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Personalized Learning:
Utilizing Canvas Technology for ELL Success

Rebekah A. Struble
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Abstract

This action research project was put in place in order to identify the possible benefits of utilizing a flipped classroom technology program called, canvas, in the sixth grade mathematics class. This implementation was meant as a means to enhance the academic success of the ELL students through a more individualized instruction plan with the aid of a technology program. Video-audios, peer discussion boards, and independent student research in conjunction with teacher guidance, redirection, and classroom group activities were utilized throughout a statistics unit over a one-month period. To properly compare the benefits of the technology program implementation there was also a targeted control group that received the same instructional plans without the means of independent technology use. During this month time period, a variety of data was collected and compared between the two comparable classes through qualitative responses, observations, and a final quantitative survey. The analysis of the collected data suggests that the ELL student's success in their math curriculum was more meaningful and better mastered when completed with an individualized instruction environment that utilized technology verses a traditional teacher lead instructional unit without individual technology.

Keywords: Canvas, technology, individualized learning, ELL instructional strategies

Personalized Learning: Utilizing Canvas Technology for ELL Success

As student computer technology becomes more accessible in our school systems and technology becomes more important to the 21st century workforce, the push for technology implementation rises to help our students with their future success. The belief here is that the technology in the classroom engages students, encourages individual learning and growth, and prepares the students for their “future by familiarizing them with the discovery process for each new tool (Capella University, 2014, para. 5).” The drive and engagement helps students to become more accountable in their own learning. That being said, integrating a 1:1 program is one way in which technology can be utilized in order to increase student learning, motivation, and self-directed work using technology integration. With a 21st century technology driven classroom comes the additional concern of the change in the student diversity.

Through the years, classes have become more and more diverse. This diversity makes differentiation in the classroom more and more vital to the success of students. In addition, more of the students are English language learners (ELLs). This fact hits the teaching profession hard. Growing numbers and diverse communities have driven the educational system to conduct studies for the ELLs in the classrooms in an effort to find strategies that benefit their learning. Most ELL students simply need instruction that can relate to their world, is at their own individual pace, and is full of graphic organizers, websites, and videos (Protheroe, 2011).

With the need for more technology use in the classroom to prepare students for the 21st century workforce and the fact that our classrooms are more diverse educators need research and implement instructional strategies that would be beneficial for not just our English students but for the ELL learners too that utilize technology.

Literature Review

English language learners (ELLs) are struggling in our traditional educational system. It is a never-ending battle to find a strategy that seems to help the majority of the ELL students. Several strategies are thought to help aid in the successful learning of ELL students, such as the use of technology, personalized learning strategies, and visual aids like graphic organizers and videos (studies listed in alphabetical order?). During this study the effects of implementing a personalized technology unit with visual aids in a 6th grade math class is tested in order to identify if the implementation of the strategies help the success of ELL learners. It is theorized that the implementation of a personalized learning strategy through technology helps in the academic success of an ELLs learning in the 6th grade general mathematics classroom. The following literature reviews identify and provide evidence towards this theory.

In an article by Dale Basye titled Personalized vs. differentiated vs. individualized learning it was shown that personalized learning is often misunderstood but highly beneficial when used properly. In this article, it stated that personalized learning is “learning that is tailored to the preferences and interests of various learners, as well as instruction that is paced to a student’s unique needs (Basye, 2016, para. 13).” It is apparent in this article that of the three types of learning environment, individualized, differentiated, and personalized; the personalized learning style is the one that is most recommended. According to Basye (2016) the benefits of a personalized learning experience are that this type of learning environment gives students the ability to control and manage their own learning. By providing students with their own power in managing their learning, it also allows students ownership in their learning. Students thus begin to think of the curriculum not as something that they have to do but more of something that they get to participate in.

In addition to clarifying the true definition of what a personalized learning environment is and how it truly benefits the students, Basye (2016) also states the importance of utilizing a technology based program when implementing this type of instruction effectively.

Since the most effective (and unrealistic) application of true personalized learning would require one-on-one tutoring for every student based on their interests, preferences, needs and pace, personalized learning is often conceived of as an instructional method that incorporates adaptive technology to help all students achieve high levels of learning (para. 16).

Following the clarification that an effective/realistic personalized learning environment implements adaptive technology a district approved adaptive technology program was researched for implementation.

In a case study article by the Rockingham County Schools the implementation of Canvas was utilized as a way to provide educators and students with a digital space in which they can organize and communicate their learning objectives as a part of their 1:1 mobile learning initiative. The district director of instructional technology and media knew that he needed to carefully consider his options and find a program that would be beneficial in enhancing learning rather than detracting from it. Especially since there is so much information at the fingertips of the technology user. Through his research, it was found that the Canvas program was highly beneficial for both educators and students alike.

The Rockingham County School District implemented the Canvas program with their Chromebooks and it was instantly found to be a hit. Teachers were reported to being excited about the program and all the different ways Canvas would improve their instruction because it

allowed a more organized digital classroom setting with options like communicating the classroom calendar and due dates with the students and grading assignments with ease and flexibility. It was even reported that with the implementation of the Canvas program several educators in the district delayed their retirement just to work with Canvas. Even three years after the original implementation of Canvas with their Chromebook technology, Christy Barham, the district's media and technology coordinator stated, "Canvas makes their (teachers) workload manageable in a 1:1 environment and offers the best user experience for both teachers and for students (Instructure, 2015)."

The application and implementation of a personalized instruction with the help of an adaptive technology program like Canvas was shown to be a true benefit but would it be helpful for the academic success of ELL students? In another resource *How the ELL Brain Learns* by David A. Sousa, many strategies and ideas were stated as effective ways in which to help aid an ELL student in the learning of their required mathematics content. Though math is said to be a universally understood language and therefore should be more understandable for ELL students; the vocabulary within math concepts is what challenges ELLs the most.

The mathematics language in the classroom is often used to express concepts that are not necessary or important in everyday usage. Words such as regroup, hypotenuse, coefficient, and exponent, or the more complex terms such as least common denominator, greatest common factor, and rational function, are common in mathematics class but not in the students' social environs" (Sousa, 2011, p. 137).

Of the many strategies listed, a few would be easy and ideal to implement with a Canvas individualized instructional unit. Strategies such as using simple sentence structures and explaining homophones that occur, allowing students a choice of presenting orally or with the

use of a presentation software, having students keep a personal work study notebook with key words, symbols, and drawings, incorporating visuals and graphic organizers, providing sentence prompts or handouts with structure or guides (i.e. skeleton notes), teaching the proper use of a calculator all combine to create a solid instruction practice that aids in ELL academic success.

Combining the above findings and research, it is found that utilizing technology to help with individualized learning can benefit both students and teachers when done correctly. It is also shown that the implementation of the Canvas program, with its' flexibility in communication and individual student assignments can provide an effective program to help guide English language learners in academic success. The Canvas program easily provides a way to help with communication blocks by allowing the view of audio/video/document files that help teach calculator use, provide visuals, show graphic organizers, and provide sentence/note prompts. From these findings, it is assumed that implementing the Canvas technology program as an individualized learning strategy can aid English language students in academic success.

Methods

Data Collection

The action research project explained in this paper was implemented in a 6th grade general mathematics classroom. The selected unit for implementation was statistics (central tendencies, line plots, and stem & leaf plots) as stated in the Iowa core for 6th grade mathematics. This unit was implemented during the third quarter of a four quarter school year. The student section where the individualized technology strategy was implemented was comprised of 40% English language learners where 60% of its members were of non-white ethnicity, and three were receiving services from special education. The results of this implementation plan were compared to a control class of the same age with a 37% ELL membership. The school of

implementation had a total student population of 1,113 students with 57% of its members of a non-white race and 72% of its members with free or reduced school lunch. The school has a 20% ELL students enrolled in the population of the school. As a professional development focus, the building of implementation has had three years of training on the SIOP (Sheltered Instruction Observation Protocol) Echevarria, Vogt, Short, (I would site the SIOP model here and in your references as well) instructional strategy model that is specially designed for English language learners in the general education classrooms. This data, in addition to the schools StartClass data show that the implemented school has a student population that is comprised mostly of Low socio-economic status individuals that struggle in the Standardized tests for reading and math (StartClass, 2017).

The focus of this action plan was to determine if an individualized technology teaching strategy such as Canvas would aid in the academic success of ELL students. In order to help answer the question of if a self-paced technology driven unit would benefit the academic success of ELL students, qualitative data such as observations, and formal/informal questioning was collected. Qualitative and quantitative data for this action plan was collected over a month long period. During the month of implementation data was collected daily. The specific details of the different data collected varied according to the specific reason(s) why it was collected.

Informal quantitative data that was collected in this action plan was a pre-test, peer discussion posts, independent topic research tasks, computerized graphic organizational notes, and concept practice problems. The pre-test data was collected at the very beginning of the unit in order to determine if students had any prior knowledge of the concept skills necessary for the unit (See Appendix A). An enrichment plan was in place for any student(s) who scored proficient in any or all concept(s) that were required for the unit. Peer discussion posts were utilized in

conjunction with independent research tasks in this action plan unit in order to provide students with an alternative independent learning and peer teaching strategy where they could research and learn different unit concepts from each other (See Appendix B) The discussion posts and independent research activities were implemented at two spots in the unit, during the introduction of measures of center verses measures of variation lesson, and for the data collection methods lesson. Another quantitative data that was collected was an activity in which students created unit notes using an editable Frayer model template. The Frayer model notes activity was utilized and collected as a means to identify student preference in note taking (computerized vs. paper) and was applied during the calculating measures of center and variation lessons (See Appendix C). Several different concept practice assignments were also assigned as ‘checkpoints’ for students to know if they are understanding the concepts fully and successfully throughout the unit prior to assessments. Together, the above collected quantitative data that was collected to help determine where the understanding of each individual student was so that they could receive additional intervention or enrichment activities as needed.

Formal qualitative data was collected in order to help identify if the individualized technology unit through Canvas helped ELL students in successfully understanding and mastering the unit concepts. The qualitative data that was collected in this action plan was a central tendency and range quiz, an M&M central tendency and range activity, and a summative assessment. Upon completion of the central tendency and range practice assignments and instruction students were given an M&M activity. This activity allowed students to practice the calculation of mean, median, mode, and range, using a fun application of the amount of each different M&M colors that appear in mini packs. Unlike the rest of the unit assessments, assignments, and readings/instructional procedures, the Canvas technology was not utilized for

this activity in the experimental group. Upon successful completion of the M&M activity students were given the central tendency and range quiz. This quiz was given for students to show their mastery and understanding of the central tendencies and range before moving on to interpreting line plots, and stem-and leaf plots. Upon successful completion of the central tendencies and range quiz students continued their unit of study by learning how to interpret and create line plots, and stem-and leaf plots. At the conclusion of the unit, students were given a district mandated summative assessment (See Appendix D). The summative assessment shows how students responded to the instructional strategies that were utilized throughout the unit. All of the collected qualitative data aided in determining the mastery level each individual student had upon the completion of each selection of the unit.

Data helps provide a better insight to the progress and success of our students throughout each unit of study no matter the instructional strategy. In this action plan, the specific types of data that was collected gave a deeper insight of the possible benefits of providing 6th grade ELL students with a technology aided individualized instruction plan. Throughout the individualized technology implementation, a combination of qualitative and quantitative data was collected including instructional videos, independent research, group discussions, and graphic organizational data. The variety of data that was collected for the control and project groups in this action plan allowed a more valuable comparison to occur. However, the true value of this data was found in the conclusions of the data analysis.

Findings

Data Analysis

During this action plan, there was a plethora of researcher bias involved. In the planning, execution, and even in the data collection process it was believed that the implementation of an

individualized technology plan would benefit the students' academic success. The district and building in which the research took place, have goals that state their opinion, technology in the classroom has a significant impact on the motivation and success of students. That said, the emphasis on utilizing technology in the classroom and the beginning hypothesis of this action plan, individualized instruction would benefit the ELL students' academic success, was also created based upon this bias. The proposed fact that technology and individualized instruction in the classroom is beneficial to the academic success of the ELL students was a big part of how this action plan was planned, implemented, and concluded. Although there is an undeniable bias in research that students thrive in a classroom that integrates technology, the truth behind the success of full-individualized technology integration and how it applies to English language learners was discovered through the collection of quantitative and qualitative data.

Quantitative data analysis. The quantitative data collected in this action plan provided information and data as to the pathways that ELL students could successfully learn concept skills by engaging them in different individualized technology strategies. In this data, students expressed their prior knowledge on the subject, willingness to learn from and help each other, choice for a preferred way to take notes, and their thoughts on the unit.

The pre-test showed that the prior knowledge of the students was very limited. In fact, 60% of the students showed no prior knowledge at all. In addition, only three of the 30 students showed prior knowledge in interpreting stem & leaf plots. This data allowed in the acceleration of lessons that pertained to content the three students already showed mastery in. This data also showed that students were starting from scratch in their learning so they would require solid instruction. The importance of an individualized instruction strategy was proven in the pre-test

data supplied in this unit with the realization that some of the students already had knowledge in a concept that was going to be taught.

Several instructional strategies played a big role in the implementation of this individualized technology driven unit. Quantitative data such as observations and concrete examples were collected during this time. The peer discussion quantitative data presented showed how beneficial it was to allow the students to discuss specific essential questions throughout the unit. Students were able to chat and discuss questions and situations pertaining to their learning (See Appendix B). This enabled peer correction and teaching to occur prior to the completion of graded assignments. However, this learning would only have occurred if the receiving student had noticed the comments others were making about their initial comments. Teaching gives a deeper understanding than just knowing; that is why this peer discussion was so vital to the learning process for both the recipient and the contributor of the discussion. After completing some discussion posts, students were then offered options for their note-taking needs for the next step in the unit. Students were given a choice of creating vocabulary notes by utilizing an computerized, editable, Frayer model template or a traditional paper notebook Frayer model template (See Appendix C). This choice in note taking method gave students the power of choice. As a result, students were more responsible with their notes and utilized them more than normal. Because of the different instructional strategies such as peer discussions and note-taking formats, students showed engagement in their self-learning progress and became more independent as the unit progressed. From the collected quantitative data over the different instructional strategies, it can be concluded that a) power of choice in how students learn and retain information gave students a pride and responsibility in their learning and b) that there is still an importance and benefit to peer interaction for the learning of all students.

Finally, the last quantitative data collection of this unit was the student survey that was given to the experimental group. The results from the end survey showed that 85% of the students in the experimental individualized instruction group stated that they would like to do another math unit on Canvas again. This shows that students were engaged and seemed to like the computer instruction alternative. In contrast, 65% responded ‘no’ when asked if they would prefer having their math instruction without using Canvas at all. So, though most like the experience and want to do another Canvas unit, only some of the students prefer it over teacher instruction without the use of canvas. The final major take-away from the survey was that 92% of the students in the individualized instruction group enjoyed working at their own pace. This will be further discussed in the challenges of this action plan, but it was great to know that almost all of the students enjoyed working at their own pace.

Quantitative data that was collected in this action plan showed that students were more engaged and energetic about the individualized instructional unit. Students were teaching and learning from one-another, were independent and prideful in their learning, and overall preferred a self-paced instructional unit that utilizes other instructional strategies other than teacher direct-instruction. Though the quantitative data shows students prefer and are more engaged in individualized technology instruction, it did not support the hypothesis that the individualized technology instructional action plan with Canvas would benefit the ELL students’ academic success.

Qualitative data analysis. The qualitative data collected in this action plan provided information and data as to how effective the instructional strategies and other quantitative data collected was in establishing the academic success of the ELL students. The collected qualitative data in this action plan showed how much knowledge students gained due to the individualized

instructional unit at several checkpoints throughout the unit, in addition to at the conclusion of the unit.

The M&M central tendency and range activity showed that students were still in the learning process in order to correctly calculate the center and range measures of a larger set of data. During the completion of this activity, 62% of the students from the individualized learning group incorrectly calculated $\frac{1}{4}$ of the values requested. Unfortunately, because this was a class activity and all students were at different locations in the unit, half of the students did not get to participate fully in the activity. After students completed their first attempt of their M&M activity, students were given individual advice and sent back to correct their errors. As students progressed independently through the activity the second time, their work and corrections on the M&M activity showed much improvement. However, the completion of this task was not an easy one. Many students had to receive multiple copies and constant reminders/tips to help complete their task in a timelier manner.

The central tendencies and range quiz was given to determine the understanding students had on calculating central tendency measures and range. The results showed an average score of 72% for the students in the experimental group and an 84% average score for the students in the control group. Further data analysis of the central tendencies and range quiz showed that students seemed to understand the basic concepts, but struggled with applying the concepts with unit vocabulary such as outlier (See Appendix D). A calculated 91% of students in the experimental group correctly answered questions about calculating the range of a given data set. In addition, in question 6, when students were asked to identify the measure of center that was the most misleading measure for a given data set, 41% answered correctly. Ninety two percent of students could correctly identify the mode of a given data set, and an average of 84% correctly responded

to the three questions pertaining to calculating the mean of a given data set. In contrast, an average of 64% of students correctly responded to the two questions that asked them to identify the median of a given data set. The central tendency and range quiz thus, showed the progress that students were making toward their goal of calculating and understanding the measures of center and range measurements.

The final collected qualitative data for this action plan unit was the final district summative assessment. The assessment showed if students mastered the unit goals or not. In the experimental individualized learning group, students averaged 60.6%. In comparison, the control direct-instructional group averaged a 75.5% on their summative assessment test. Looking closer at the item analysis, 60% of the students in the individualized learning group missed questions pertaining to creating plots (stem and leaf, and box plots) from provided data. This data showed the difference in the progression and success of each class's action plan unit instructional strategies.

Qualitative data is a concrete numerical account of data to help show student progress in the unit goals. This particular collected data showed that students in the control group were, in general, more successful in this action plan than those in the individualized instructional group. In addition, students in the individualized instructional group performed worse (during the first attempt) than those in the control group in the M&M activity. Finally, the central tendency quiz collected as qualitative data showed that students in the individualized instructional group were making progress in their learning and understanding of the unit concepts but were struggling with particular problems on the quiz. What possible reasoning's and understandings we can take from this data is to be discussed next.

Outcome. Using the results of the collected quantitative and qualitative data, several conclusions can be stated about the success of the individualized Canvas unit action plan. First, though students enjoyed the individualized Canvas unit, it was not successful by itself in increasing student academic success. Students agreed (based on survey results) that the unit would be better with a variation of direct and indirect instruction. Second, in the individualized Canvas instruction not all students completed all of the instruction prior to the summative assessment date. This led to students not even knowing the basics of some of the unit concepts and having to take the district summative assessment, which then led to lower test scores than desired. Finally, the collected data shows that though the implementation of the individualized Canvas unit action plan heightened the engagement of the students, it did not benefit the understanding and mastery of the unit's academic goals.

Discussion

Challenges

The process of implementing a technology and individualized instructional unit into a 6th grade general mathematics classroom was researched and planned with the goal of increasing the academic success of the ELL students in the class. With any project however, some unforeseen complications arose.

Implementing technology into the classroom always brings with it a certain risks and precautions that educators must take such as taking the time to introduce/teach the proper use of the technology, management of the proper use of the technology, and a plan in case the technology fails. During this action plan when introducing and teaching the proper use of the Canvas program, most students were already knowledgeable of it. This created an opportunity for peer interaction and teaching where selected students educated peers on how to sign in and

use the Canvas program. There was little problem with the proper use of the laptops until students were left with a substitute. After being absent the rules of proper technology use for the Canvas unit was simply retaught, unfortunately some things are going to be out of the educator's hands. That being said, a week into the implementation process there was a technological difficulty with the Canvas program that lasted a couple of days. This prevented the students from continuing the online Canvas unit using technology. Fortunately, because the results of this action plan were being compared with a control group it was an easy switch to print off paper copy assignments and have students in the experimental group use them until they could access Canvas once again. Technology individualized instruction is a great way to engage students, however; like anything else, the educator would always need a backup plan on hand and a keen eye to prevent inappropriate technology use.

Another challenge that developed when implementing the individualized Canvas instruction was noted after the first two weeks of implementation. Several students (including the control section) were starting the unit project titled M&M Tendencies. In this activity project, each student received a mini M&M individual packet where they documented how many of each color of M&M they had in their pack. Then they went around, asked, and recorded how many each of their peers had of each color. Because of numbers, students were required to have a minimum of 15 numbers but could have more if desired. The issue? Students in the experimental session were in so many different places that when some started the activity there were only 3 others that they could get numbers from. This problem went on for two days, which left those students with nothing to do in class. This was a major problem that needed a solution. The solution that was used was to have students document only their numbers and then copy down the rest of their values from another class (the control session). This did its purpose, however;

did not help create and implement student interaction that was hoped for. Class activities in an individualized Canvas instruction unit need to be carefully planned and considered to ensure all students can participate as the activity as designed with specific deadlines.

The M&M activity leads into the third major challenge that was faced in the implementation of this action plan to help aid in the academic success of ELL students. Almost all of the students in the experimental sessions were falling further and further behind where they should be in the unit instruction in order to meet the summative assessment deadline. Though this unit was designed to enable students to work at their own pace (which students attested that they liked), it was apparent by the end of the third week that students were struggling with self-managing their 'next steps' in the unit. To help students hopefully get through all of their required material before the assessment in week four a visual organizer was created and posted for students to mark completed assignments and understand all the tasks that needed completed prior to the assessment deadline (See Appendix E). This was a great success and after just three days of use, most students who were behind had gotten back on track and were in the study mode for the assessment in time. This begs the question, if the assignment visual was implemented earlier how much faster would all of the students have all been ready for the assessment. It is possible that if the assignment visual was implemented earlier that students in the experimental session would have had at least an extra week to participate in station and group work review activities to help in the performance of the summative assessment.

There is to be expected challenges with any instructional implementation, but knowing and reflecting upon all of the challenges can help to strengthen the implementation of the instructional strategy the next time it is applied. This action plan individualized instructional unit was no different in that it showed several possible situations that could happen. Upon the

completion of this action plan, the hypothesis of the academic impact of an individualized Canvas technology unit plan on ELL students was answered.

Conclusion

The purpose of this action plan was to implement a research-based individualized technology unit in order to help the academic success of the ELL learners in the experimental class section. The data showed that students enjoyed the Canvas program and the individualized instruction that allowed them to work at their own pace. It was also showed, based upon the final assessment scores that students in the experimental group did not benefit academically in comparison to the control group. The data also showed that students were unprepared to self-manage all of the unit tasks that were required of them for the completion of the unit. Throughout the implementation of this action plan and based upon the data collected it can be concluded that the individualized technology Canvas unit (as it was implemented) was unsuccessful in aiding in the academic success for ELL learners.

Though the hypothesis of this action plan was proven false with the unit plan alone, there is still belief that with minor additions to the unit plan, it can still be very successful in provided students with an engaging and academically effective instructional unit. If this individualized instructional strategy were to be re-applied to the classroom instruction three simple changes would most likely highly benefit the success of the unit on the ELL learners. First, an assignment visual guide would need to be in place from the beginning of the unit in order to help students maintain self-accountability and organization in the tasks they have completed and still need to complete prior to the summative assessment. Another changed that would be implemented is a selected day in which all students would collectively participate in a planned group activity. The required knowledge for this activity would need to be 'front-loaded' prior to the activity and also

noted as an assignment needing to be completed (managed with the use of the assignment visual) before students returned to the Canvas unit. Finally, the last change that would possibly make this unit the most beneficial unit that it could be is the use of not just Canvas instruction but also group direct instruction mixed in, as requested by students in the survey.

True, the hypothesis of this unit plan did not turn out as planned. However, also true is the fact that reflection upon the collected data lead to a possible implementation of a much stronger unit plan for the next implementation of the individualized Canvas technology unit. I personally cannot wait to attempt this individualized instruction plan once again with the minor changes listed above in hopes of seeing a higher academic success rate in the ELL learners in the classroom.

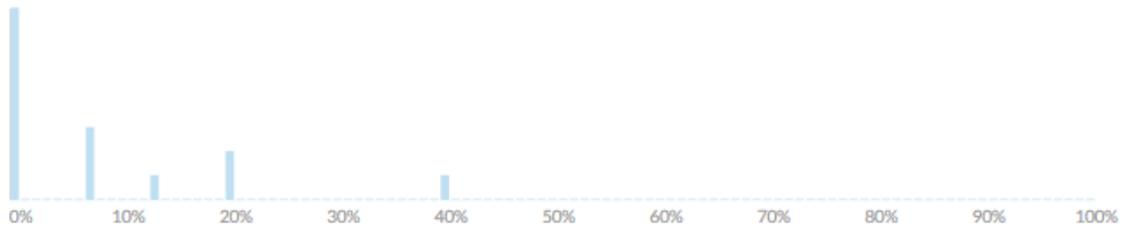
References

- Basye, D. (2016, October 23). Personalized vs. differentiated vs. individualized learning. Retrieved March 10, 2017, from <https://www.iste.org/explore/articledetail?articleid=124>
- Capella University. (July, 22, 2014). *5 reasons to incorporate technology into your classroom*. Retrieved from
- Echevarría, J., Vogt, M. E., & Short, D. (2008). *Making content comprehensible for English learners: The SIOP model*. Boston: Pearson/Allyn and Bacon.
- Instructure. (2015). *Canvas and chromebooks: Essential components of district's 1:1 initiative*. Retrieved March 10, 2017, from [https://www.canvaslms.com/case-studies/Case Study Rockingham County Schools.pdf](https://www.canvaslms.com/case-studies/Case_Study_Rockingham_County_Schools.pdf)
- Protheroe, N. (2011). *Effective instruction for english-language learners*. *Principal*, 90(3), 26-29.
- Sousa, D. A. (2011). *How the ELL brain learns*. Thousand Oaks, CA: Corwin, A SAGE Company.
- StartClass. (2017). *North middle school in sioux city, iowa*. Graphiq. Retrieved from <http://public-schools.startclass.com/1/34339/North-Middle-School>.

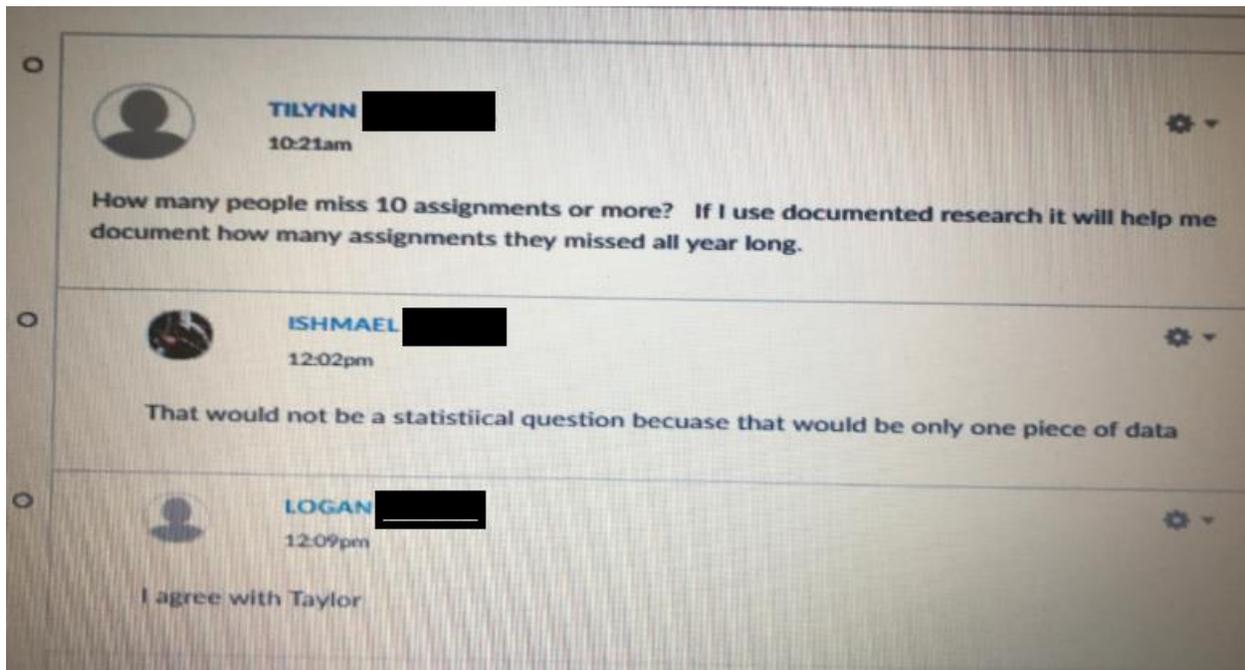
Appendix A

Student Pre-Assessment Knowledge

⌚ Average Score	📊 High Score	📉 Low Score	⊖ Standard Deviation	⌚ Average Time
8%	40%	0%	1.67	63:05:57



Appendix B
Student Discussions



Appendix C

Students Response to Variety of Instructional Strategies (Frayer Model)

<p>Definition</p> <p>*Aka: Average *A measure of center that is usually used when there is NO extreme values.</p>	<p>Steps to calculate:</p> <ol style="list-style-type: none">1. Order the numbers from least to <u>greatest</u>.2. Add up all of the numbers.3. Divide the sum by the number of numbers we added.
<p>Mean</p>	
<p>2, 3, 4, 6, 2</p> <ol style="list-style-type: none">1. 2, 2, 3, 4, 62. $2+2+3+4+6= 17$3. $17/5 = 3.4$ <p>Mea = 3.4</p>	<p>Create your own example</p>

Appendix D

Student Post-Assessment Knowledge

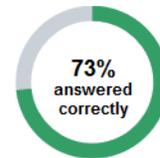
Lionel is apartment hunting. He makes a table of the cost of the apartments.

Discrimination Index ⓘ

Apartment Rental Prices	
Apartment Choice	Price per Month (\$)
A	750
B	732
C	760
D	765
E	745
F	760

Find the mean of this set of data.

4512	5 respondents	17 %	
33		0 %	
752	22 respondents	73 %	
745	3 respondents	10 %	



Attempts: 30 out of 30

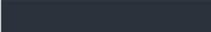
+0.29

The average age of visitors at an amusement park is recorded for several months.

Discrimination Index ⓘ

25, 30, 65, 42, 34, 22, 35

After removing the outlier from the list, find the mean of the data.

36.14	14 respondents	47 %	
31.33	9 respondents	30 %	
38.50	5 respondents	17 %	
26.86	2 respondents	7 %	

