged in classes if teachers, students, and schools work collaboratively towards only applying activities and experiences that add value to your education?

Question 4. The fourth question asked students how they felt about having teachers, students, and the school working collaboratively together to add-value to their education. The chart shows the majority of students liked the idea of working collaboratively to add-value to their education. As one student stated, “it would put everyone on the same page and would be a lot better” (Period 1, Student 11). Another student stated that they felt “if teachers listened to students more then they would be more engaged in the lesson” (Period

1, Student 13). Another student stated that this would “open interpretations, as well as creativity” (Period 3, Student 10). Still, another student stated this would allow for input to have “more activities and experiences that will realistically benefit us in the real world” (Periods 3, Student 13). The aspect of students working with teachers and their schools together seems to be positively received.

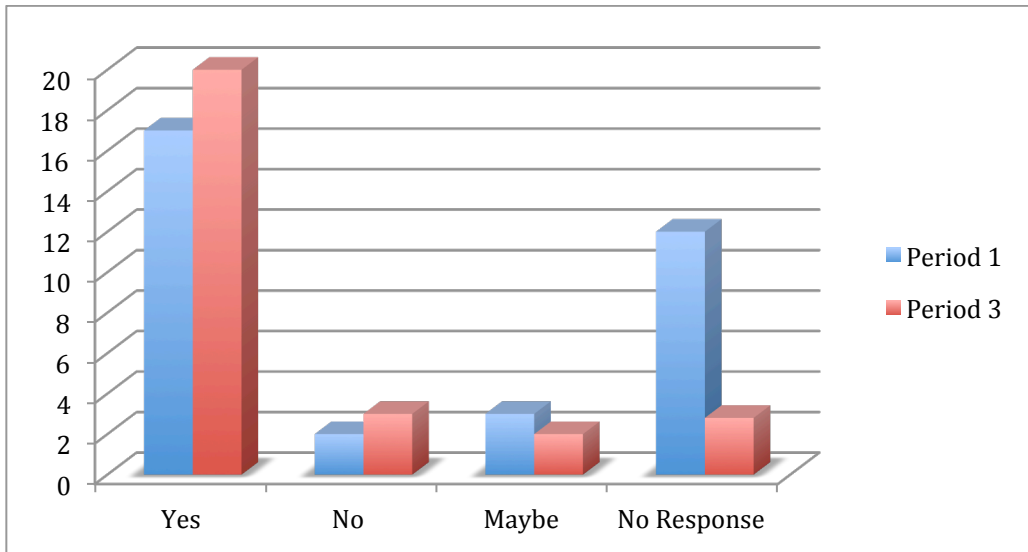


Figure 5: Would your engagement in school improve if you were able to have a voice in your education that was actively being used by your teachers and/or school to take action? Briefly explain why.

Question 5. Question number five asked students if they would be more engaged if they had a voice that was actively being used by their teachers. The chart shows the general consensus of students’ response to the question, that consensus being yes. In answering this question, several students had some very intriguing thoughts. One student stated that they would be enthused about having a voice that was actively used by their teachers “because with my ideas may come curriculum that hasn’t been introduced and student choice is more beneficial in a long-term sense” (Period 3, Student 10). Another student said they would appreciate this because their “education would finally be about me learning rather than teachers and the school needing me to get a good grade for money” (Period 3,

Student 3). Yet another student reiterated that, “sometimes educators forget that we are up and coming adults and we deserve to contribute with how we spend some of our time” (Period 3, Student 17). Although, there are some students who feel differently most students would appreciate having a voice.

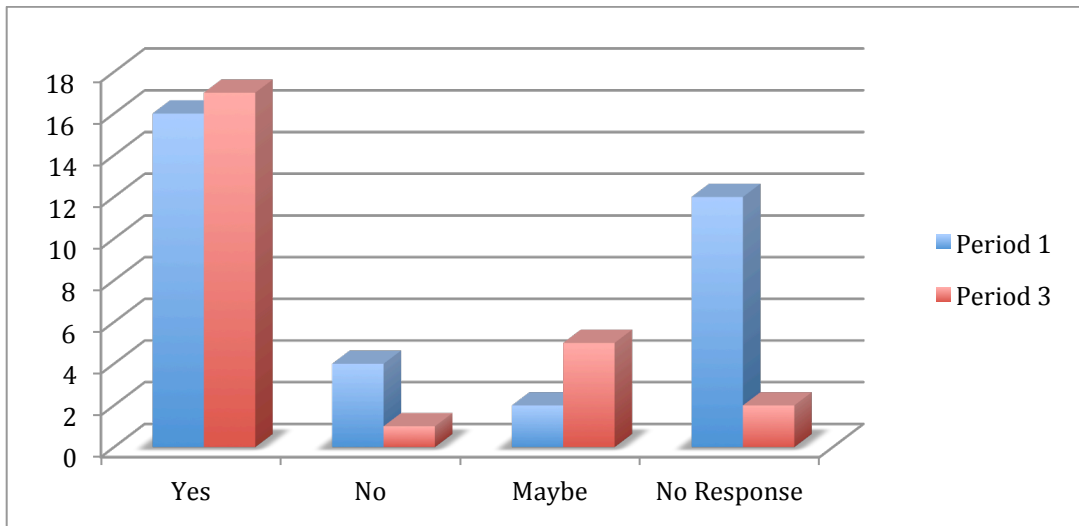


Figure 6: If your teachers asked to receive anonymous feedback from each student in the class on the lesson subjects and delivery, would this be helpful to you if the teacher uses it to make immediate changes in the classroom? Why?

Question 6. The students were asked if they would find it helpful if their teacher asked for anonymous feedback on the class from each student in an attempt to make immediate changes. There were several students who were not really sure if this would help or not, and others didn’t like the idea at all, but the majority still thought this would be very helpful. The main theme that came across from students who answered that this would help them feel “heard,” by having “concerns and suggestions... be addressed” and that the teachers “cared about what the students thought” (Period 1, Student 4; Period 1, Student 5; Period 1, Student 29). Several students also responded to this question stating that if a teacher “takes the time to ask for feedback, it should be used” and that “student choice is helpful and opinions need to be voiced” (Period 3, Student 20; Period 3, Student 10).

Other students brought up some good points that need to be taken into account. One student stated, “immediate changes could be hard if it was completely shifting the way a classroom worked because kids would have to adjust quickly” (Period 1, Student 14). Another student states that this may or may not help as “everyone isn’t going to have the same ideas so you might not get benefited from it” (Period 1, Student 3). The last student that needs to be brought to attention in their response stated that things written anonymously “won’t be easy for teachers to know who is struggling more,” which would make it difficult for teachers to help specific students (Period 3, Student 6). This is reason for teachers getting more than just anonymous feedback, as teachers will need additional input to get a real idea of which students are struggling and need extra help.

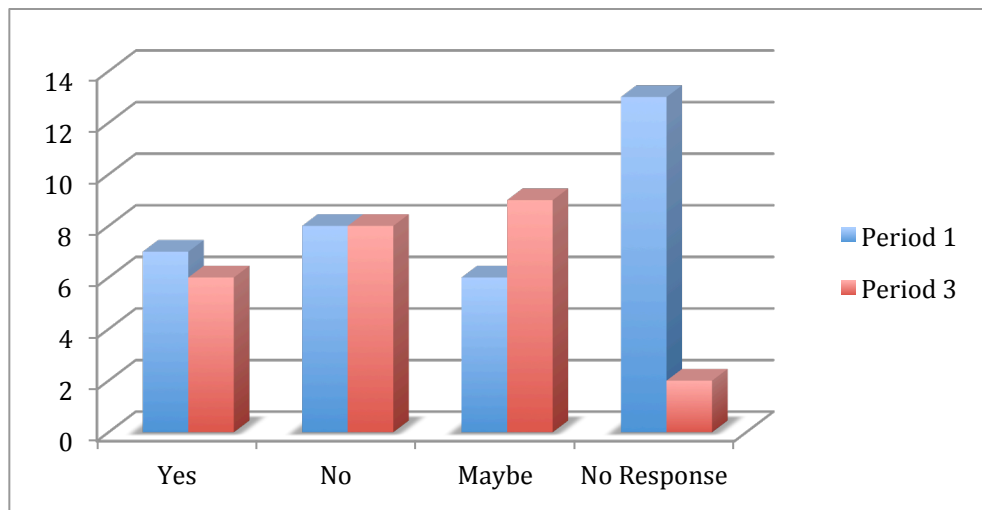


Figure 7: Do you currently feel you have a voice that is heard in the classroom? Please provide specific examples.

Question 7. The students were asked in question seven if they felt they had a voice in the classroom. After charting the responses, many students didn’t give a response even with the questionnaires being anonymous. Although, if compared to the charts for the rest of the questions, it is about the same number of students from period one that did not respond, about 13. Those who did give a response are shown in the chart to be spread out

fairly even with a slight tendency to feeling they have no voice or maybe might have a voice in some classes. Several students commented that they “just do whatever teacher tells” them to do and that the “work goes on without” them (Period 1, Student 24; Period 1, Student 16). Or, if a student questions the lesson or asks why they are being taught something, they “are considered rude” (Period 3, Student 20).

For a student who feels they have a voice, they are allowed to have “class votes or look for input or opinions on what to do or how a classroom should be” (Period 1, Student 14). One student described having a voice as being treated like “adults instead of kids,” which makes the student “feel like a lot of teachers struggle to find a balance” (Period 3, Student 18). Student voices are important and should be heard, but it is up to the teacher to listen.

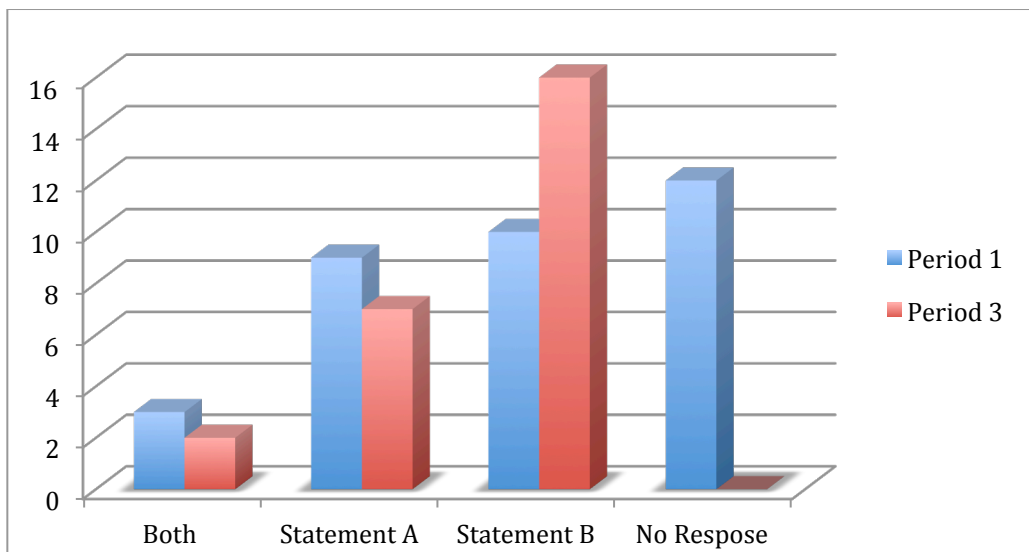


Figure 8: Which statement is more inviting or interesting to you? Please explain why. A. Learning how to add value to your education. B. Learning how to eliminate waste from your education.

Question 8. The final question asked students which statement was more inviting or interesting to them; A. learning how to add value to your education, or B. learning how to eliminate waste from your education. Some students found they liked both statements used

together because by “adding value you eliminate waste, they both improve learning” (Period 1, Student 5; Period 3, Student 20).

The students who chose Statement A seemed to have the general theme that they liked “focusing on the positive” more than the negative (Period 1, Student 10; Period 3, Student 22;). Another student made the wise statement that “waste will always be there,” so focusing on adding value is more important (Period 1, Student 14). Several students shied away from Statement B purely because they didn’t like the indication that they were being taught something wasteful (Period 1, Student 14; Period 1, Student 15). One student had an interesting response stating, “a lot of the things we take are required, but there is no value to the knowledge since I’ll never use it again” (Period 3, Student 3). This student continued on to state, “eliminating waste can just be forcing me to use everything I learn so it’s not wasted, i.e. standardized testing” (Period 3, Student 3).

For those students who chose Statement B, the general theme seemed to be that they didn’t like learning unimportant information or skills (Period 1, Student 25; Period 1, Student 7; Period 1, Student 17; Period 1, Student 29). One student responded with an explanation for choosing Statement B since students learn so much that “will never be used in real life and eliminating that will allow more space for valuable education” (Period 3, Student 13). Other students seem to have a similar understanding that by eliminating waste you will have the opportunity to add value. One student simply stated, “not everything that is taught is a necessity” (Period 3, Student 10). In this question, a theme reappeared from past questions, the theme of relevancy to real world application. This is shown by a student who responds that they don’t see the purpose of taking math when they have no intention of

having a career that involves math and knows no connection to math in everyday life (Period 3, Student 4).

Through this data we have seen a trend in student responses. They generally do want to have more of a voice in the classroom and more involvement in the development of their own education. In teaching our students 21st Century Skills, there should come a point where we give students more responsibilities and treat them not as empty vessels, but as young adults who can handle more responsibility. From the feedback the students have given it reiterates that students, just like athletes, can rise to the level of the players around them. Furthermore, those students who experienced teachers that genuinely cared and listened provided a more positive and enriching learning environment. This should be what we all strive for. The educational system may not be ready to have students sitting on the school boards providing input, but students can and should be giving input into the classrooms they learn in. After all, what better way to get the students involved than giving them the pride of an idea that is implemented through the classroom, a sense of value and equality can be given to every student.

Section V: Conclusions and Recommendations

Dissemination Plan

This research will be presented during my defense for my thesis and, hopefully, published. As a long-term plan after conducting more research and implementing Lean into the classroom, I would like to write a book that breaks down Lean concepts as applied in the manufacturing industry that focuses on the culture. This will also contain a second book about Lean in Education, focusing on the Lean Culture within a school and the

implementation of Lean in the classroom. These two short books would be published as one since background knowledge of Lean is needed and the knowledge on how to implement Lean into education can be useful across multiple industries. My vision for these books is that they would be a guide to Lean, the culture, and implementations in both the manufacturing and educational industries.

Action Plan

More research is needed, as this is a beginning point on how to best implement Lean Thinking in the classroom and eventually into the Educational System as a whole. The first step is to take the student voices that I collected from the questionnaire and apply it to the classrooms I am placed into during my student teaching in Spring 2015. With every opportunity I get, I will provide the students with a chance to share their voice and help to build the culture with my one and only strict rule of “respect,” which will of course have to be discussed and defined with the class. From this study, I have gathered the general theme that students would like to have more voice and say in their own education, which would improve their engagement. There, are of course, some students that have differing opinions. However, I wonder if those differing opinions are related to the lack of experiencing classrooms where they have a voice and are able to participate in creating the culture from the responses in Question one. Even so, I hope to allow my students not only to participate in creating the classroom culture, but to also use their input to determine where Lean Education should be focusing improvements on, adding-value verses eliminating waste.

Now I am not saying, nor has any of the research said, that Lean should be applied directly into the classrooms without any alteration. Lean will absolutely need to be adjusted in order to better fit the education system, but that is still being determined. This is one

reason why more studies on applying Lean into the educational industry need to be carried out. May suggests, as do several other articles, that the focus of lean should shift from eliminating waste to adding-value (May, p. 34). I would agree, but what they miss and was the reason for the failure of the first attempt at implementing Lean in the West is that the true focus of Lean is the culture rather than the elimination of waste. So as teachers, we must first build the Lean Culture in our class and then focus on adding-value more than just eliminating the waste. If it doesn't add value to our students' education or experience then lose it. From the data collected for Question eight there seems to be a fairly even split in students' thinking.

So for now, I would like to try a little of both and directly watch students engagement and reactions to continuous improvements we make as a class or in small groups. These continuous improvements will be structured as problems or issues with the culture we create as a class or assignment/activity/experience that could be structured or arranged to better fit the needs of the class. It will take some trial and error to work out further details, which I hope to do during my student teaching. The discussions that will commence about the culture or assignment/activity/experience will be set with a bias either towards adding-value or eliminating waste or a combination. It will be interesting to see which has the best outcomes for the students.

A next step for me as a master teacher in this action research is more literature review. I plan to go back through my resources, as well as several new resources, and do more in depth research. In an ideal world, I would love to go and visit Toyota in Japan to get a first hand account of Lean Thinking applied in its original state. I am left to wonder if the Japanese use Lean in their education system and I plan to research that. There is no final

outcome of this research yet, which means there is more research needed and I intend to continue doing so.

Education has gone through many reforms and is still in need of change to help our students be more prepared for life after school. Think of it this way, if the goal of education is to prepare students as productive members in our democratic society with the 21st century skills to be immediately hired into the workforce. Our education system is truly customer based on what the students and employers need or demand. Now look at Lean Manufacturing where a company can change due to demands of the customer to produce exactly what is needed in a timely manner with little waste for all parties and still provide the highest quality possible. If we are looking at education as a customer-based industry, then applying Lean Thinking should allow our educational system to implement continuous improvements in order to change with the demands of outside industries without having to go through a long drawn out reform that starts building from scratch each time.

APPENDIX A: ACTION RESEARCH QUESTIONNAIRE OCTOBER- NOVEMBER 2014

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