How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

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Abstract

Students use language to communicate with one another, share their ideas, and learn. Academic language is a specialized language associated with disciplinary content. Having a strong academic language foundation provides children with opportunities to communicate as scientists, historians, and mathematicians. Often, English Language Learners (ELLs) need additional support to use and understand academic language. Past research supports that students will benefit from explicit vocabulary teaching during science instruction, increased language exposure, and collaborative group work. Research also suggests that combining inquiry-based instruction with direct and explicit vocabulary teaching will increase the ELLs' performance in academic language. This study aimed to examine how inquiry-based instruction will increase the ELLs' academic language. A sixth-grade technology cohort of 73 students participated in a STEM-based sustainability unit during the COVID-19 Global Pandemic. The students completed 10 inquiry-based lessons and a design challenge. The students were evaluated using a pre- and post- content assessment, lesson activities, and rubrics for the engineering design challenge and academic writing. The findings in this study suggest that inquiry-based instruction supports academic language growth for the ELL students.

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Introduction

The purpose of this study was to examine how inquiry-based instruction, which promotes authentic opportunities to interact with the classroom curriculum, will increase English Language Learners' (ELLs) academic language. Research demonstrates how increased opportunities to use and incorporate language into a conversation will increase the students' language abilities (Coyne & McCoach, 2009). Through increased and authentic opportunities, the children's academic language will increase (Huerta et. al, 2016). Inquiry-based design (IBD) is an instructional technique driven by student questions. The students can explore problems to take control of their own learning. This provides the ELLs with authentic opportunities to interact with grade-level curriculum. Although research shows the ELLs benefit from IBD, they still need strategies and support to meet the demands of the general education curriculum (Alecio et. al, 2012).

The students in this study were sixth-graders enrolled in technology, an engineering-based exploratory class. It was hypothesized that the students' academic language would benefit from IBD instruction and completing a design challenge. This would lead to an overall performance increase and the ability for the students to integrate academic language into their own writing.

To test the hypothesis, a sustainability unit was developed for sixth-grade technology students. The unit took place during the COVID-19 Pandemic and was taught through distance learning. The first two weeks focused on instruction and content deliverance, where hands-on and exploratory activities were integrated into distance learning instruction. The third week focused on designing and creating an eco-friendly shoe, and the fourth week focused on

developing an “advertisement” to sell the shoe, with a focus on integrating academic language. Integrating hands-on and academic language was to not only improve academic performance, but also increase the students’ ability to integrate academic language into their own writing.

Literature Review

This study was designed to demonstrate how inquiry-based instruction and an engineering design challenge will provide the ELLs with an opportunity to authentically interact with academic language. Children communicate through language and need academic language to successfully engage in the classroom curriculum. Specifically, in science classrooms, there is a learning gap between the native English speakers and the ELLs based on language demands. In science, the students need to have command of academic language, and a developed understanding of how abstract concepts and words can be combined. This study aimed to incorporate inquiry-based instruction, an engineering design challenge, and explicit vocabulary instruction to increase academic language in the ELLs to answer the research question: “How will inquiry-based instruction increase academic language for English Language Learners?”.

Academic Language

In the classroom, the children learn through language. Whether language is verbal or nonverbal, the children need language to communicate with one another, share their ideas, and learn. In school, teachers utilize both social and academic language. Social language is associated with every day and casual conversation; however, academic language is a specialized language associated with disciplinary content. Academic language provides the children with opportunities to think as scientists, historians, and mathematicians because they can integrate complex and subject-specific content into their conversations. Academic language has three

purposes; to describe complexity, higher-order thinking, and abstraction, all of which are three skills that will bring children to the next academic level. Teachers should enhance academic language comprehension and development by designing authentic opportunities for children to engage with the curriculum. This learning method has been shown to increase academic language in the ELLs. (Gottlieb & Slavit, 2014)

For the ELLs, academic vocabulary can be challenging to internalize and apply to their everyday learning. Academic language can be broken down into three tiers. Tier 1 includes basic or common everyday words, Tier 2 covers the academic language that appears across all curriculum domains, while Tier 3 language is content-specific and not part of everyday use. Teachers use direct instruction and incorporate various strategies such as teaching a word of the day, creating academic vocabulary journals, utilizing graphic organizers, as well as playing games. Making language connections and strategies while teaching will benefit the ELLs (Sibold, 2011).

One instructional delivery method is blended instruction, which meets the ELL's language needs while integrating the general education curriculum. Zweip et al, (2011) studied one district in California which implemented a blended English Language Development and Science curriculum. Fifth-grade science teachers integrated direct vocabulary instruction into science lessons. Over a two-year trial period, data were collected through lesson plans, observational notes, and teacher and principal interviews. Results indicated that when successful, blended learning is a very powerful instructional method. It provides the students with a familiar environment. The students can engage, feel comfortable, and take risks with language in an educational community.

Young children benefit from increased language exposure. Coyne & McCoach (2009) aimed to determine the most efficient method for vocabulary instruction for early childhood students. This study directly compared the extended, embedded, and incidental instructional methods for three Kindergarten classes in a suburban community. Extended instruction provides the children with more opportunities to interact with the language, embedded instruction reviews the meaning of a word during instruction, and incidental instruction glances over the meaning using context clues. There were 42 students in the three classes, and 69% identified as Hispanic, 24% as African American, and 6% as Caucasian. Utilizing the story Goldilocks, researchers identified nine Tier 2 target words which only appeared one time in the story. All the students listened to Goldilocks three times. Each time used a different condition which was paired with three target words. Data were collected through pre-and post-interview questions. Researchers questioned the children's full and partial word understandings. The children answered questions directly after reading, and one to three days after the third reading. Results indicated that prior to reading, the children had no prior knowledge during initial exposure. After reading, extended instruction produced better results. Overall, increased exposure to content-based language will benefit ELLs. Providing the children with increased opportunities to interact with the language will increase their understanding and ability to use the language in their own work.

ELLs can experience gaps in language, which can impact their academic performance across the curriculum; therefore, it is imperative to design a curriculum that will meet their language needs while still delivering engaging content to the students. Tier 3 language is found in each subject, so it is important to integrate strategic based instruction into classroom lessons. As demonstrated by past research, the children's academic language will expand through

increased exposure and language usage, so their abilities will develop during the year through authentic opportunities to interact with the academic curriculum.

Strategies for Teaching ELLs

Strategic based instruction is very effective for the ELLs, which provides the students with strategies to combine into the general education curriculum. There are many strategies that can be utilized to provide language and writing support to the students. Using strategies allows the students to feel comfortable and develop confidence in the learning environment. To guarantee science is accessible to all students, teachers must integrate ways to meet ELLs' language and academic needs. For the students to learn from one another, teachers should incorporate group work into their instruction. Students are not only held accountable, but also must interact in a social setting while integrating Tier 3 language into their conversations. Group work automatically increases collaboration between the students who might not typically work together. Teachers must explicitly teach new content vocabulary. The science curriculum has content-specific language that the ELLs might not be familiar with, so they need direct and increased exposure to be academically successful with their native-speaking peers. While planning activities, teachers should incorporate technology. There are programs that can translate the academic curriculum into a student's native language. This provides the students with direct translation to the English content and will increase their comprehension (Medina-Jerez, 2007).

Teachers can integrate visual imagery into scientific content to increase academic language for the ELLs. Visual stimulation can help children develop and utilize new academic content into their academic schema. Cohen and Johnson (2011) aimed to determine the relationship between imagery and vocabulary acquisition and retention in elementary school

students. Researchers selected 25 biology words from the Pearson Realize curriculum and administered a pre-test to 89 fifth grade students in five classes living in predominantly Caucasian communities on Long Island, New York. Based on the pre-test results, 15 of the most unfamiliar words were selected and used for the study. To determine the students' vocabulary knowledge, all the students completed the Peabody Picture Vocabulary Test-IV, Form B, and then were divided into four intervention groups. The first intervention group only included presenting the scientific word and concept to the children. The second intervention group received pictures paired with the vocabulary. The third group drew visual images on paper, while the fourth group viewed images and then created their own based on what they saw. All the students viewed the 15-selected words, heard the word in a sentence, and then participated in their respective intervention group. The students' vocabulary acquisition and retention was tested through completing cloze sentences and word matches. The students also reflected upon their learning through a survey and small group discussion. Results indicated ELLs will demonstrate language improvement over time when classroom content is presented alongside visual images. ELLs will benefit from images incorporated into content-based learning and will provide them with concrete opportunities to combine their prior knowledge with new academic language.

Through effective instructional measures, such as interactive journals and science notebooks, the ELLs will demonstrate an increase in proficiency during the year. In 2016, Huerta, Tong, Irby, and Alecio investigated language growth over time. The researchers collected science journals from 30 fifth grade students, 10 who were English Language Learners, 10 former English Language Learners, and 10 native English speakers. At the beginning, middle, and completion of the school year, the journals were evaluated using a language-based and

concept based rubric. Data indicated that academic language increased for all three student groups. The ELL students and the former ELL students experienced statistically significant results in both their academic language and conceptual concepts. Although all students experienced significant growth rates during the year, the ELLs demonstrated the largest difference from the beginning of the year to the end of the year.

Combining and integrating multiple multimodal strategies into instruction will best support the students' learning. August (2009) examined how providing the children with a "toolbelt" of strategies will best support a child's individual strengths and weaknesses. In a high needs and multilingual community, teachers in 20 fifth grade science classes implemented a new curriculum designed to support the ELLs in their classes, while the other 20 did not. The program, Project QuEST, specifically integrated strategies to benefit the ELLs. Instructional charts and hands-on materials were used in every science lesson. While teaching, teachers not only explicitly taught science vocabulary but also used visuals and graphic organizers. The students had opportunities to preview classroom material before it was taught, and were also paired with native English speakers to serve as a guide for language and academics. After nine weeks, data were collected from a vocabulary and reading passage. Regardless of language ability, the intervention curriculum produced higher academic scores than the typical classroom curriculum. Both the ELLs and the native English speakers experienced a statistically significant growth in vocabulary development. The QuEST curriculum developed a balanced science classroom, which has multiple benefits for the ELLs. The students not only viewed visuals directly related to their academic content, had explicit vocabulary instruction, but also had designated time to interact on the curriculum level with their native language peers.

When developing a classroom curriculum, it is critical to integrate strategies into the classroom activities. Visuals, verbal scaffolding, questions, journal writing, and peer interactions are all effective instructional measures for the ELLs. Exposing the students to multiple strategies will allow the student to choose a method to meet his/her individual language needs. Using strategies will increase a student's language ability, confidence, to ultimately provide a safe place to contribute to and take risks within the academic community.

Inquiry-Based Design

Question driven instruction provides the ELLs with an opportunity to interact authentically with grade-level material. Not only will academic performance increase, but the ELLs have countless opportunities to interact and learn from their peers. In Inquiry Based Design (IBD), the students are introduced to a problem. Working collaboratively, the students will investigate the problem and build on each other's ideas. While investigating, the students often read grade level or advanced literature; therefore, the ELLs need strategies and modifications to best suit their academic needs. After researching possible solutions, the students will present their findings to the class (Holbrook & Kolodner, 2000). This method provides the ELLs with peer support as well as an authentic opportunity to use academic language during class time.

IBD learning has been shown to improve scientific attitudes, processes, and overall scientific engagement. Cox, Lambeth, and Maxwell (2015) examined the effects of inquiry-based learning on the academic achievement, attitudes, and engagement in fifth-grade science students. Forty-two students from two classes completed pre- and post-tests, a student engagement checklist, and field notes. The students receiving IBD instruction achieved higher academic

scores; however, they were not statistically significant when compared to the group which received traditional instruction. The students in the IBD model classroom exhibited an increase in their science attitudes, although; the results were statistically insignificant when compared to the traditional group. Although the difference in student engagement was not statistically significant, the students were on task 16% more class time than their peers in the traditional group setting. Overall, the students in the experimental class displayed an increase in their academic achievement, attitudes, and engagement towards the science curriculum

The schools that utilize IBD instruction outperform schools not teaching with IBD. Taylor, et al. (2012) investigated the long-term effects of IBD instruction. The teachers in the target school utilized the Science Writing Heuristic approach. The ITBS, which assesses science inquiry, life science, earth/space science, and physical science, measured the students' achievement at the target school and compared the results to the average state scores. Results indicated students with learning needs in the target school, which utilized IBD, performed at least 10% higher each year than the rest of the state. Based on this study, it can be suggested that the ELLs will also benefit from IBD.

When the students are presented with consistent IBD instruction during the school year, they will maintain science process skills, concepts, and content knowledge over a sustained period. Cotabish et. al (2013) explored how participating in a yearlong engineering design program increased students' skills. The researchers analyzed science process skills from 818 program participants and 932 non-participants in grades two through five using the Scoring Rubric for Scientific Processes. The students designed a simulated controlled experiment to address a scientific question. To address science content knowledge, the students completed a

curriculum-based assessment that followed a scoring rubric. The students in second and third grade demonstrated their knowledge in weather and matter; whereas, fourth and fifth-grade students completed a short-answer writing assessment. Science concept knowledge was assessed through a curriculum-based assessment that highlighted overlying concepts in science and math. The students who participated in the program scored an average of 32% higher than those who did not. Overall, researchers found statistically significant results across all three domains: science process skills, science concepts, and science content knowledge. These results can be implicated for the ELLs since the children who participated in the program demonstrated increased language command, as supported by their writing scores.

Not only is IBD effective in increasing the students' writing abilities, but combining IBD with direct and explicit vocabulary instruction will increase the ELLs' academic performance. Lara-Alecio et. al, (2012) investigated integrating how combining direct vocabulary and reading instruction with IBD science instruction for 240 fifth grade students from low socioeconomic status will improve content level understanding for the ELLs. For science instruction, the teachers explicitly introduced new vocabulary and reviewed old vocabulary concepts during a six-week period to determine how this strategy will impact performance. Data were collected from a benchmark science test to measure scientific concepts and content, and a reading benchmark test to measure academic language acquisition. Overall, the students' performance increase in science, writing, and vocabulary under the intervention conditions. Integrating direct and explicit vocabulary instruction is both an effective instructional measure and strategy. Explicit vocabulary instruction can be implemented consistently by teachers across the curriculum to improve the ELLs' performance and close the science achievement gap.

IBD instruction should be incorporated into a classroom with a high ELL population. The students have opportunities to interact with grade-level curriculum, subject-specific academic language, and with their peers in both a formal and informal academic setting. IBD increases classroom engagement and most importantly, language abilities, therefore; IBD paired with explicit vocabulary instruction should be integrated into classroom instruction.

Engineering Design Challenge

Engineering design challenges present the children with real-life and authentic problems to solve. The children work collaboratively to design a solution to meet specific criteria presented in the problem. While solving design challenges, the ELLs are presented with real-life and authentic opportunities to engage in classroom content. Teachers predicted that design challenges will encourage the development and use of science concepts and the English language because the students can express their ideas with actions, and not just direct language. In a school with low socioeconomic status, two classes participated in a parallel design challenge in physical science. A fourth-grade class studied rocks and minerals, while a second-grade class studied soil. Both classes use specific criteria to create a wall, share their findings, and then improve their designs. Both teachers concluded that students' academic language increased from a holistic design challenge approach (de Romero et. al, 2006). The children saw the content-specific language in multiple contexts, so they developed familiarity and ownership of the language.

Through design challenges, the ELLs will learn, use, and apply specific content language to their own work. In a low socioeconomic status school district, one fifth grade classroom participated in a design challenge where they acted as NASA Engineers. The teacher noticed how the students' preliminary designs were based on their lack of prior knowledge. After

participating in the design challenge, researching information about the topic, and incorporating the content into their own work, the students possessed the language abilities to design an accurate plan and explain their work using academic language, rather than "it looks cool!" (Gerlach, 2010). Design challenges provide students with an opportunity to experience science. Through design challenges, students will build their knowledge, gain a deeper understanding, and use subject-specific academic language.

There are various ways to support and engage the ELLs in academic language. As supported by research, integrating strategic instruction to IBD and an engineering design challenge should allow children to develop, use, and apply, their academic language. Using visual aids, direct and explicit vocabulary instruction, and the IBD model for instruction, children will incorporate the academic language into their own work.

Method

Research Question

Past research has demonstrated the benefits of direct vocabulary instruction into inquiry-based instruction and engineering design challenges in improving the ELLs ability to use academic language. The present study was conducted to answer the question, "How will inquiry-based instruction increase academic language for English Language Learners?"

Setting

The students in this study attend a suburban elementary school that is located one hour outside a major metropolitan city. Many of the students in this district belong to a lower socioeconomic status, while 87% of students are eligible for free or reduced lunch. Most of the students who attend this district are Hispanic or Latino (73%), 24% are African American, 2%

are Caucasian, and 1% are Asian American. This school houses approximately 1,110 students in sixth, seventh, and eighth grade, with a student-teacher ratio of 13:1.

Two hundred and forty-nine sixth grade technology students, from 10 different technology sections, participated in this study. Of the 249 students, 81 are eligible for English Language services and 1 student has an IEP. While in school, the class meets for 45 minutes on an alternating day schedule. During the COVID-19 Pandemic, learning moved online. Each week, the students completed three lessons and two assignments. The students had the opportunity to participate in two forty-minute-long google meet sessions to review and discuss learning material. While at home, the students communicated through google classroom, virtual online sessions, remind, or google voice text messages. The students independently completed the activities and assignments at home. The students received individual feedback on all digital assignments.

Description of Unit

The technology unit (Appendix A) that was developed for this research consisted of 10 online lessons (Appendix B), each highlighting hands-on STEM learning while following the engineering design process. The lessons addressed the concepts of sustainability, recycling, waste, qualities of shoes, characteristics of shoes, and parts of shoes. To culminate the unit, the students created prototypes of their own shoe and then wrote an “Instagram advertisement” to incorporate academic language into their own work. In the design challenge (Appendix C), the students had to follow certain specifications and constraints to ensure the application of the concepts addressed in the unit.

Data Collection

Pre-and post-tests (Appendix D) were administered before the start of the unit and again after the unit to measure academic performance in environmental and engineering design concepts. Before the start of the unit, 153 of 249 total students completed the pre-test measuring their academic knowledge of environmental concepts, such as sustainability, and shoe vocabulary, such as outsole, midsole, and upper. For seven of the lessons, the objectives were measured using a combination of various assessments, such as writing journals, multiple-choice questions, and video responses. The final three lessons consisted of planning, designing, and writing the design challenge. The students' knowledge of environmental and shoe language was reassessed using the written portion of the design challenge and academic post-test.

Results

The students were assessed in various ways throughout the unit. The students completed three major assessments during the unit. First, the students completed the pre-test. This was a ten-question assessment that was used to assess Tier 3 academic vocabulary knowledge. The students selected the word they felt best completed the sentence. After the unit, the students were administered the identical post-test. The second major assessment was the engineering design challenge. This engineering design challenge had two parts; the shoe design and academic writing. The first rubric assessed the student's final designs, and characteristics the designs included. This rubric was a checklist for the students. The students received one point for each category if they included the corresponding feature in their final design. If the feature was not in their final design, the student received zero points. The students could receive a maximum of 10 points for this rubric. The second rubric assessed the students' academic writing and their ability

to incorporate the academic language into their own writing. There were five categories included on this rubric, and the students could have earned two, one, or zero points for each category. The students could receive a maximum of ten points on this rubric.

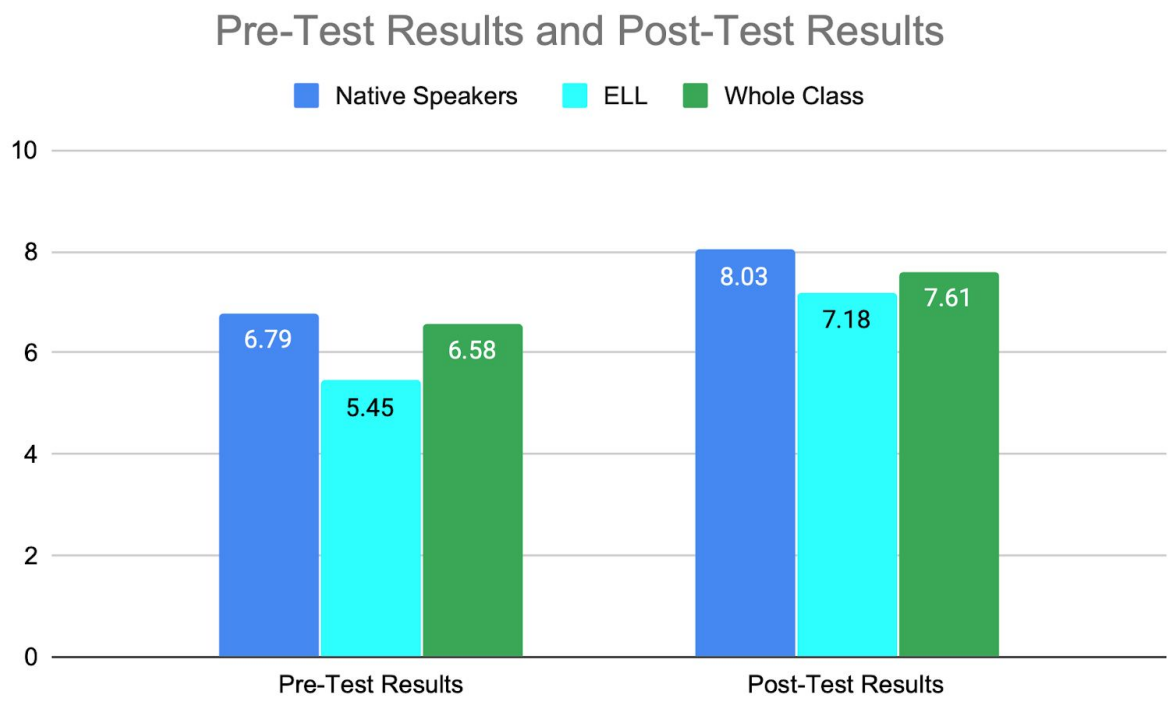
Data were analyzed from the pre- and post- content assessment. Each question in the pre-test was worth one point. The students could have scored a maximum of ten points on the pre-test and post-test. In total, 73 students completed the entirety of the design challenge, so their results were included in this study. Another 97 students completed various activities throughout the unit but were not included in data analysis.

As supported by the data in Figure 1, the students scored an average of 6.58 out of 10 points on the pre-test, while the students earned an average of 7.61 out of 10 points on the post-test. The class average increased by an average of 1.03 points, which demonstrated an increased understanding of the academic language.

The ELLs also experienced an increase in performance from pre- to post-test. Of the 83 ELLs in the 10 technology sections, 11 students reported data during online learning. The ELL students scored an average of 5.45 out of 10 points on the pre-test, but earned 7.18 points on the post-test; experiencing an average of 1.73-point increase. This suggests the ELL students experienced language growth during the unit.

The native English speaking students also experienced growth from the pre-test to the post-test. They averaged 6.79 out of 10 points on the pre-test, and 8.03 out of 10 points on the post-test, so their overall scores increased by an average of 1.24 points. This suggests the native English speakers also experienced an increase in their academic vocabulary.

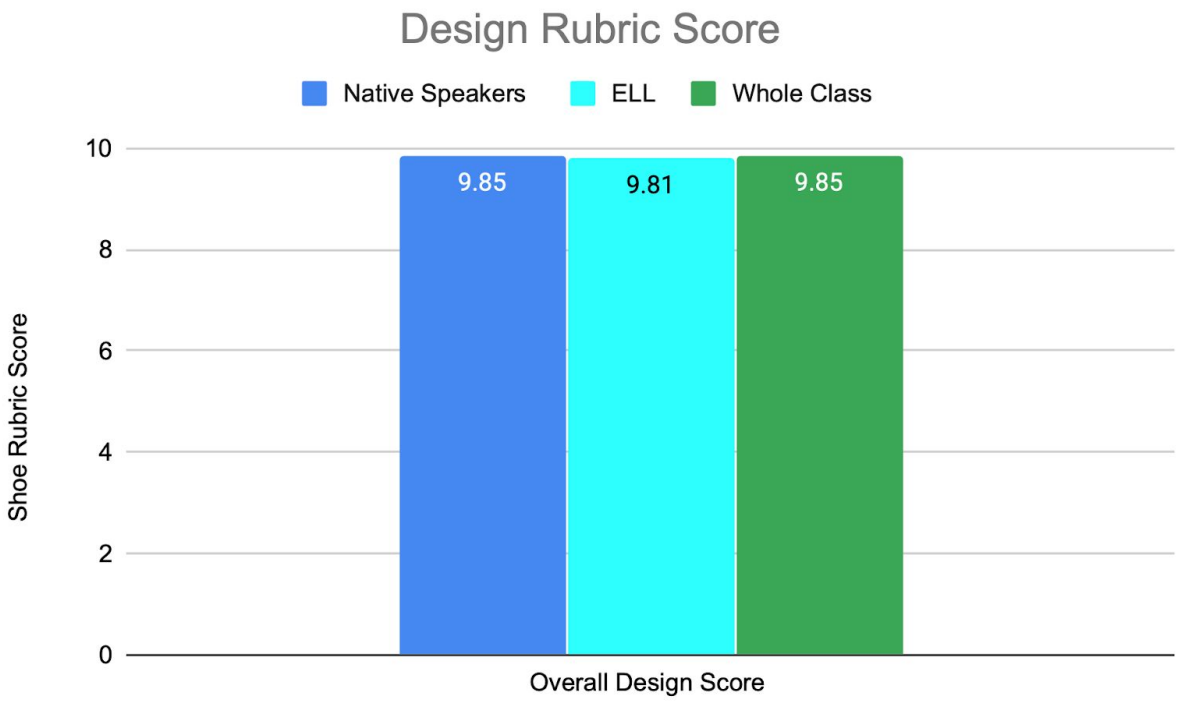
Figure 1 Pre-Test Results and Post-Test Results



How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

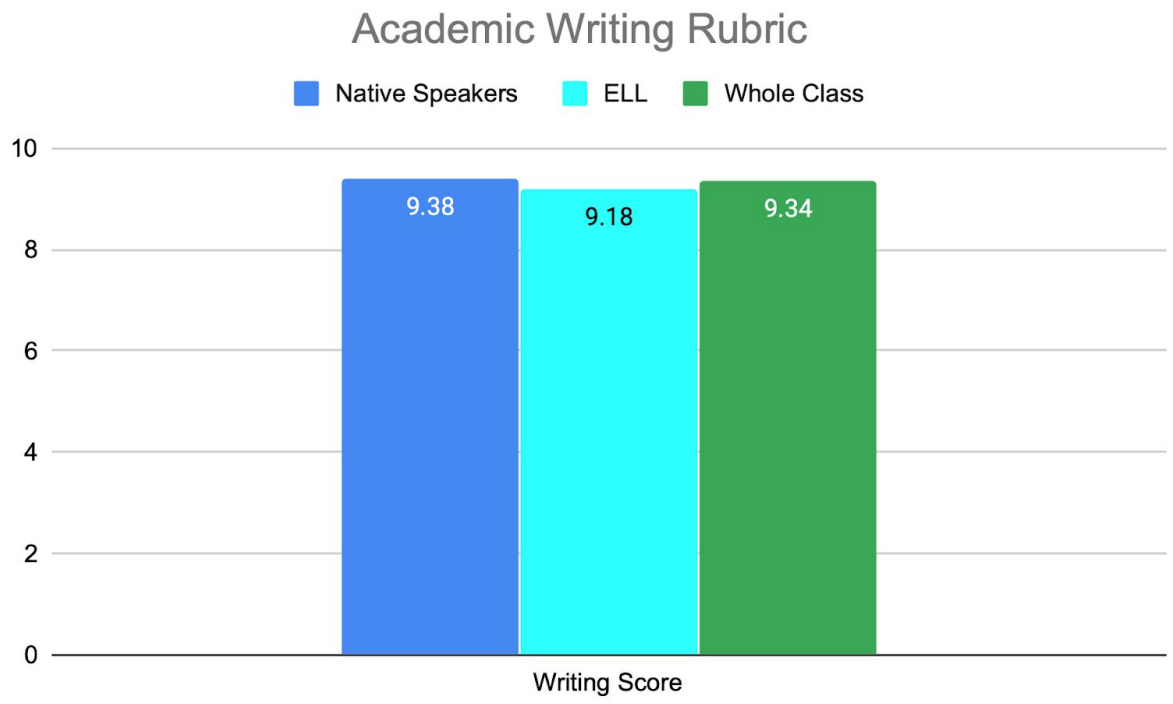
In the design challenge (Figure 2), the students demonstrated a clear understanding of what their designs should include. On this rubric, the students received a checklist that included features to be included in their designs. The students earned points for the features they included in their design, using recyclable materials, and creating a shoe that would fit on their own foot. The entire class earned an average score of 9.85 out of 10 possible points, the native English speakers earned an average score of 9.85 out of 10 points, and the ELL students earned 9.81 out of 10 points. All average scores are comparable to each other.

Figure 2 Overall Design Rubric Score



As supported by the results in Figure 3, the students' performance varied in the writing component of the design. Before writing, the students received a model paragraph and a rubric. The rubric had five categories, and the students could earn two points for each category. The rubric covered sixth-grade writing expectations, writing stamina, academic vocabulary, and descriptive writing. The students earned a maximum of two points per category, with a maximum score of 10 points. Like the design challenge, final writing scores were very similar. The ELL students earned an average of 9.18 out of 10 points, the native English speakers earned an average of 9.38 out of 10 points, and the whole class scored an average of 9.34 points.

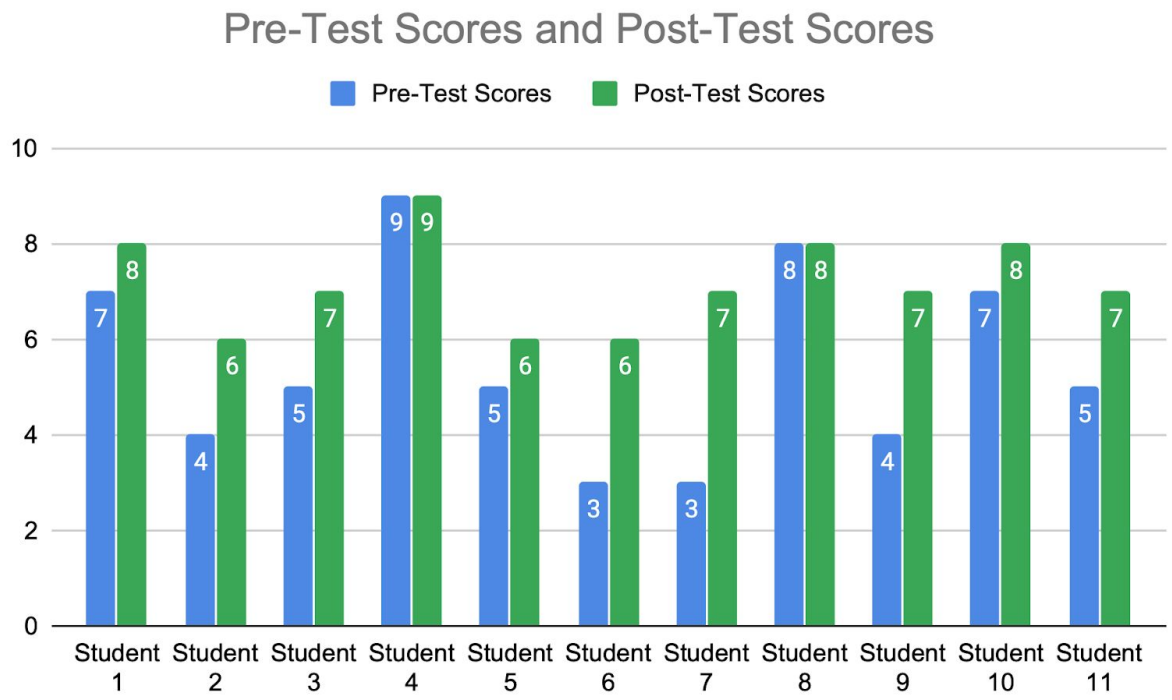
Figure 3 Academic Writing Rubric



How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

When looking specifically at the ELLs' pre-test and post-test scores in Figure 4, all student scores either increased, or remained the same. 9 out of 11 students all increased their scores by at least one point, suggesting that the students developed an increased understanding of the meaning of academic vocabulary words. Both Student 4 and Student 8 saw no growth between the pre-test and the post-test, however; the students already had high scores, so they would not experience as much growth. Student 7 had the largest growth (+4 words), and Student 6 and Student 9 both scored 3 points higher than their pre-test scores. All other students' scores increased by 1 or 2 points. This suggests the students developed a greater understanding of the academic language discussed during the unit.

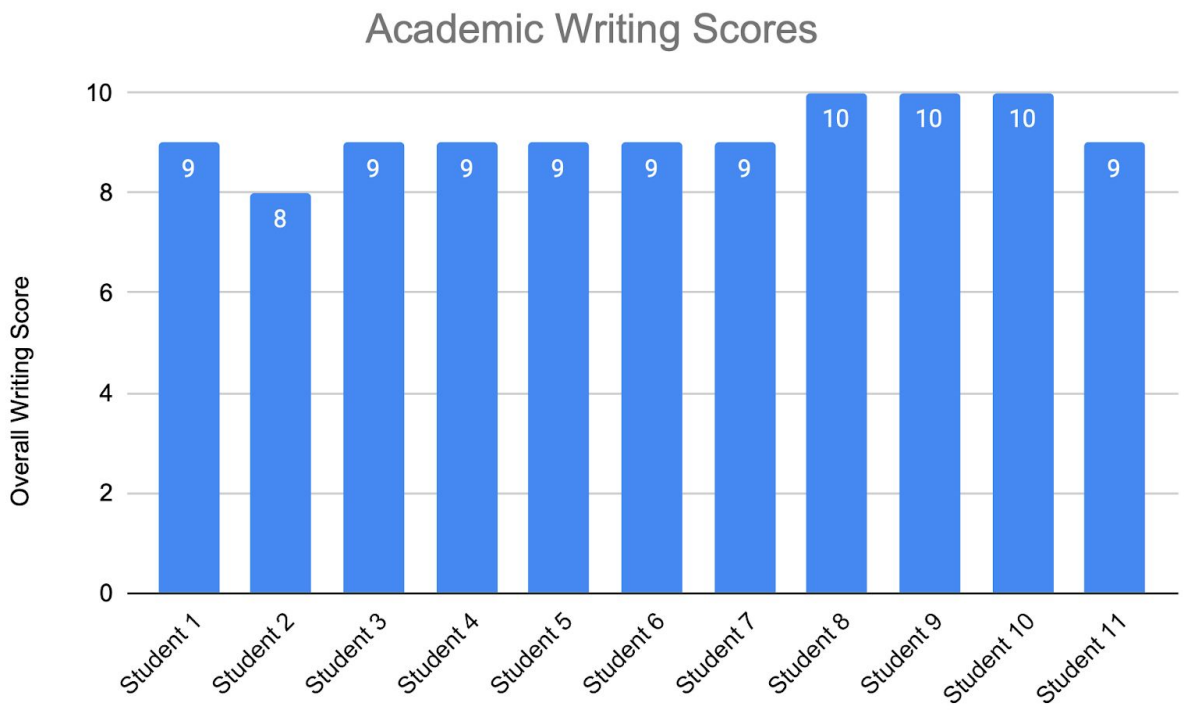
Figure 4 Pre-Test Scores and Post-Test Scores



How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

As supported by the data in Figure 5, the ELL students successfully applied the academic language into their writing. Three students scored a maximum of 10 points, seven students scored a 9 out of 10 possible points, and one student scored 8 out of 10 possible points. The students' overall scores were very close to the average score of the whole class, suggesting the the students' performance is similar to the rest of their peers.

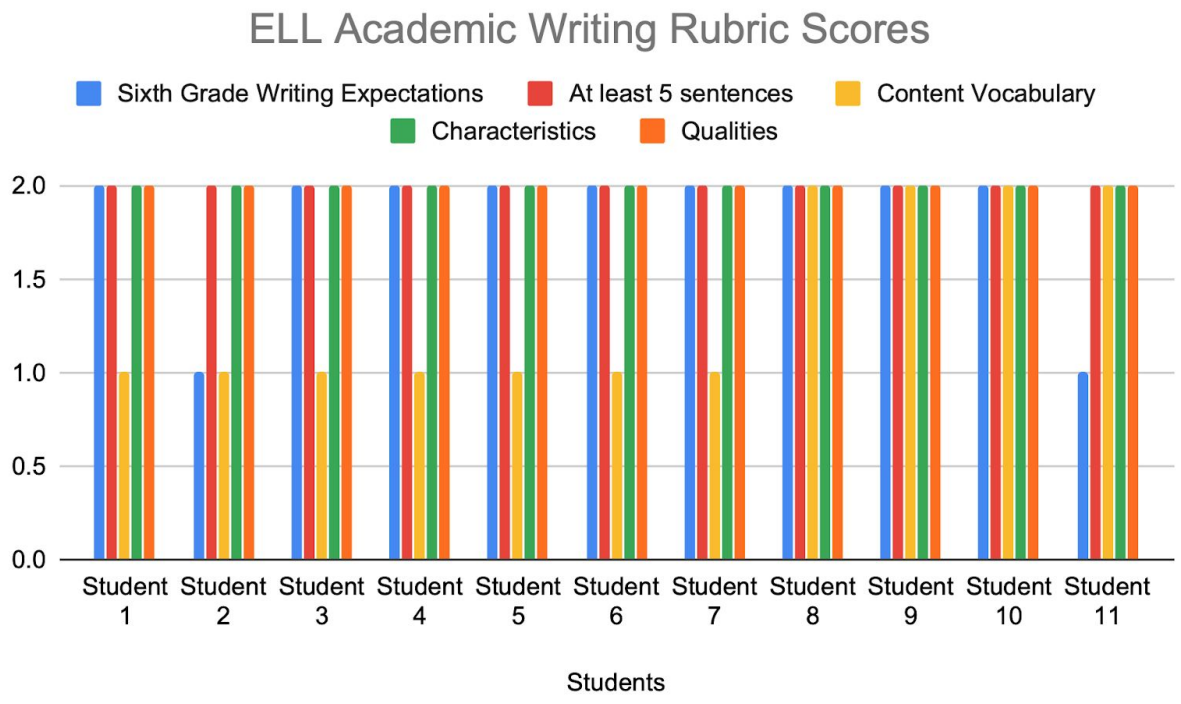
Figure 5 Academic Writing Scores



How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

When breaking down the ELLs' relative strengths in Figure 6, it is evident they demonstrate a relative strength in writing stamina and descriptive language. The data suggests that the students have a relative weakness in applying their academic vocabulary to their own writing. Ten out of eleven students earned full credit for sixth-grade level writing expectations. All eleven students wrote at least five sentences and described the characteristics and qualities of their designs. Despite success in the other rubric categories, only four students earned the maximum points for academic language, suggesting this skill is a relative weakness for the ELL students.

Figure 6 ELL Academic Writing Rubric Scores



How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

When comparing post-test scores to writing scores in Figure 7, it is apparent that the students' can incorporate words they know into their writing, but are not aware of the meaning of all ten academic vocabulary words. All 11 students performed a minimum of 1 point better on their writing than they did on the post-test. On the post-test, the ELL students scored an average of 7.18 out of 10 points, but an average of 9.18 out of 10 points on the writing rubric. This suggests that the ELL students have stronger overall writing skills.

Figure 7 Comparing ELL Post-Test Scores to Academic Writing

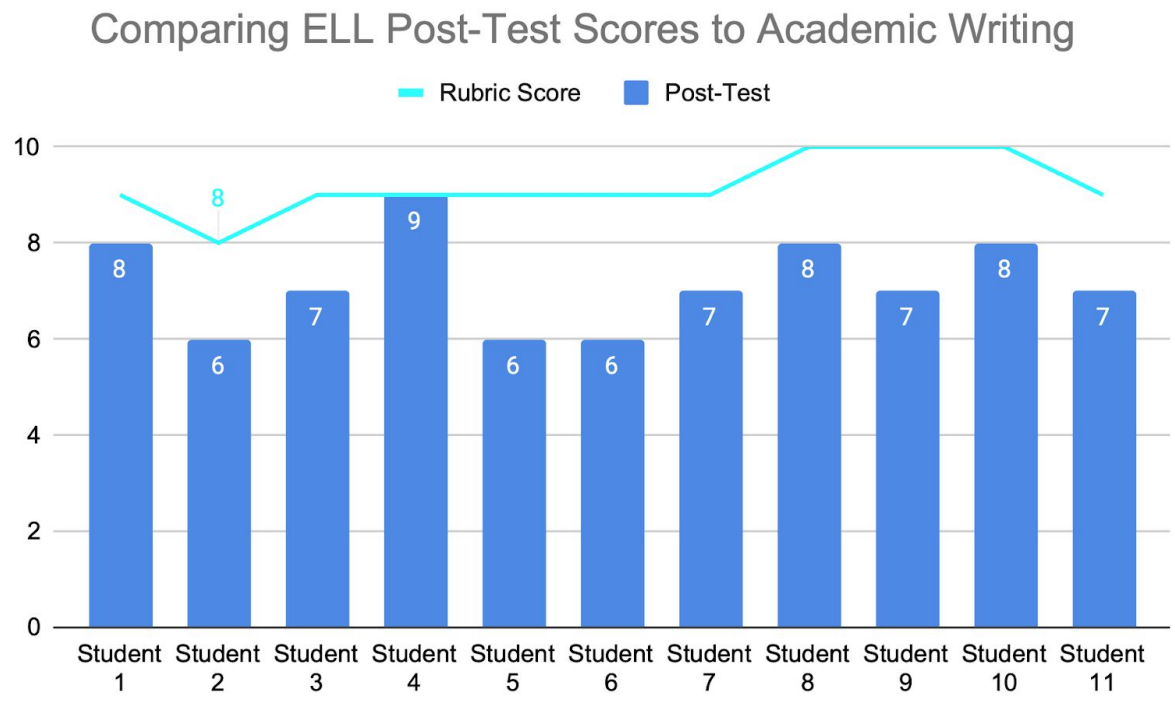
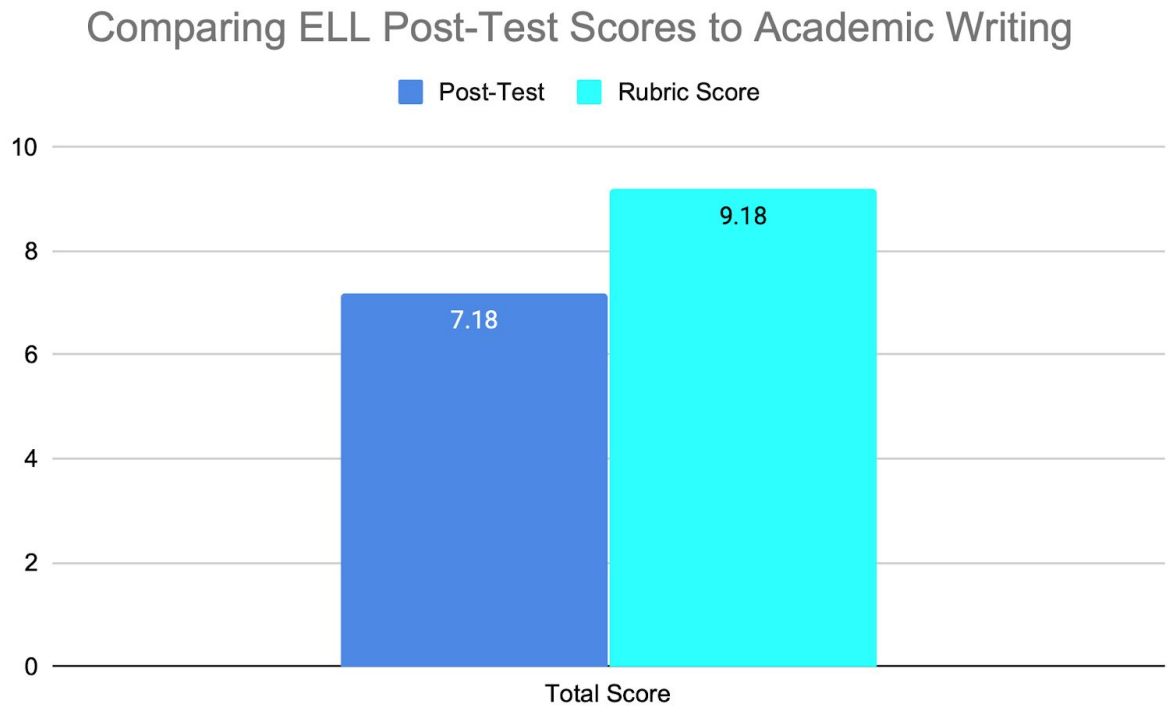
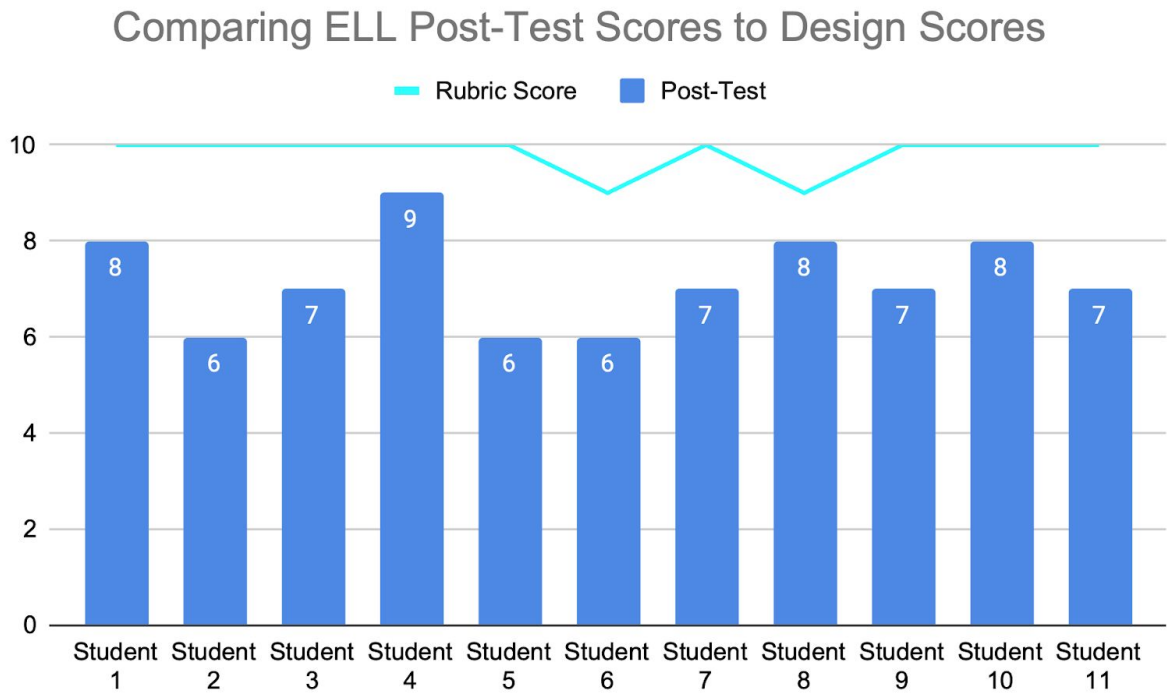


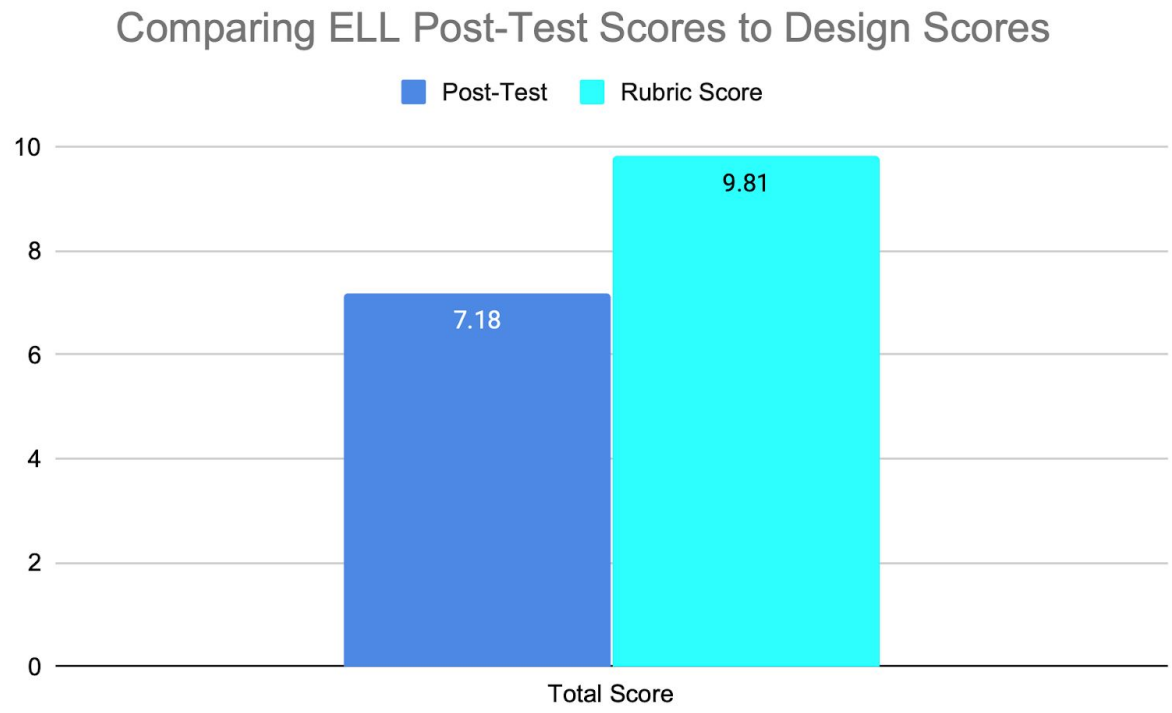
Figure 7 Comparing ELL Post-Test Scores to Academic Writing, continued



When comparing the post-test scores to shoe building scores in Figure 8, it is evident the children's ability to apply academic language into their engineering design is much higher than their ability to integrate their ideas into writing. The students scored an average of 9.81 out of 10 points on the engineering design challenge, but 7.18 out of 10 points on the post-test. Individually, each student performed better while building or drawing their shoe than on the post-test, suggesting building is a relative strength for the ELL students.

Figure 8 Comparing ELL Post-Test Scores to Design Scores





Overall, the results support that inquiry-based instruction and design challenges will improve the academic language abilities of the ELL students. As indicated by the results, all students experienced language growth throughout the unit.

Discussion

The improvement in the academic performance scores indicates that inquiry-based instruction and a design challenge can be successful in developing academic vocabulary in the ELL students. When the ELL students can participate in authentic experiences while learning, they are able to internalize, understand, and apply their content-specific academic vocabulary. The results presented in this study indicate that using inquiry-based instruction and a design challenge approach provides the children with opportunities to develop their academic language and apply the language to their own work. Although this study was completed during online learning, it is probable that the results will be similar in a typical classroom setting.

It is important to discuss that all eleven ELL students incorporated at least two academic vocabulary words into their writing. This demonstrates they had developed enough of an understanding of the vocabulary word to include the word in their own writing. Although academic vocabulary is a relative weakness for the ELL students, they successfully used two words in their own writing. All students performed better on the writing component of the assignment than on the academic post-test. It is important to point out that sometimes, the students type using the voice to type feature on their devices. This can suggest why the academic writing scores are much higher than the academic post-test scores for ELL students. The students can feel more comfortable integrating the language into their dialect rather than their writing.

The ELLs will benefit from including visuals into direct instruction. Cohen and Johnson, (2012) demonstrated how fifth-grade students will benefit from including visuals while teaching academic content, and specifically academic vocabulary. Through online instruction, it is critical to provide visuals for all students. In each online learning lesson, the students had the opportunity to interact with videos, diagrams, and models. The visuals in each lesson can contribute to an increase in academic performance in the content post-test and integrating academic vocabulary into the students' writing.

Despite having more access to visuals, it is apparent to point out that it is very challenging to provide explicit and direct vocabulary instruction in an online learning environment. Researchers Zweip, et. al, (2011) suggest that academic vocabulary must be incorporated into science instruction. Lara-Alecio, et. al, (2012) also recommend explicitly teaching academic vocabulary words into inquiry-based science instruction. Academic vocabulary was seen throughout the lessons, and incorporated into every morning message posted to the google classroom stream. It is critical to point out that even though the words were posted and described on the google classroom stream, assignments, classwork, and during google meets, the students may not have all spent enough time interacting with the language; suggesting the importance of in-person and direct vocabulary instruction.

As supported by the students' work samples (Appendix E), it is evident they carefully planned, critically thought through, and problem solved while creating their designs. Normally, the students would have been working in collaborative groups, but instead had to complete the work independently from their peers. The students used materials they found in their house. One student even cut up an old pair of jeans to use for her design. The students were innovative,

creative, and truly demonstrated the qualities of true engineers while working. Despite facing these challenges, their designs were impressive.

It was not surprising to find that all the ELL students displayed higher scores on their designs than on their academic performance and academic writing. The design challenge was a hands-on activity and forced the students to interact in an authentic way with the academic vocabulary. Allowing the students to display their knowledge of academic vocabulary through planning and designing their shoes encouraged the student to engage with their design and not their computer. Throughout the design, the children's questions differed in google classroom than during the unit. The students asked questions such as, "What do you think about my idea?" "What do you think would work better?" "Can I make two shoes?". Prior to the design challenge, students asked questions such as, "I don't understand what to do." "Can you help me?", and "Do I have to do this?". This online dialogue demonstrates the children's engagement in the design challenge. As supported by their online conversation, the students were more engaged and motivated to complete their shoe design than the other lesson activities. This project-based assessment is engaging and motivating to the students, and very different from what the students were experiencing in their other online classes. Through creating their shoe, the students had the ability to showcase their skills at a much higher level than on a google form academic test.

As supported by de Romero (2006) and Gerlach (2010), engaging in an engineering design challenge will expose children to academic vocabulary in an authentic setting. Through collaborative group work, the students interact with one another and must discuss their projects. This reinforces content and academic vocabulary in an informal setting. It is probable that students completed their design challenges with a family member. While completing the project,

it can be assumed the students used the academic language in their conversation. This can suggest that there is not only a correlation between hands-on and conversation integrated design challenges, but they could be attributed to the students' increased post-test academic stores.

A limitation that could have prevented further growth in academic language is the notion that this learning segment took place during the COVID-19 Pandemic. Although the students demonstrated an increase in their abilities, they did not demonstrate mastery of all ten academic vocabulary words, or the ability to integrate at least three words into their own writing. Rather than working in collaborative groups, the children worked independently on their own electronic devices. Many students are working from Chromebooks, iPads, Tablets, or cell-phones. The students may have experienced frustration with their devices, inconsistent internet access, or were even possibly sharing a device with other family members. This inconsistent way of working certainly could have affected the children's academic progress and engagement during the unit.

Teacher reflection journals (Appendix F) note that the students were challenged by working independently. Lessons that typically would have taken one class period were broken down into smaller tasks with concrete goals. The students were not only playing the role of the student, but also the teacher. The students were provided with step-by-step directions, modified instructions, scaffolded activities, and received various google classroom messages of encouragement throughout the unit. Despite many modifications, it is challenging to maintain full classroom engagement. Had this unit been completed in school, the students would have been engaged daily with their peers, motivated by each other, and provided with direct teacher support and differentiation to best meet their needs.

As supported by research, the ELL students can learn from other students when working in collaborative groups. Researchers August et. al, (2009) implemented the project QuEST, which integrated explicit vocabulary instruction, visuals, and group work into science instruction. Working in collaborative learning groups provides the ELLs with an opportunity to learn and develop their language from their classmates. Unfortunately, working from an electronic device eliminates any kind of person to person language interactions, suggesting it is very challenging to develop academic language through lack of in-person conversation. This can attribute to the minimal increase in academic post-test scores.

Overall, the study results suggest the overwhelming importance of in-person instruction. The students must interact with their peers to benefit not only their academic but socio-emotional learning as well. The results can also suggest that teachers should rethink how they administer exams. Instead of traditional pen and paper exams, hands-on exams can be a more accurate representation of a student's abilities and knowledge.

Conclusion

The findings in this study suggest that inquiry-based instruction and design challenges will help improve academic language for the ELL students. When provided with engaging and authentic ways to interact with academic vocabulary, the students' ability to not only understand, but apply their knowledge of academic vocabulary into their own writing increased. The students should have ample opportunities to use academic language when interacting with their peers. Despite the overlying challenges presented from the COVID-19 Pandemic, the students remained engaged in the inquiry-based lessons, created their designs, and applied their knowledge to incorporate academic vocabulary into their own writing. In the future, educators can develop and evaluate content related design challenges to have a better understanding of the ELLs' abilities in the classroom.

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Appendix A Unit Plan

Lesson 1: Shoe Design

Learning Target: Learning Objectives:	"I can use specifications and constraints to help me make sense of a problem." *Students will be able to:* ● define a problem. ● use details from a reading and video to describe specifications and constraints. ● create 3 specifications and 3 constraints based on the context of the problem.
Standards	<u>Technology:</u> ● Engineering design is an iterative process involving *modeling* and *optimization* used to develop technological solutions to problems with given constraints. <u>NGSS:</u> ● *MS-ETS1-1:* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ● *ESS3-3:* Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. <u>English Language Arts:</u> ● *CCSS.ELA-LITERACY.RST.6-8.1:* Cite specific textual evidence to support analysis of science and technical texts. ● *CCSS.ELA-LITERACY.RST.6-2.2:* Determine the central ideas of conclusions of a text; provide an accurate summary of the text distinct from prior knowledge of opinions.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Key Vocabulary	● specifications (especificaciones)- characteristics a solution MUST include ● constraints (restricciones)- different things that can limit a solution ● problem (problema)- what an engineer needs to solve ● solution (solución)- how an engineer will solve a problem
Do Now/Motivation	● The students will be asked to read the Adidas publication.
Activities	● The publication will describe the problem, specifications, and constraints of the project. ● The students will respond to a google classroom question ○ "What is the problem you are trying to solve?" ○ "What are the specifications for this design?" ○ "What are the constraints?". ● The students will read their "design contract" which will describe how they will act and communicate when working online. The students will electronically sign the form.
Modifications/Accommodations for SWDs and ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.
Pivotal/Essential Question	How can we use specifications and constraints to help us make sense of a problem?

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Check for Understanding with Targeted Feedback ● How do you plan to check for understanding throughout the activity? ● What questions will you ask as you check in with students? ● How will you use the success criteria to give targeted feedback?	● Through reading the student responses on google classroom, I will have the opportunity to provide each student with individualized feedback. Based on student responses, I will clarify and check for understanding. Students will be asked questions such as, ○ "What is something your shoe MUST do to be successful?" ○ "What are some things that will limit your solution?" ○ "What is "Adidas asking you to solve?" ● I will use the rubric to give targeted feedback by scaffolding the children's discussion responses to meet the academic expectations.
Success Criteria/Rubric	For this lesson, students will be awarded points based on their responses. All student responses will be based on the video and reading. Students will 1 point per response, for a total of six points. 1 point for identifying the problem, 1 point for each specification, and 1 point for each constraint.
Lesson Summary	1. The students will read the "ADIDAS Proposal" 2. The students will determine the problem they have to solve. 3. The students will determine the specifications and constraints for the design they will be creating during the unit. 4. The students will sign the "design contract"

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Lesson 2: Recycling and Sustainable Materials

Learning Target: Learning Objectives:	● "I can describe how using sustainable resources can reduce humans' impact on the environment." *Students will be able to:* ● identify sustainable/recycled materials. ● describe why resources are considered sustainable. ● determine which materials can be used in their own homes to create their shoe.
Standards	<u>Technology:</u> ● Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological processes change energy, information, and materials resources into more useful forms. ● Technology can have positive and negative impacts on individuals, society, and the environment and humans have the capability and responsibility to constrain or promote technological development. <u>NGSS:</u> ● *ESS3-3:* Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. <u>English Language Arts:</u> ● *CCSS.ELA-LITERACY.RST.6-8.1:* Cite specific textual evidence to support analysis of science and technical texts. ● *CCSS.ELA-LITERACY.RST.6-2.2:* Determine the central ideas of conclusions of a text; provide an accurate summary of the text distinct from prior knowledge of opinions.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Key Vocabulary	• sustainable (sostenible)- materials that meet our needs today and can be used over time • environment (medio ambiente)- the area where people, animals, and plants interact with each other • recyclable (reciclable)- materials that can be broken down into other materials • resources (recursos)- different things in the environment which can be used to make products
Do Now/Motivation	• The students will watch the Tech Insider Video https://www.youtube.com/watch?v=pJBRqespiOA which explains how Adidas transforms plastic ocean waste into new shoes and jerseys.
Activities	• The students will read (and annotate if their technology allows) the newsELA article: *Is it possible to make no waste?* • The students will respond to a 3-2-1 post. Using information from both the Tech Insider video and newsELA article, students will write 3 facts they didn't know, 2 ideas they find interesting, and write 1 higher order thinking question they have. • The next day, the students will respond to the journal reflection questions.
Modifications/Accommodations for SWDs and ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students will have the opportunity to ask questions directly on google classroom. In addition, the newsELA article can also be accessed in Spanish as well.
Pivotal/Essential Question	How can using sustainable materials help us reduce our ecological impact?

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Check for Understanding with Targeted Feedback ● How do you plan to check for understanding throughout the activity? ● What questions will you ask as you check in with students? ● How will you use the success criteria to give targeted feedback?	● Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning. ● As I check in with students, I will ask questions such as: ○ "Why is that material sustainable?" ○ "How can we use it over time?" ○ "Why are some materials sustainable while others are not?" ○ "Why is it important to use sustainable materials? ● I will use the rubric to provide targeted feedback by scaffolding the children's responses to meet the academic expectations.
Success Criteria/Rubric	Students will be encouraged to use details from the article and video in their journal response. Student journal response will be graded using a rubric.
Lesson Summary	1. The students will watch the Business Insider Adidas video. 2. The students will read the newsELA article. 3. The students will complete a 3-2-1 4. The students will respond to the journal reflection questions.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Activity 3: Shoe Qualities

Learning Target: Learning Objectives:	● "I can choose two qualities that are important to me when buying sneakers ." *Students will be able to:* ● describe the appearance of a sneaker. ● identify the characteristics of a "good" shoe. ● evaluate a shoe based on its characteristics.
Standards	<u>Technology:</u> ● Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems. <u>NGSS:</u> ● *MS-ETS1-3:* Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. <u>English Language Arts:</u> ● *CCSS.ELA-LITERACY.SL.6.2:* Interpret information presented in diverse media and formats (e.g. visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
Key Vocabulary	● quality (cualidad)- specific characteristic a product will have ● evaluate- determine if something is "good" based on its qualities
Do Now/Motivation	● The students will watch the youtube video, *History of Sneakers in 60 Seconds* https://www.youtube.com/watch?v=1l8Vs7BR3ZQ

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Activities	● The students will describe the qualities they like in their favorite pair of shoes. ● The students will go on a "shoe"vanger hunt around their house. They will have to find and describe the characteristics of at least two pairs of shoes. While on the scavenger hunt, students will respond to the questions: ○ "What does this shoe look like?" ○ " Why do you like wearing it?" ● Based on their scavenger hunt, students will either respond via Flipgrid, or in writing to Journal 2.
Modifications/Accommodations for SWDs ad ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.
Pivotal/Essential Question	What qualities are important to me when buying new shoes?
Check for Understanding with Targeted Feedback ● How do you plan to check for understanding throughout the activity? ● What questions will you ask as you check in with students? ● How will you use the success criteria to give targeted feedback?	● Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning. ● As I check in with the students, I will ask questions such as: ○ "What do you look for when buying a shoe?" ○ "Why do you like certain shoes over other shoes?" ○ "Can you use more specific language to describe your shoe?". ● I will use the rubric to provide the children with targeted feedback which will scaffold their responses to meet academic expectations.
Success Criteria/Rubric	The students will be graded using a rubric. The students will need to describe each pair of shoe with at least two qualities. Then, the students will also need to demonstrate sixth grade grammar and language expectations.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Lesson Summary	1. The students will watch the youtube video *History of Sneakers in 60 Seconds*. 2. The students will go on a "shoe"vanger hunt around their house. They will describe the characteristics of 2 pairs of shoes and evaluate why the shoe is "good" or "bad". 3. The students will respond through Flipgrid or Journal 2 reflection questions.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Lesson 3: Parts of a Shoe

Learning Target: Learning Objectives:	● "I can describe how the different shoe parts hold my foot in place." *Students will be able to:* ● identify the parts of the shoe. ● describe the parts of the shoe. ● explain why each part is important to the overall shoe.
Standards	<u>Technology:</u> ● Technology can have positive and negative impacts on individuals, society, and the environment and humans have the capability and responsibility to constrain or promote technological development. <u>NGSS:</u> ● *MS-ETS-1-3:* Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better solution to better meet the criteria for success. <u>English Language Arts:</u> ● *CCSS.ELA-LITERACY.SL.6.2:* Interpret information presented in diverse media and formats (e.g. visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
Key Vocabulary	● outsole (suela exterior)- comes in contact with the ground ● midsole (entresuela) - absorbs shock from the ground ● upper (superior) - top part of the shoe, has the tongue and laces ● tongue (lengua) - holds the laces in place ● laces (cordones) - hold the foot in place

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Do Now/Motivation	● The students will be invited to watch the commercial *ASICS Gel Technology Video.* The students will look at the special features of the gel technology and how it correlates to how the shoe is used.
Activities	● The students will look at the labeled Asics shoe. ● Using one of the same shoes they analyzed in Activity 3, students will label the outsole, midsole, upper, tongue, and laces of their own shoe. ● The students will respond to the reflection questions in Journal 3.
Modifications/Accommodations for SWDs ad ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.
Pivotal/Essential Question	How do the parts of the shoe hold my foot in place?
Check for Understanding with Targeted Feedback ● How do you plan to check for understanding throughout the activity? ● What questions will you ask as you check in with students? ● How will you use the success criteria to give targeted feedback?	● Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning. ● As I check in with students, I will ask questions such as: ○ "Which material helps the sneaker to be comfortable when you are walking or running? Why? ○ "Why are some materials better to use than others?" ● I will use the success criteria to give targeted feedback. Students will be encouraged to write in complete sentences and provide a realistic material for each part of the shoe.
Success Criteria/Rubric	The student work will be graded using a rubric. Students will need to write in complete sentences, and provide an

	example of a realistic material for each of the parts of the shoe.
Lesson Summary	1. The students will watch the *Asics Gel Technology* commercial. 2. The students will look at the diagram of the Asics sneaker. 3. The students will label the outsole, midsole, upper, tongue, and shoelaces on their own shoe. 4. The students will determine what materials will represent each part of the shoe.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Lesson 4: Begin with the End in Mind

Learning Target: Learning Objectives:	● "I can begin with the end in mind and develop a plan for creating my shoe." *Students will be able to:* ● label a diagram using academic language ● incorporate prior knowledge into a design ● create a plan to follow while they will be creating their shoe.
Standards	<u>Technology:</u> ● Engineering design is an iterative process involving *modeling* and *optimization* used to develop technological solutions to problems within given constraints. <u>NGSS:</u> ● *MS-ETS1-1:* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. <u>Language Arts:</u> ● Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flow chart, diagram, model, graph, or table)
Key Vocabulary	● specifications- what the design MUST do ● constraints- what LIMITS the design solution ● plan- an idea or process to follow for creating a project ● design- solution
Do Now/Motivation	● Today, the students will complete the *planning sheet*.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Activities	● The students will be asked, “What characteristics must your design include to be successful? ● The students will be asked, “What characteristics are important to include in your shoe?” ● The students will determine which materials they are planning to use to represent each part of their shoe. ● The students will plan out their design. They will upload their designs.
Modifications/Accommodations for SWDs ad ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.
Pivotal/Essential Question	How can we use our prior knowledge to develop a plan for creating our shoe?
Check for Understanding with Targeted Feedback ● How do you plan to check for understanding throughout the activity? ● What questions will you ask as you check in with students? ● How will you use the success criteria to give targeted feedback?	● Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning. ● As I check in with students, I will ask questions such as: ○ What materials are you planning on using? ○ Why will they be helpful in building? ○ What might be important to include while building? ● I will use the success criteria to give targeted feedback. The students will be reminded to label their design, be specific in their work, and use realistic materials for building.
Success Criteria/Rubric	The students will receive points based on their work. The students will receive points for a labeled design, using realistic materials, and being specific in their

Lesson Summary	1. The students will complete the planning sheet. 2. The students will revisit the design specifications. 3. The students will sketch two possible ideas they might want to create out of materials/models in google drawings. Students will have the option of choosing how they will create their design.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Lesson 4: Building Your Design

Learning Target: Learning Objectives:	● "I create a shoe design based on my prior knowledge." *Students will be able to:* ● use their plan to create a design. ● integrate their prior knowledge into a design. ● incorporate their ideas into a final design.
Standards	<u>Technology:</u> ● Engineering design is an iterative process involving *modeling* and *optimization* used to develop technological solutions to problems within given constraints. <u>NGSS:</u> ● *MS-ETS1-1:* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. <u>Language Arts:</u> ● Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flow chart, diagram, model, graph, or table)
Key Vocabulary	● plan (el plan) - an idea or process to follow for creating a project ● Design (proyecto) - solution ● trial and error (puerba y error) - trying different ideas until finding one that works.
Do Now/Motivation	● The students will revisit their plan from yesterday's activities.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

<table>
<tr><td>Activities</td><td>

<table>
<tr><td>If the students are creating a 3-D model, they will begin building their design.</td><td>If the students are designing on the computer, they will begin to design their shape. The students will need to label what materials they would use if they were creating this design in person. The students also will label each of the five parts of their shoe.</td></tr>
</table>

The students will be encouraged to troubleshoot their ideas through google chats.
While building over three days, the students will be asked a check in question at the beginning of the day to see if they have any problems or need help with anything.

</td></tr>
<tr><td>Modifications/Accommodations for SWDs ad ELLs</td><td>Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.</td></tr>
<tr><td>Pivotal/Essential Question</td><td>How can we use our plans to help us create our final designs?</td></tr>
<tr><td>Check for Understanding with Targeted Feedback
How do you plan to check for understanding throughout the activity?
What questions will you ask as you check in with students?
How will you use the success criteria to give targeted feedback?</td><td>Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning.
As I check in with students, I will ask questions such as:
What materials are you planning on using?
Why will they be helpful in building?
What might be important to include while building?</td></tr>
</table>

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Success Criteria/Rubric	Students will be graded using a rubric
Lesson Summary	1. The students will begin to design their shoes. 2. The students will problem solve with their peers through google chats.

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Lesson 5: Advertisements

Learning Target: Learning Objectives:	● "I can construct a well developed paragraph to help share/communicate my ideas." *Students will be able to:* ● incorporate academic language into their own work. ● utilize academic language in their own writing. ● create an "advertisement" based on their own design.
Standards	<u>NGSS:</u> ● *MS-ETS1-1:* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. <u>Language Arts:</u> ● *CCSS.ELA-LITERACY.RST.6-8.7:* Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flow chart, diagram, model, graph, or table) ● *CCSS.ELA-LITERACY.W.6.1.A:* Write arguments to support claims with clear reasons and relevant evidence.
Key Vocabulary	● outsole (suela exterior)- comes in contact with the ground ● midsole (entresuela) - absorbs shock from the ground ● upper (superior)- top part of the shoe, has the tongue and laces
Do Now/Motivation	● The students will listen to the embedded loom link in the powerpoint

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?

Activities	● The students will revisit their shoe design/drawings. ● The students will look at the writing format their writing sample will follow ● The students will view a sample writing. ● The students will create their own paragraphs based on the characteristics and qualities in their shoe.
Modifications/Accommodations for SWDs ad ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.
Pivotal/Essential Question	How can we share our work?
Check for Understanding with Targeted Feedback ● How do you plan to check for understanding throughout the activity? ● What questions will you ask as you check in with students? ● How will you use the success criteria to give targeted feedback?	● Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning. ● As I check in with students, I will ask questions such as: ● “How can you be more descriptive in your writing?” ● “What else can you include so the ‘person’ would buy your shoe?”
Success Criteria/Rubric	Students will be graded using a rubric.
Lesson Summary	1. The students will listen to the loom link. 2. The students will look at an example paragraph 3. The students will create their own paragraph based on their shoe designs. 4. The students will upload paragraphs and images of their work onto the Instagram post page.

Appendix B: Teaching Materials

Run the Runway
Adidas Sustainable Shoe Resource Project

Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
		April 8 **Lesson 1** Specifications and constraints	April 9 **Activity 1** What do you already know?	April 10 No Assignment- Enjoy the holiday weekend with your family!
April 13 **Lesson 2** Recycling and Sustainable materials	April 14 **Lesson 2** Recycling and Sustainable materials Google Meet @ 10:30am	April 15 **Activity 3** "Shoe"vanger hunt	April 16 **Activity 3** "Shoe"vanger hunt Google Meet @ 9am	April 17 **Lesson 3** Parts of the Shoe Video
April 20 **Lesson 3** Parts of the Shoe Video	April 21 **Lesson 4** Begin with the End in Mind- Plan Google Meet @ 10:30am	April 22 **Activity 4** Begin to build	April 23 **Activity 4** Continue to build Google Meet @ 9am	April 24 **Activity 4** Finish Building
April 27 **Activity 4** Finish Building	April 28 **Lesson 6** What's in an advertisement ? Google Meet @ 10:30am	April 29 **Activity 6** Write and revise advertisement	April 30 **Activity 6** Write and revising advertisement Google Meet @ 9am	May 1 **Project is Due!**

Lesson 1, Wednesday April 8th

Learning Target	I can use specifications and constraints to help me make sense of a problem.
Morning Message	Good morning! Today, we are going to begin the "Run the Runway Contest". Our class was selected by Adidas to create and model their eco-friendly spring shoe line. It is up to you to create one prototype of the shoe. When we return to school, we will have a *shoe release party* where you can all model your own prototypes.
Essential Question	By the end of today's lesson, you will be able to answer the *ESSENTIAL QUESTION* - How can we use specifications and constraints to help us make sense of a problem?

Academic Vocabulary	- specification (especificacion)
	  - something a solution MUST do
	- constraint (restriccion)
	  - something that LIMITS a solution
	- problem (problema)
	  - what an engineer needs to solve
	- solution (solución)
	  - how an engineer will solve a problem

Things to Do Today:	1. Read the "PSA" from the Adidas representative. 2. Respond to the *question of the day* on google classroom. 3. Sign the "contract" from Adidas. 4. Begin collecting materials you might use to design your sneaker.

Adidas Representative Offices

April 7, 2020

Adidas Offices
1234 Shoe Street
Shoe Town, New York, 12345

Dear Westbury 6th Grade Technology Students:

Congratulations! Your school has been selected to compete in our first ever "Run the Runway". We call on you to help design a sneaker made out of recyclable materials to use in our Spring/Summer 2020 line.

Here at Adidas, we always are looking to use sustainable resources to create our products. We want to make our products as environmentally friendly as possible. Since 2012, we have tried to used recycled materials as best as we can.

Our Contest Rules:

- You MUST use materials you find in your own house.
- You will create a prototype that will fit on your right foot.
- You should be able to walk about eight feet in your shoe (the length of a large bed).

Design Presentations:

- You will create an advertisement for your shoe.
- Your advertisement can be in the form of a radio announcement, an instagram post, or television commercial.

Your completed prototype and advertisement will be submitted **no later than** April 24th.
Sincerely yours,

Adidas Representative Offices

Adidas Representative Offices

1234 Shoe Street Shoe Town, 12345 123-456-7890

Please read the following information and "sign" the document below by selecting today's date.

Since you will be participating in the Spring 2020 Run-the-Runway Competition, you must abide by all of the Adidas Online Learning Community Rules.

We expect:

1. You will be respectful when commenting and asking questions in your online community.
2. You will complete your assignment when they are due. This will allow you to design the best product.
3. You will ask your teacher and classmates for help. We understand these are new working conditions, but they are new conditions for everyone.
4. If the technology device you are using is not cooperating, ask for help. There is always another way to do the assignment.

If you do not follow the above rules, you will be reported to management.

I agree to the following terms and conditions outlined above and am excited to participate by clicking the date below.

Date

mm/dd/yyyy

Lesson 2, Thursday April 9th

Learning Target	I can determine what academic vocabulary I will learn during the unit.
Morning Message	Good morning! Today, you will become familiar with many of the words and ideas we will be discussing over the next few weeks. As you complete lessons and activities, the words will become more and more familiar to you.
Essential Question	By the end of today's lesson, you will be able to answer the *ESSENTIAL QUESTION* - How can we use context clues to help us determine the meaning of an unfamiliar word?
Academic Vocabulary	- upper - midsole - outsole - characteristics - resource - material - sustainable - reuse - recycle - environment
Things to Do Today:	1. Complete the google form "Run the Runway Words to Know". 2. Continue collecting materials you might want to use when building your shoe! We are not building yet, but the more materials you have collected, the easier it will be to build.

Lesson 2, Monday April 12th

Learning Target	"I can describe how using sustainable resources can reduce the impact humans have on the environment."
Morning Message	Good morning! Today we are going to investigate what sustainable materials are and how they can help the environment. You will also see how Adidas creates shoes out of sustainable resources.
Essential Question	By the end of today's lesson, you will be able to answer the *ESSENTIAL QUESTION* - How can using sustainable materials help us reduce our impact on the environment?

Academic Vocabulary	- sustainable (sostenible)
	  - materials which meet our needs right now and can be used over time
	- environment (medio ambiente)
	  - the area where people, animals, and plants interact with each other
	- recyclable (reciclable)
	  - materials that can be broken down into other materials
	- resources (recursos)
	  - different things in the environment which can be used to make products

Things to Do Today:	1. Watch *Tech Insider* Youtube video called: "How Adidas Turns Plastic Bottles Into Shoes". 2. Read the newsELA article: *Is it possible to make no waste?* 3. Post 3 facts you learned from the article, 2 things you found interesting, and one question you have. 4. Continue collecting possible materials you might want to use for your shoe. **Do NOT start building yet!**

Activity 3, April 15th

Learning Target	I can choose three qualities that are important to me when buying shoes.
Morning Message	Good morning! Today you will determine which qualities are most important to you when buying a new pair of shoes.
Essential Question	By the end of today's lesson, you will be able to answer the *ESSENTIAL QUESTION* - What qualities are important to me when buying new shoes?

Academic Vocabulary	- quality (cualidad)
	  - specific characteristic a product will have
	- evaluate (evaluar)
	  - determine if something is "good" based on its qualities

Things to Do Today:	1. Watch the Youtube video *History of Sneakers in 60 Seconds".*
	2. Go on a "shoe"vanger hunt (aka scavenger hunt) around your house. Find 2 pairs of sneakers. For each shoe answer the questions:
	  ○ What does this shoe look like?
	  ○ Why do you like wearing it?
	3. Please respond to the reflection questions in Journal 2.
	4. Continue to gather materials you are planning on using for building. **DO NOT start building yet!**

Journal 2

Once you are finished with your "shoe"vanger hunt, please respond to the following reflection questions. You can also complete this assignment on Flipgrid. Please write with proper grammar rules and capital letters.

- What makes a shoe "good" for you? Why would you choose to wear one shoe over another shoe?

- Describe each of the shoes that you found on your "shoe"vanger hunt.

Shoe	What does it look like?	Why do you like wearing it?
My Example My Brooks Running Sneakers	My sneakers are mainly black and have white mixed in. The bottom is white and the middle is black and white. The shoe laces are black.	I like these shoes because they are comfortable and cute. I like to run in comfortable shoes.
Shoe 1		
Shoe 2		

Lesson 3, April 17th

Learning Target	I can describe how the different shoe parts hold my foot in place.
Morning Message	Good morning! Today, we are going to look at the different parts of our sneakers.
Essential Question	By the end of today's lesson, you will be able to answer the *ESSENTIAL QUESTION* - How do the parts of my sneaker hold my foot in place?

Academic Vocabulary	- outsole (suela exterior)
	  - comes in contact with the ground
	- midsole (entresuela)
	  - absorbs shock from the ground
	- upper (superior)
	  - top part of the shoe, has the tongue and laces
	- tongue (lengua)
	  - holds the laces in place
	- laces (cordones)
	  - hold the foot in place

Things to Do Today:	1. Watch *Asics Gel Technology* youtube video. While watching, think of how the different parts of the shoe work together to help athletes run faster.
	2. Look at the Asics diagram. Notice the different parts of the shoe.
	3. Find one of the sneakers you looked at yesterday.
	  ○ Find the outsole.
	  ○ Find the midsole.
	  ○ Find the upper.
	  ○ Find the tongue.
	  ○ Find the laces.
	4. Respond to the reflection questions in Journal 3.
	5. Continue to collect materials you might use for building. <u>Do NOT start building yet!</u>

Journal 3

Please respond to the following Journal 3 *reflection questions*. Make sure you write with 6th grade grammar and punctuation.

1. How do all the parts of the shoe work together to hold your foot in place?

2. What materials are you planning on using to represent each part of your shoe?

Part of Shoe	Material you are Planning on Using
Outsole	
Midsole	
Upper	
Tongue	
Shoe Laces	(you can use a real pair of shoe laces if you choose!)

Lesson 4, April 21st

Learning Target	I can begin with the end in mind and develop a plan for building my shoe.
Morning Message	Good morning! Today, you will develop a plan for creating your shoe.
Essential Question	By the end of today's lesson, you will be able to answer the *ESSENTIAL QUESTION* - How can use our prior knowledge to develop a plan for creating our shoe?

Academic Vocabulary	- outsole (suela exterior)
	  - comes in contact with the ground
	- midsole (entresuela)
	  - absorbs shock from the ground
	- upper (superior)
	  - top part of the shoe, has the tongue and laces
	- tongue (lengua)
	  - holds the laces in place
	- laces (cordones)
	  - hold the foot in place

Things to Do Today:	1. Complete the planning sheet. 2. Sketch two possible designs you might create. 3. If you are having trouble finding materials from home, you can also create a DETAILED model of your design in google drawings/on paper. ○ If you decide to do this instead, please label your diagram with each material you would PLAN on using, if you were creating the design. 4. Once you have sketched your design, **you may begin building/drawing.**

When solving problems using the **Engineering Design Process**, it is important to plan out your thinking.

What characteristics must your design include to be successful? (specifications)

Characteristic 1: My shoe must be made out of recyclable materials
Characteristic 2:
Characteristic 3:

What qualities are important to include in your shoe?

Characteristic 1: My shoe must be cost effective (cheap to buy!)
Characteristic 2:
Characteristic 3:

What material will you use?

Part of the Shoe	Material
Outsole	
Midsole	
Upper	
Tongue	
Laces	

Now, sketch out your design. Be sure to label its important features. Upload a picture with your work.

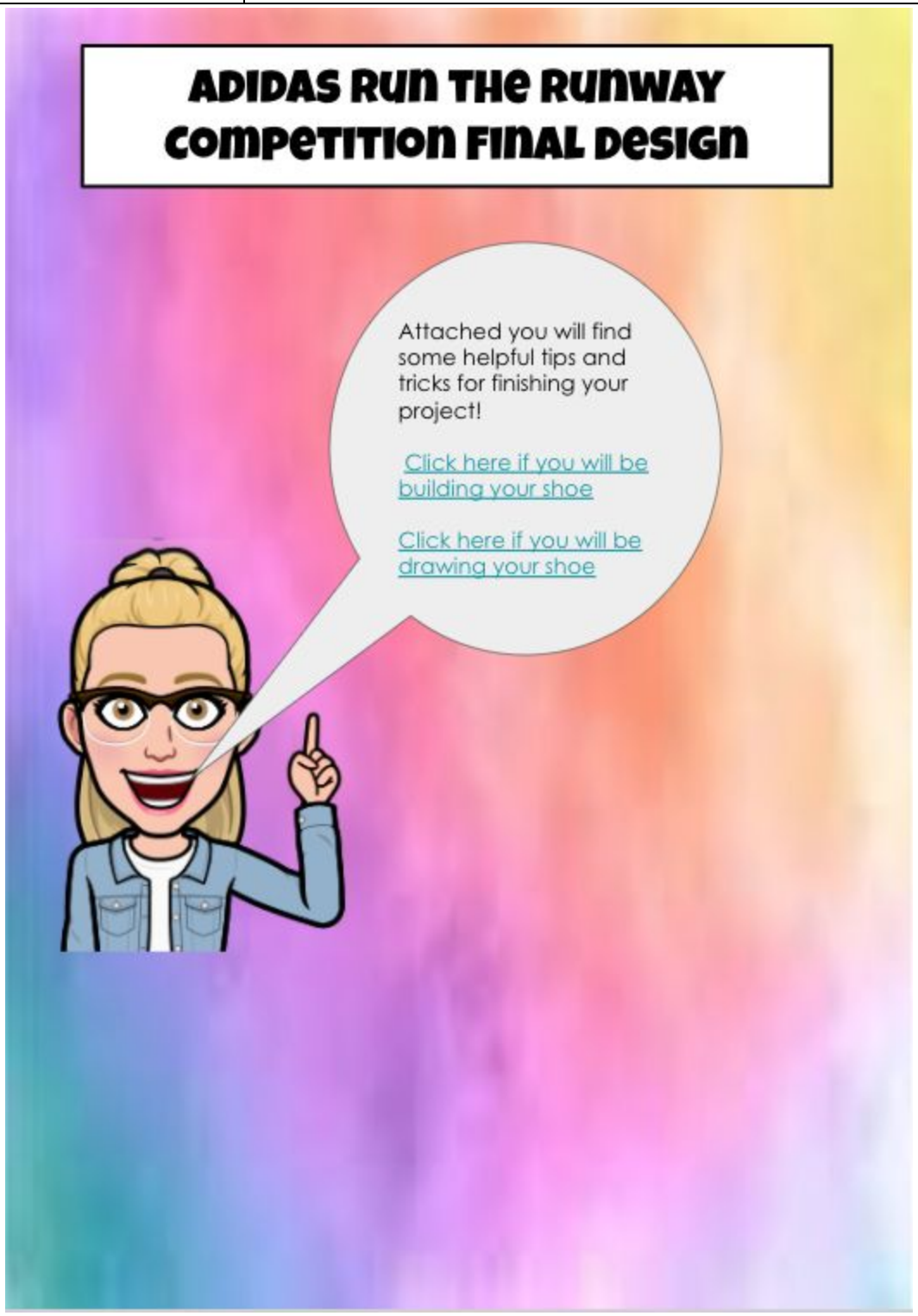
Appendix C Design Challenge Materials

Activity 4/5 April 22nd-April 24th

<table>
<tr><td>Learning Target</td><td>I can create a shoe design based on my prior knowledge.</td></tr>
<tr><td>Morning Message</td><td>Good morning! Over the next few days, you will be creating your shoe!</td></tr>
<tr><td>Essential Question</td><td>By the end of today's activity, you will be able to answer the ESSENTIAL QUESTION
- How can we use our plants to help us create our final design?</td></tr>
<tr><td>Academic Vocabulary</td><td>- plan (el plan)- an idea or process to follow for creating a project
- design (proyecto)- solution
- trial and error (puerba y error- trying different ideas until finding one that works</td></tr>
<tr><td>Things to Do Today:</td><td>1. Take out your plan
2.<table><tr><td>If you are building a 3D model, start and continue working with your material.

If you have any questions, please let me know!</td><td>If you are working on the computer or on paper, begin designing. If you know of another platform, you can work there as well.
- You MUST label the materials you would "use".
- You MUST include all 5 parts of the shoe in your design (outsole, midsole, upper, tongue, laces)</td></tr></table>3. Please plan your building and time accordingly. Make sure your designs are detailed enough with the time you have. You should be done by Friday April 24th to avoid any weekend homework from technology, but can continue building or drawing if you need. Please send me</td></tr>
</table>

	a picture of your work by Monday April 27th!



HELPFUL HINTS FOR DRAWING

Drawing:
- Please draw a picture of your shoe on white paper
- Sketch your shoe before making a final copy!
- Be as detailed and creative as you can!

Click here to upload a picture!

Building Checklist	Did I do this?
I can design the side view of a sneaker.	I can design the side view...
I can draw a design that includes: - outsole - midsole - upper - tongue - laces	My design include..
I can describe what materials I would use to make each part of my shoe.	
I can label my drawing.	
I can draw a shoe that includes at least 3 colors.	
I can complete my work neatly and on time.	

HELPFUL HINTS FOR BUILDING

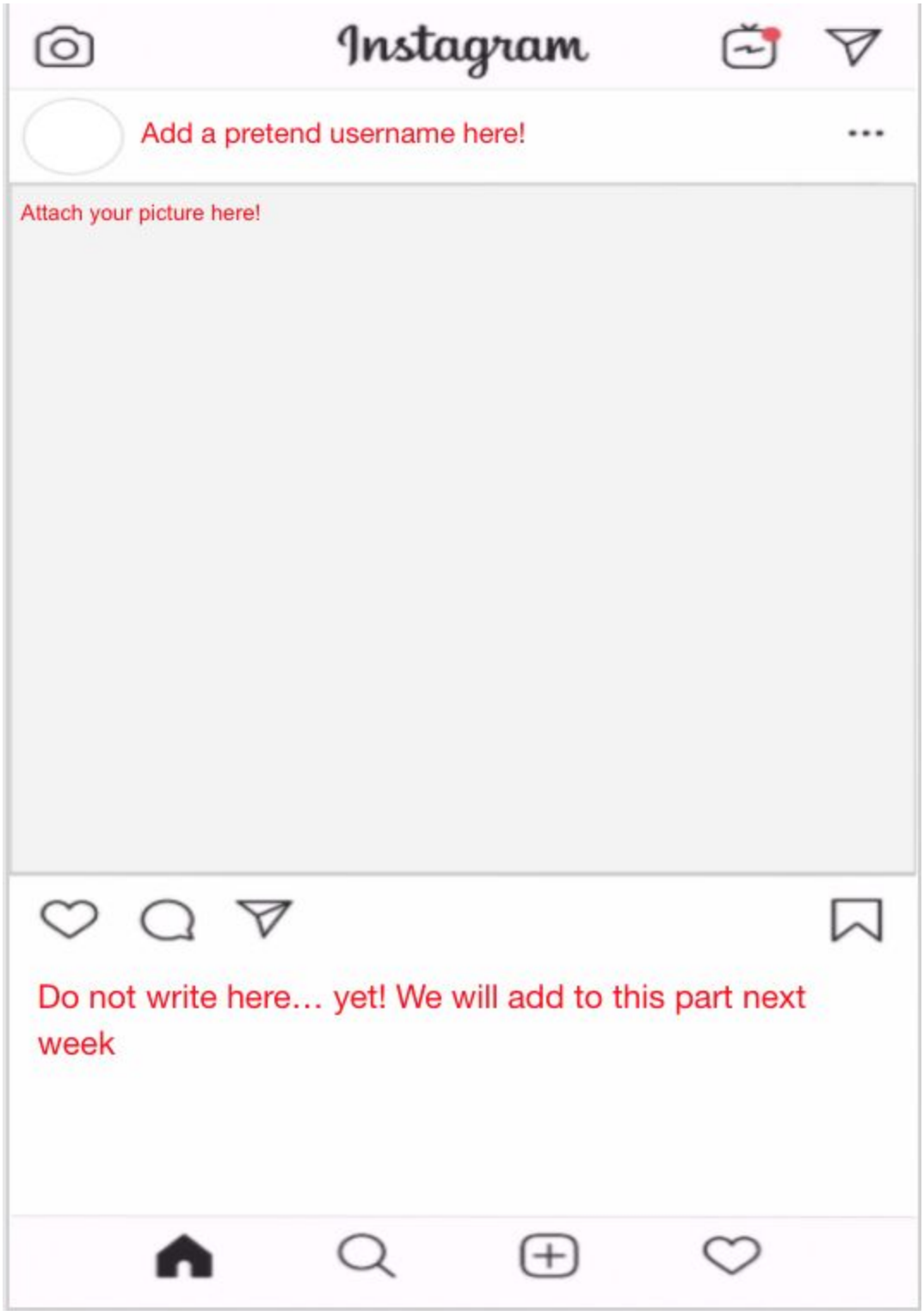
Materials:

- For this project, anything you have in your house can be used!
- Possible materials:
  - Cardboard
  - Duct Tape
  - Cereal Boxes
  - Newspaper
  - Soda Cans
  - Anything else you can find!

Click here to upload a picture!

Building Checklist	Did I do this?
I can use recyclable materials/materials found at my home to create my sneaker.	I used....
I can create a sneaker that has: - outsole - midsole - upper - tongue - laces	My sneaker has...
I can make a sneaker that fits my foot.	My sneaker...
I can problem solve by using strategies I already know and asking for help	I problem solved by...
I can describe what materials I used for my project	I used....
I can complete my work neatly and on time.	

How Will Inquiry-Based Instruction Increase Academic Language for English Language Learners?



Design Challenge Rubric

Student can…	Points
create a design with an outsole.	The student includes outsole (1 point).
create a design with a midsole.	The student includes midsole (1 point).
create a design with an upper or tongue.	The student includes design with upper or tongue (1 point).
create a design with laces.	The student includes design with laces or explains why the laces are not included (1 point).
create a design with everyday materials found at home.	The student uses everyday materials found at home (1 point).
create a design that is neat, detailed, and thoughtful.	Student creates a design that is thoughtful, neat, and detailed (2 points) The student creates a design that is neat (1 point).
create a design that is labeled and fits his/her foot.	The student creates a design that is labeled or fits his/her foot (1 point).
turn in work on time and ask questions if s/he needed help.	The student submits work on time and communicates if s/he needs help (2 points). The student submits work on time (1 point).

Academic Writing

Lesson 5: Advertisements, April 27th -May 1st

Learning Target: Learning Objectives:	- "I can construct a well developed paragraph to help share/communicate my ideas." *Students will be able to:* - incorporate academic language into their own work. - utilize academic language in their own writing. - create an "advertisement" based on their own design.
Standards	<u>NGSS:</u> ● *MS-ETS1-1:* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. <u>Language Arts:</u> ● *CCSS.ELA-LITERACY.RST.6-8.7:* Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flow chart, diagram, model, graph, or table) ● *CCSS.ELA-LITERACY.W.6.1.A:* Write arguments to support claims with clear reasons and relevant evidence.
Key Vocabulary	- outsole (suela exterior)- comes in contact with the ground - midsole (entresuela) - absorbs shock from the ground - upper (superior)- top part of the shoe, has the tongue and laces
Do Now/Motivation	- Students will listen to the embedded loom link in the powerpoint
Activities	- Students will revisit their shoe design/drawings. - Students will look at the writing format their writing sample will follow - Students will view a sample writing. - Students will create their own paragraphs based on the characteristics and qualities in their shoe.
Modifications/Accommodations for SWDs ad ELLs	Both Students with Disabilities and English Language Learners will be supported throughout the lesson. For English Language

	Learners, the vocabulary will be provided in both English and Spanish. Students have opportunities to ask questions through google classroom as well.
Pivotal/Essential Question	How can we share our work?

Check for Understanding with Targeted Feedback
- How do you plan to check for understanding throughout the activity?
- What questions will you ask as you check in with students?
- How will you use the success criteria to give targeted feedback?
	- Throughout the lesson, I will be able to check for student understanding and provide direct feedback. Through google classroom, I can provide individualized feedback for each student. Based on the student responses, I will be able to provide them with individualized questions to guide their learning.
	- As I check in with students, I will ask questions such as:
	  - "How can you be more descriptive in your writing?"
	  - "What else can you include so the 'person' would buy your shoe?"

Success Criteria/Rubric	Students will be graded using a rubric.
Lesson Summary	1. The students will listen to the loom link. 2. The students will look at an example paragraph 3. The students will create their own paragraph based on their shoe designs. 4. The students will upload paragraphs and images of their work onto the Instagram post page.

Run the Runway Instagram Advertisement
https://www.loom.com/share/57b38d5999bd4ecf9c0978ef46cc524f
Click here to watch my loom and hear me explain what you have to do!
Learning Target: "I can construct a well developed paragraph to help share/communicate my ideas.
Click here to the next slide

THE WRITING COMPONENT

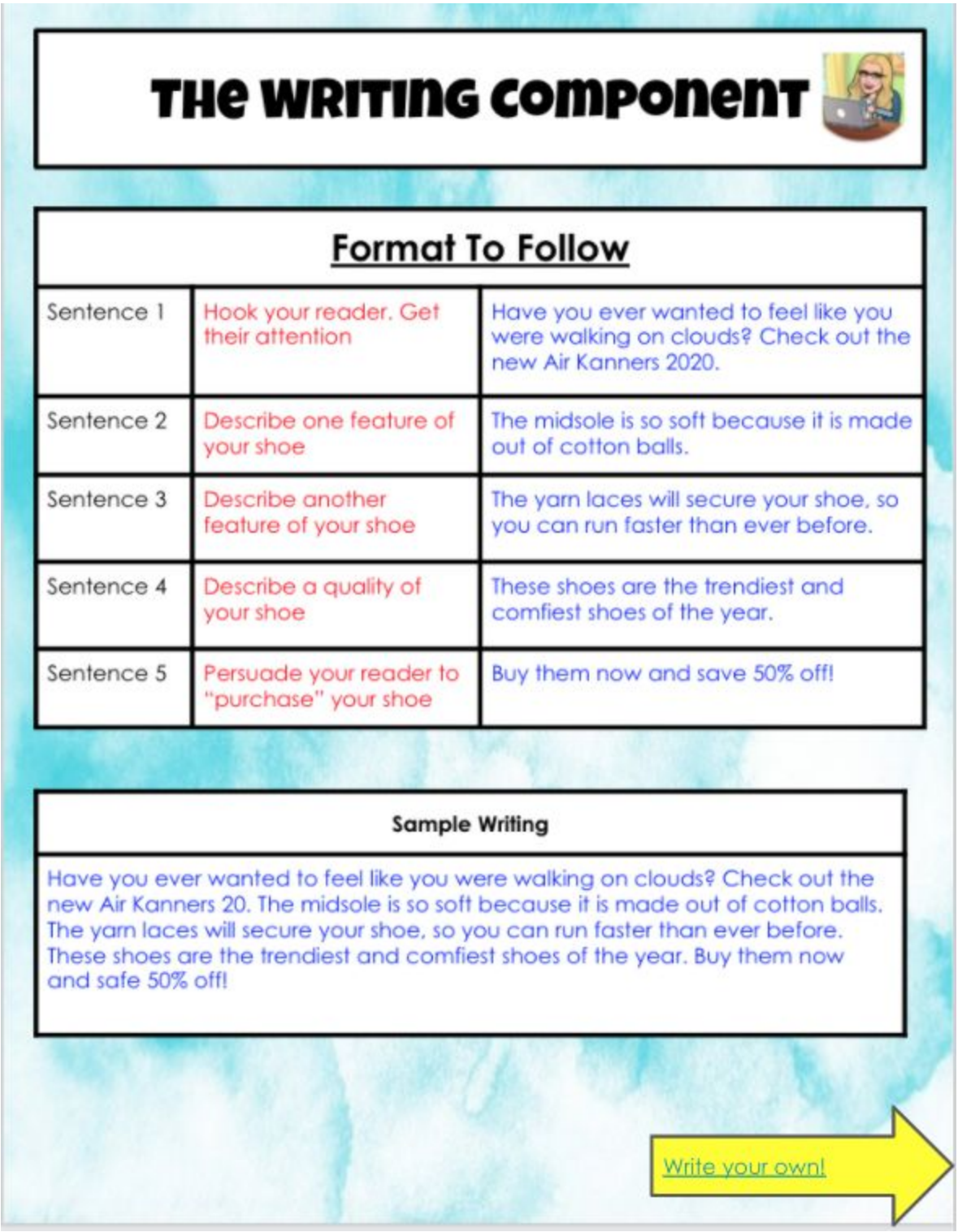
This week, you will be completing the "advertisement" portion of the project. Your writing MUST

- include at least **five** sentences.
- be based off of the shoe you drew/created.
- include sixth grade grammar and writing expectations. (proper grammar, punctuation, complete sentences!)
- follow the format for your paragraph.

Format To Follow

Sentence 1	Hook your reader. Get their attention	Have you ever wanted to feel like you were walking on clouds? Check out the new Air Kanners 2020.
Sentence 2	Describe one feature of your shoe	The midsole is so soft because it is made out of cotton balls.
Sentence 3	Describe another feature of your shoe	The yarn laces will secure your shoe, so you can run faster than ever before.
Sentence 4	Describe a quality of your shoe	These shoes are the trendiest and comfiest shoes of the year.
Sentence 5	Persuade your reader to "purchase" your shoe	Buy them now and save 50% off!

Click here to continue!



THE WRITING COMPONENT

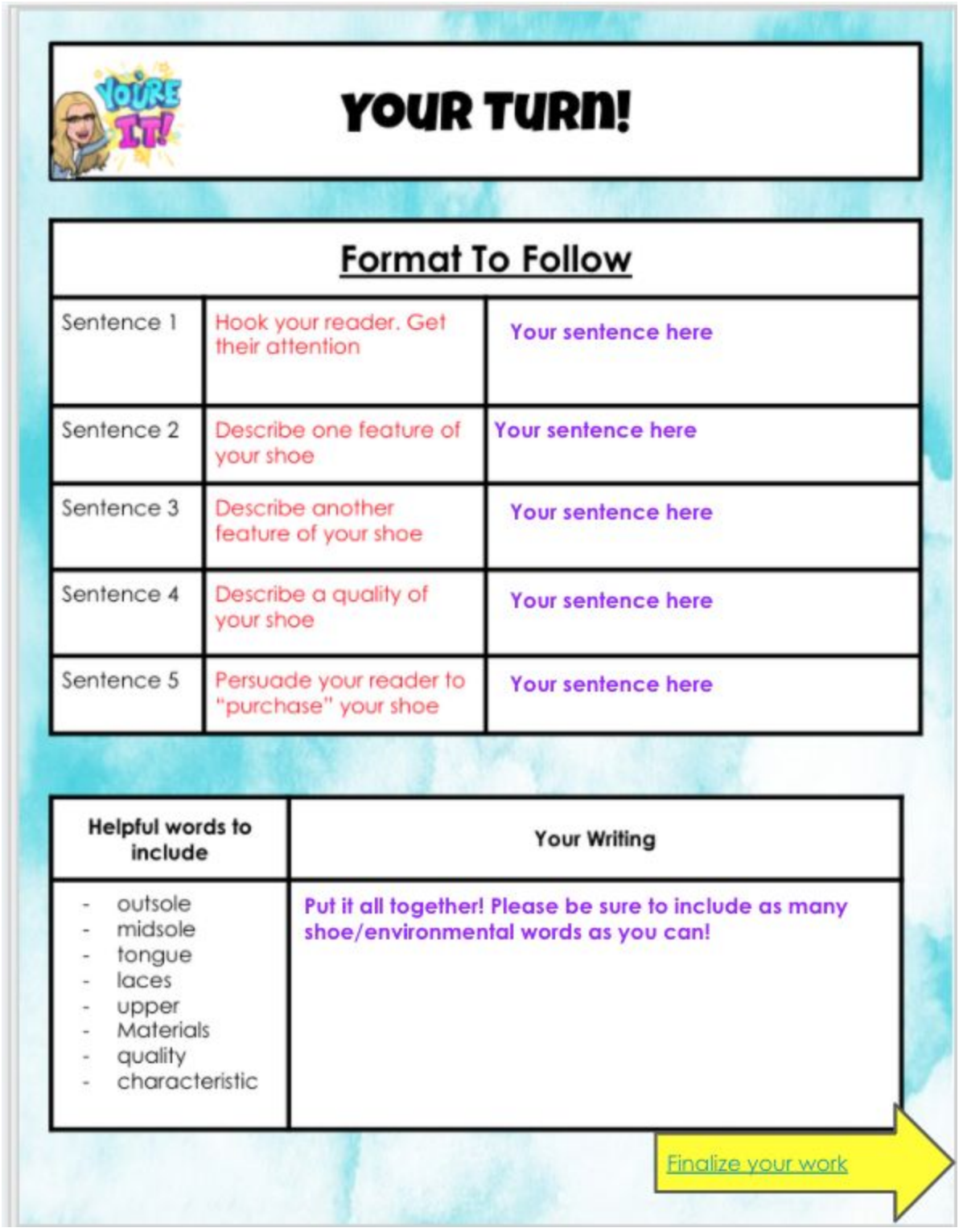
Format To Follow

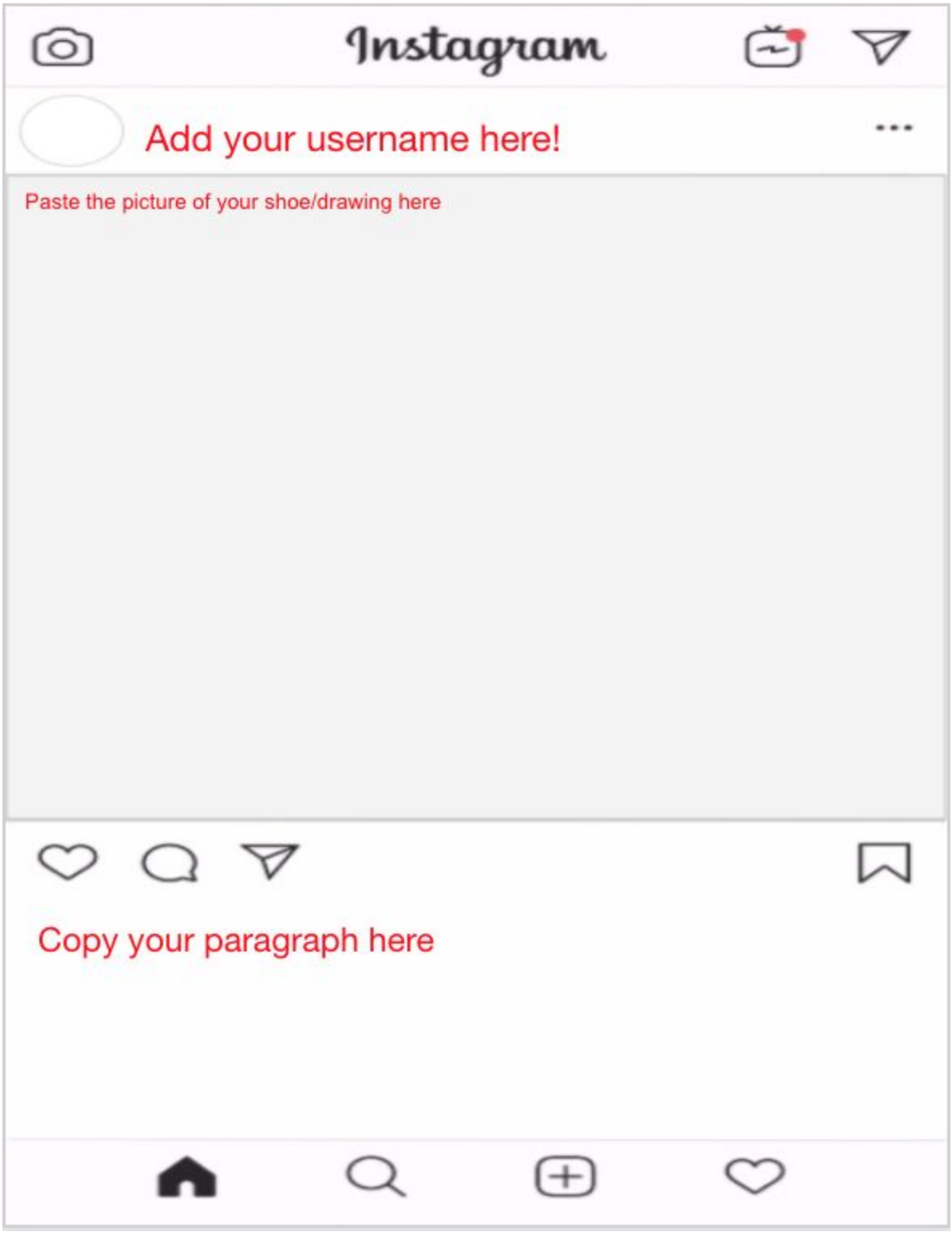
Sentence 1	Hook your reader. Get their attention	Have you ever wanted to feel like you were walking on clouds? Check out the new Air Kanners 2020.
Sentence 2	Describe one feature of your shoe	The midsole is so soft because it is made out of cotton balls.
Sentence 3	Describe another feature of your shoe	The yarn laces will secure your shoe, so you can run faster than ever before.
Sentence 4	Describe a quality of your shoe	These shoes are the trendiest and comfiest shoes of the year.
Sentence 5	Persuade your reader to "purchase" your shoe	Buy them now and save 50% off!

Sample Writing

Have you ever wanted to feel like you were walking on clouds? Check out the new Air Kanners 20. The midsole is so soft because it is made out of cotton balls. The yarn laces will secure your shoe, so you can run faster than ever before. These shoes are the trendiest and comfiest shoes of the year. Buy them now and safe 50% off!

Write your own!


YOU'RE IT!
YOUR TURN!
Format To Follow
Sentence 1
Hook your reader. Get their attention
Your sentence here
Sentence 2
Describe one feature of your shoe
Your sentence here
Sentence 3
Describe another feature of your shoe
Your sentence here
Sentence 4
Describe a quality of your shoe
Your sentence here
Sentence 5
Persuade your reader to "purchase" your shoe
Your sentence here
Helpful words to include
- outsole
- midsole
- tongue
- laces
- upper
- Materials
- quality
- characteristic
Your Writing
Put it all together! Please be sure to include as many shoe/environmental words as you can!
Finalize your work


Instagram
Add your username here!
Paste the picture of your shoe/drawing here
Copy your paragraph here

Academic Writing Rubric

Student can...

write with sixth grade expectations and practices. Student writes in full sentences, uses proper punctuation, and grammar.	Student writing is not in complete sentences and lacks proper grammar and punctuation.
write at least five sentences.	Student writes less than 5 sentences.
includes at least three shoe vocabulary words in their writing.	Student includes less than two shoe vocabulary words in their writing.
describes two accurate shoe characteristics based on their own design.	Student describes less than two characteristics related to their shoe.
describes at least one quality related to their shoe.	Student does not include a quality to describe their shoe.
(bonus points) Student work is neat, on time, and accurate.	

Appendix D Academic Content Pre- and Post- Test

Run the Run Way Words to Know

Please complete the questions based on what you already know. Use the drop down word box to select which word you think best completes the sentence.

Your email address (**jkanner@westburyschools.org**) will be recorded when you submit this form. Not you? Switch account

* Required

The _____ of the shoe will protect the upper part of your foot. * 10 points

Choose

_____ are different materials found in the environment. * 10 points

Choose

When building, it is important to consider the _____, which is the area where people, animals, and plants live. * 10 points

Choose

_____ resources can be used over long periods of time. * 10 points

Choose

It is important to _____ plastic and newspapers because the old waste will be converted to reusable materials. * 10 points

Choose

The _____ of the shoe absorbs the shock from the ground. * 10 points

Choose

When problem solving, engineers have to look at the different _____ they can use. * 10 points

Choose

The ____ of the shoe comes in contact with the ground when walking. * 10 points

Choose

When designing, it is important for engineers to consider what _____ their solution will have. * 10 points

Choose

It is important to _____ materials, which means you'll use them again. * 10 points

Choose

Submit

Choose

Upper

Midsole

Characteristics

Resource

Material

Sustainable

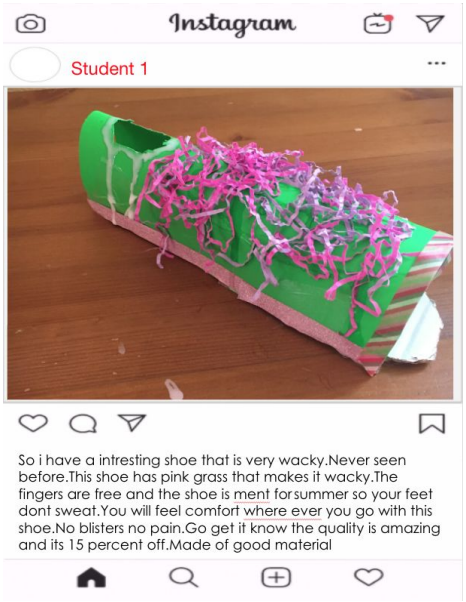
Reuse

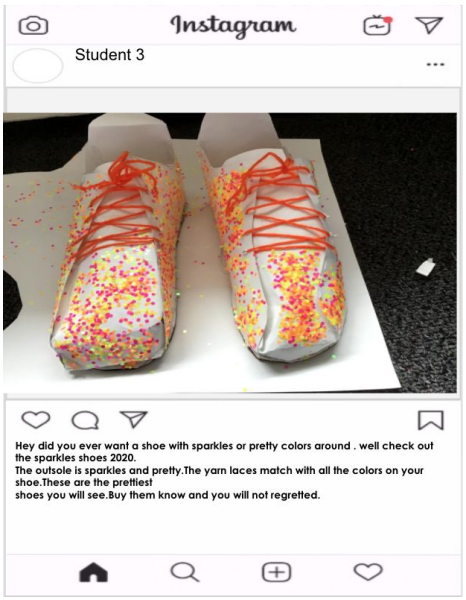
Recycle

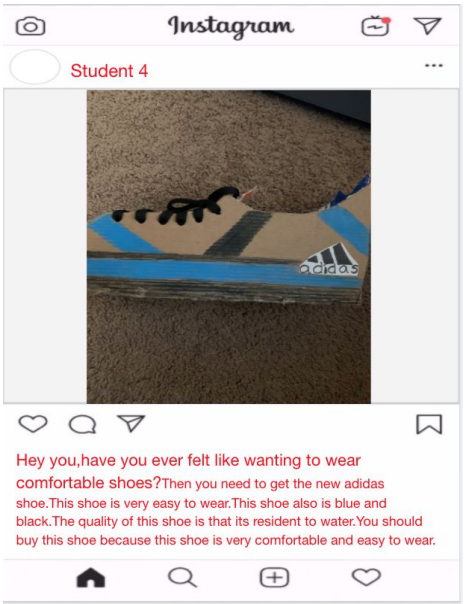
Environment

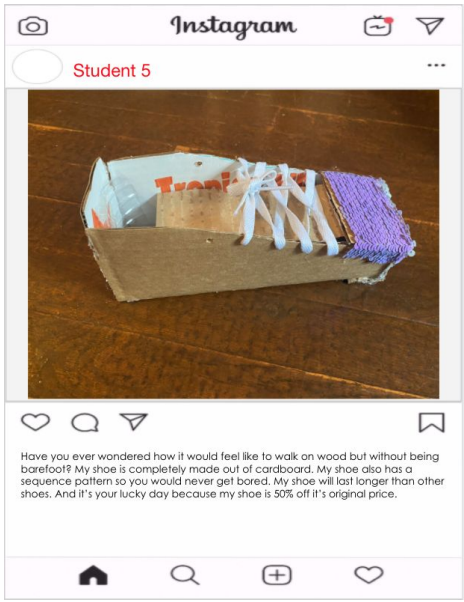
Outsole

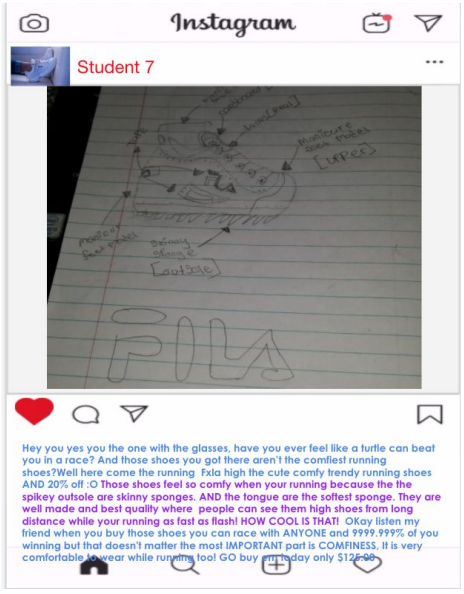
Appendix E Student Work Samples



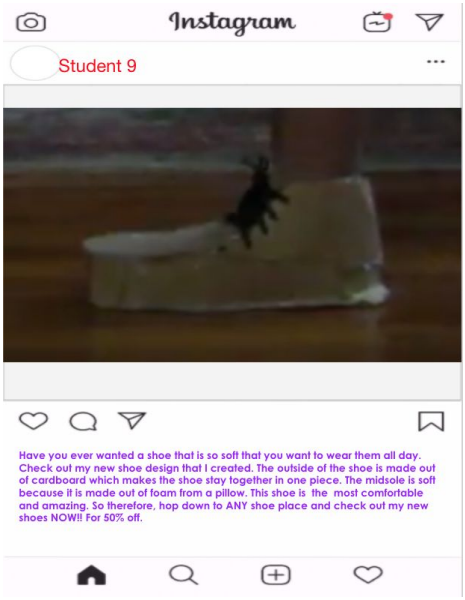




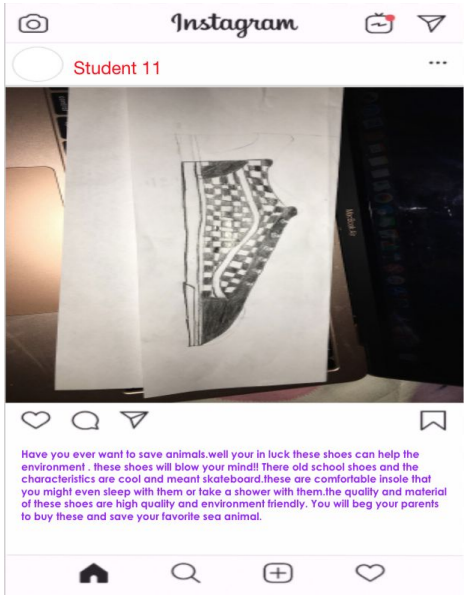



Instagram
Student 7
Hey you yes you the one with the glasses, have you ever feel like a turtle can beat you in a race? And those shoes you got there aren't the comfiest running shoes?Well here come the running Fxla high the cute comfy trendy running shoes AND 20% off :O Those shoes feel so comfy when your running because the the spikey outsole are skinny sponges. AND the tongue are the softest sponge. They are well made and best quality where people can see them high shoes from long distance while your running as fast as flash! HOW COOL IS THAT! OKay listen my friend when you buy those shoes you can race with ANYONE and 9999.999% of you winning but that doesn't matter the most IMPORTANT part is COMFINESS, It is very comfortable to wear while running too! GO buy em today only $128.98

Instagram
Mr.Mrs12
Hey do you want to help save the world then check out the new Cb's 2020's.The outsole,tongue,and upper is made out of cardboard so that's makes it using recycleable materials.In the midsole it has recycleable cloth and has cardboard to make it warm and comfortable.And this shoe is affordable and can help stop the littering and pollution problems.
Also if you buy it now in the next 24 hrs we will include free shipping and 5 percent off.


Instagram
Student 9
Have you ever wanted a shoe that is so soft that you want to wear them all day. Check out my new shoe design that I created. The outside of the shoe is made out of cardboard which makes the shoe stay together in one piece. The midsole is soft because it is made out of foam from a pillow. This shoe is the most comfortable and amazing. So therefore, hop down to ANY shoe place and check out my new shoes NOW!! For 50% off.

Instagram
Student 10
Have you ever weared a shoe that is made of cardboard? This shoe has a tongue and laces for your foot could not slip out. The upper is to hold your foo Come get your shoe for $89 and get 50% off


Instagram
Student 11
Have you ever want to save animals.well your in luck these shoes can help the environment . these shoes will blow your mind!! There old school shoes and the characteristics are cool and meant skateboard.these are comfortable insole that you might even sleep with them or take a shower with them.the quality and material of these shoes are high quality and environment friendly. You will beg your parents to buy these and save your favorite sea animal.

Instagram
Matthew9
Have you ever wanted to show your friends your shoes, but you just couldn't get their attention? Try the Shoeniverse so you'll get the attention of the center of the universe. It is the best and most popular ones yet. The outsole looks the best on these shoes, and the laces have a red and black square design. The upper is made out of a water bottle part, and it has the perfect fit in the shoe. You do not want to miss out on this shoes quality, design, etc! Buy one the day it is released, and it will be 60 percent off!

Instagram
aa_lopezzx
Have you ever wanted to have the most popular shoes. The shoe is super comfortable because the midsole is made out of foam and styrofoam. The shoes material is almost unbreakable. The Air evolution 5s are the comfiest and sturdest shoe ever. The shoe is original, is 30% of, and it comes with a free keychain.

Instagram
JDM1004
Jake woke up late and had to be in school in 10 minutes, and his school was 1 mile away! But he had already missed the bus, so he had to run to school, and he decided to wear his Environmental Triple Rs Pro. And in these shoes, he ran to school in time, with even some time to spare! So, have you ever wanted to feel like your feet have their own bed? And you want to run pretty fast or faster? Then try buying the Environmental Triple Rs Pro, which are nice and affordable! The outsole of this shoe is really soft, squishy, and durable because it is made of strong styrofoam, making you feel like you are walking on clouds, and the midsole is made of cardboard. The strong laces and strong cardboard upper part cardboard tongue lock and support your foot in the shoe, but it is comfortable and protective at the same time, when you are running. These shoes are the most popular, affordable, and most recyclable shoes of the year. And after these shoes are destroyed, they can be made into a brand new pair of shoes since the materials are recyclable. Buy these shoes within 15 days and save 25% off and an additional pair of socks and shirt.

Instagram
___joel._
Do you want to run as fast as a cheetah? Check out the new Joel's Originals. You are never going to find comfortable shoes like Joel's Originals. The midsole is very strong and soft because it is made of cardboard. These shoes are the comfiest and best designs of the year. But now and save 50% off.

Appendix F Teacher Journals

Journal 1: April 8th

In my first lesson, I wanted the students to be able to make sense of a problem through critically reading a passage and identifying the problem they will be solving, and specifications and constraints for the specific problem. To begin the distant learning unit, the students read and opened the *PSA* from "Adidas". This document explained the unit the children will be participating in, and the specifications and constraints of the design challenge. Then, as a google classroom question, the students were asked, "What is the problem you have to solve? What are the specifications of the challenge? What are the constraints?". The students individually responded through google classroom. Then, the students signed an "online contract agreement" which reminded students of distance learning expectations.

Based on the student responses, unpacking a problem and critically reading is a skill many students need to work on; however, a majority of the students have an increased developed understanding of defining a problem, and identifying specifications and constraints. About ½ of the students correctly responded, provided evidence from the reading, and added in additional specifications, such as a shoe being comfortable. The other students needed additional prompting to successfully determine the specifications and constraints of the situation.

Since this lesson was completed over distant learning, it is challenging to gauge the understanding of the children. If I were to teach this lesson in person in the classroom, I would have dressed up as the "Adidas Representative" and explained the project and what "Adidas" is asking the students to do. Then, I would have passed out "invitations" and "contracts" for the students to sign. Providing the students, and especially the English Language Learners, with an

engaging and interactive introduction to the unit would engage the students, captivate their attention, and set the stage for the rest of the unit.

Journal 2: April 9th

In today's lesson, I wanted the children to be introduced to some of the academic language they will be discussing for the rest of the unit. In today's activity, the students were invited to complete a google form. In the google form, students had to select the correct word to complete the sentences. Based on the responses, many students demonstrated a prior understanding of content based and Tier 3 Vocabulary; however, many students experienced challenges with *resources*, *characteristics*, *midsole, outsole, upper*. Over the course of the unit, the students will have increased exposure to the language.

Since this lesson was completed over distant learning, it is challenging to determine the effort the children are putting into their work, background distractions, and if they are receiving any help from their parents or older siblings. Despite the outside distractions, results still represented a "bar curve". If I were to teach this in person in the classroom, I would have paired this lesson with the activities on April 9th. Breaking up the online activities will not overwhelm the children, keep them engaged, and allow them to feel successful by completing the assignments in smaller "chunks" rather than all at once.

Journal 3: April 13th

In today's lesson, I wanted the children to see how Adidas transforms plastic waste into their merchandise. To start the lesson, the children viewed a Tech Insider video which described how Adidas has partnered with Parlay, takes plastic waste out of the ocean, breaks the products down, and then builds them back up into polyester. Then, the students read a newsELA article,

"Is it possible to make no waste?". After that, the students would respond with three facts they didn't already know, two facts they found interesting and one question they had based on the material.

Based on the student responses and questioning, the students were engaged with the Adidas video, but didn't spend as much time reading the newsELA article. In today's lesson, the students received a rubric to show them how I was going to grade them. This encouraged the students to provide details and evidence from the video or article and write in complete sentences. One student messaged me on google classroom and said, "That was really cool to watch!". We discussed how even though Adidas practices this on a small scale, there are still actions we can take in our own communities. I gave him the information about Operation Splash, an environmental organization on Long Island, and told him to explore. A little while later, he said he can't wait to go visit the organization when "we are allowed out again".

Although the students were engaged in the material, this is week three of online learning. All classes have now started learning new material, and many students asked for help with directions, and said their workload was too much to manage. Despite the overwhelming lack of motivation displayed by the students, many of them still displayed they were engaged with the material and asked thoughtful questions.

If I were teaching this lesson in the classroom, I still would have kept a similar structure; however, I would have engaged the students by showing them the Tech Insider Video. Then, we would have discussed different materials that can be recycled in our community. From there, the students would have read and discussed a brief article about recycling and sustainable materials.

With any remaining time in the period, the students would have participated in the 3-2-1. If they needed additional time, they would have finished the 3-2-1 for homework.

Journal 4: April 15th

In today's lesson, I wanted the children to recognize different qualities and characteristics that are important to consider when purchasing or creating a shoe. The students viewed a one minute *History of Sneakers in 60 Seconds* video on Youtube. While watching, the children focused on how the different visual characteristics have changed over time. Then, the children went on a "shoe"vanger hunt around their house. They researched two different characteristics for each shoe and documented what they viewed on a graphic organizer. The students responded to the overall question "What qualities make a shoe good for wearing?".

Overall, the students accurately completed the assignment. Students differentiated between a shoe characteristic and a quality, however; many of their shoe qualities were common. Students often listed that comfortable and trendy are important to them. Few students spoke about versatility or durability. This lesson was more straightforward and simple than the previous lessons, so students participated with a greater level of independence, but demonstrated a higher level of engagement with the previous lesson.

If I were to teach this lesson in the classroom, I would have turned the classroom into a museum. Different sneakers would have been spread around the room. The students would be museum goers and participate in a gallery walk. They would read information about each shoe, and then write why they think the specific sneaker was selected to be at the museum. At the end of the period, the students would regroup and discuss which sneaker characteristics are important

to them and why certain qualities are more important to include when building a shoe than others.

Journal 5: April 17th

In this lesson, I wanted the students to recognize the different parts of the sneaker. Students started the lesson by watching the *ASICS Gel Technology Video*. This video highlighted Asics Gel Technology and how they contribute to an athlete's performance while running. The video broke down the different parts of the sneaker and how they all help contribute to the stability and durability of the sneaker. The students then viewed a labeled diagram of a sneaker. For the purpose of our project, the students will be focusing on the outsole, midsole, upper, tongue, and laces. Then, the students viewed one of the shoes they studied in the previous day's activities. The students identified each of the parts on their own sneakers. Finally, the students responded to the reflection question "How do all the parts of the shoe work together to support your foot".

In this lesson, it is evident that the students are beginning to grow tired of online learning. The students who were typically submitting well thought out assignments are now barely writing in complete sentences. Since this lesson was completed during distance learning, it is challenging to gauge the student's engagement level since they are not in the classroom. The student might be completing work with a student or parent, from a phone, or waiting to connect to Wi-Fi hotspots from their own homes. Despite an overall quality of the work, the students still appear eager to create their own shoes. Most students accurately described how the different parts of a shoe work together to support our feet.

If I were teaching this lesson in the classroom, I would have taught the material very differently. Students still would have viewed the Asics video to start the lesson. Then, students would be reminded of their "problem". They are a team of shoe engineers trying to create the best shoe out of recycled materials. I am a runner, so I have a lot of old running shoes around my house. The students would have received a shoe that was separated into its respective shoe parts. The students would be tasked with piecing the shoe back together and determining the role of each part. This lesson would provide all students with a hands on and engaging way to discover and discuss the parts of the shoe.

Journal 6: April 21st

Today, the students had to create and upload a plan for their work. Based on the student responses and engagement levels, the students had the option to either draw a detailed design of their shoe, or build a model out of household materials. The students are working independently from home, so it is important to validate and consider their strengths when designing. The students had to list their materials and what they are planning on using for each part of their shoe. The students would plan out their work on paper and then upload a picture of their plan.

More students independently uploaded or sent in a plan of their work. The students are becoming increasingly comfortable with the technology they use each day. Overall, many students spent a lot of time working on their plans; however, it is obvious that others did not. It can be challenging to maintain student engagement and excitement because the students are not sitting directly in front of you, but behind a computer screen working independently.

If I were teaching this lesson in school, the students would have collaborated to create two possible designs. Working together, the students would have incorporated ideas from both

designs into a final design. The students would describe why they think their design will be successful and meet all design specifications.

Journal 7: April 27th

Over the next few days, the students completed the design challenge for this unit. Students would be either drawing or designing their Environmentally Friendly shoes. Each student received a design checklist so they were aware of their expectations for the project. As they finished, the students sent in their designs through email, text, or directly attaching the photograph to the assignment.

Overall, the students designed shoes with varying detail. Some students put hours of effort into their work, and others turned in a simple sketch on the computer. Not being at school made this part of the project very challenging because it is not simple to manage a large scale design challenge from student's independent homes. Despite not seeing the students in person every day, the students have opportunities to ask questions over google classroom, during live google meet sessions, to each other, and the people living in their houses. Many students turned in incredibly detailed work. Some students tried to upload pictures of their own shoes. Some students decided they were going to draw and create slippers or high heels.

If this part of the project was completed in person, students would have chosen one student to "model" the shoe. All the students would contribute to the building process. The sneaker would be designed in school so it would be a total representation of student abilities. Under the circumstances, it is so important to increase the home to school connection. The students were told to build with people in their house and ask for help. This way, parents or older siblings can be engaged in the students' academics in a formal and informal setting.

Journal 8: May 1st

In this lesson, the students developed a writing component to describe their sneaker as an "advertisement". The students watched a loom recording of my google slide presentation. The presentation explained the students would complete a writing portion of the project over the next few days. The students would follow a five sentence format to complete their work. Then, students viewed my example. Finally, the students would write their own paragraphs. This lesson was also explained over a live google meet session as well.

The students appreciated the loom recording, since the recording allows the students to listen as many times as they need. During a time when there is no in person instruction, we are fortunate enough to have unlimited accessibility to different free technology resources.

To complete the project, the students have to upload both their picture and writing sample to an Instagram "Advertisement". The students demonstrated limited writing abilities. Many students followed my scaffolding word for word, only changing what applied to their own designs. Other students are stronger writers and created paragraphs independent of the format. Many students received points for structure, but did not receive points for academic vocabulary. The students needed reminders to include the "shoe words" into their descriptions. When prompted, many students successfully went back into their writing and added in the appropriate language.

If I were to teach this lesson in person, the students would create and film a commercial based on their shoe. Then, the students in the class would vote for the shoe they would be most likely to purchase in a store. The "winning" shoe would be revealed during a "Shoe Release Party" where the students' work would be celebrated with a snack and a movie.

Under COVID-19, any gathering with people outside those living in a home is not permitted, so we had to get creative to celebrate. During a live google meet, we played a Disney movie Kahoot, and the students participated in a “museum walk” where they had an opportunity to share their own work. The students wore sunglasses to show off their shoes as they excitedly described how they worked, what the shoe looked like, and how the shoe turned out.