TCSJ PBL Overview

Title:	**Understanding rational numbers through project design.**	**Est. Start Date: 9/1/2017**	**Duration: 20 days**
Teacher:	**Paul Villalovos and Brian Barnett**	**Grade Level: 7th Grade**	
Content Focus:	**Math**	**Other subject areas to be included: Language Arts, Career and Technical Education**	
Overall Idea: Summary of the issue, challenge, investigation, scenario, or problem	**The idea of the project is to utilize a real world task to gain foundational understanding of computing rational numbers.**		
The Project: What will students design, build, and/or present at the end of the PBL to demonstrate their expertise and solution/answer to the Driving Question?	**The students will design and present a back pack rack usable for the junior high classes. The students will demonstrate knowledge and use of rational numbers in their design of the back pack rack by their final project. These projects will be presented to the site principal and to the head of maintenance. It is possible that the designs might be presented to the School Board, if the designs are feasible and implemented on campus.**		
Essential Question:	How do we use addition, subtraction, multiplication, and division of rational numbers for real world application?	**Driving Question**	Can we create a back pack rack unique and usable for the junior high students?
Content and Skills Standards to be addressed: (CCSS, NGSS, Calif.)	CCSS.MATH.CONTENT.7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. CCSS.MATH.CONTENT.7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.		

		T+A	E		T+A	E
21st Century Skills and MPS to be explicitly taught and assessed **(T+A)** or that will be encouraged **(E)** by Project work but not taught or assessed:	**Communication**		**X**	**Collaboration**		**X**
	Critical Thinking	**X**		**Creativity**	**X**	
	Productivity/Accountability		**X**	**Adaptability**		**X**
	CTE Standards Building and Construction Trades		**X**	**College and Career Readiness Standards**		**X**

			Presentation Audience	
Culminating Products and Performances	**Group:**	**Presenting unique and feasible back pack rack for possible creation.**	**Class** **Whole Class**	**x**
			School **Site Principal**	**x**
			Community **School Board**	**x**
	Individual:	**n/a**	**Experts** **Head of Maintenance**	**x**
			Web	
			Other: **Local Paper (possbily)**	

Project Overview

Entry event
to launch inquiry, engage students:

Outline or Conceptual Flow
Include assessment points and *clearly identify* opportunity(s) for students to inquire, research, and share their new knowledge with their peers.

Note: Details of lesson plans do not belong in the outline.

Activity: Modified Marshmallow Challenge

Place students into strategic groups (5 minutes).

Materials: 1 set of instructions
1 reflection paper per group
20 pieces of spaghetti
20 marshmallows
20 paperclips
1 yard of painter's tape
1 yard of string

Directions: Create a free standing structure to hang as many marshmallows as possible, using the given materials.

Predict the number of marshmallows that your group will hang (2 minutes).

Build your structure and hang your marshmallows (20 minutes)

Record Results (5 minutes)

Reflect on structure building (3 minutes)

Group discussion on activity (5 to 10 minutes)

	Discuss Project, Standards, and Driving Question Outline and Sequence What are the essential math skills needed of a 7th Grade Student to create a functional back pack rack? 1. Adding and Subtracting Decimals is accomplished by lining up the place value and utilizing previously learned regrouping concepts. (7.NS.A1) ***Assess*** 2. Adding and Subtracting Fractions is completed by using common factor concepts, regrouping, and different versions of fractions. (7.NS.A1) a. Converting mixed fractions to improper by multiplying the whole number by denominator and adding that to the numerator. b. Regrouping numbers by taking groups of tens and moving them into the next place value. c. Common factors create fractions containing equal parts. ***Assess*** 3. Multiplying decimals is completed by using multiplication concepts and counting deeper understanding of base 10 value. (7.NS.A2) ***Assess*** 4. Multiplying fractions is completed by using mixed and improper conversions while multiplying numerators and numerators. (7.NS.A2) ***Assess*** 5. Dividing decimals is done by converting the divisor to a whole number and moving the decimal in the dividend using base 10 concepts. It is essential to line the place value up with the quotient. (7.NS.A2) a. Move the decimal over to the right to divide by a whole number and move the decimal over to the right the same amount of spaces in the dividend. b. Line place value up in the quotient. ***Assess*** 6. Dividing fractions is similar to multiplying fractions. The difference is that you reciprocate the divisor and perform multiplication concepts. (7.NS.A2)

	a. Converting mixed to improper by multiplying the whole number by denominator and adding that to the numerator. b. Multiply by the reciprocal of the number you are dividing by. ***Assess*** 7. Using the computational skills of fractions and decimals will allow students to calculate prices and tax. ***Assess***				
Assessments	**Formative Assessments** (During Project)	Quizzes/Tests	X		
		Journaling/Learning Log			
		Preliminary Plans/Outlines			
		Rough Drafts			
		Other	X		
	Summative Assessments (End of Project, identify content areas to be covered) ***NOTE:*** *The end of PBL Summative Assessments do NOT replace The Project.*	Written Product(s), with rubric		Other Products	
		Oral Presentation, with rubric	X	Peer Evaluation	X
		Multiple Choice/Short Answer Test	X	Self-Evaluation	X
		Essay Test		Other	

Resources Needed	**On-site people, facilities**	
	Equipment	Chromebooks, Internet Access
	Materials	Personal Google Accounts, Poster Board, rulers, markers
	Community resources	

Reflection Methods	(Individual, Group, and/or Whole Class)	Journal/Learning Log		Focus Group	X
		Whole-class Discussion	X	Fishbowl Discussion	
		Survey		Other	

Project Teaching and Learning Guide

Knowledge and Skills Needed by Students
(to successfully complete culminating projects and to do well on summative assessments)

Student needs to be able to:	**Student needs to be able to:**

Add and subtract decimals by lining up the place value and utilizing previously learned regrouping concepts	Add and subtract fractions by using common factor concepts, regrouping, and different versions of fractions.
Student needs to be able to: Multiply decimals by using multiplication concepts and counting deeper understanding of base 10 value.	**Student needs to be able to:** Multiply fractions by using mixed and improper conversions while multiplying numerators and numerators.
Student needs to be able to: Divide decimals by converting the divisor to a whole number and moving the decimal in the dividend using base 10 concepts. It is essential to line the place value up with the quotient.	**Student needs to be able to:** Dividing fractions is similar to multiplying fractions. The difference is that you reciprocate the divisor and perform multiplication concepts.
Questions to be Provided by the Project Teacher **(to successfully complete culminating products and to do well on summative assessments)**	
Teacher asks questions to recall facts, make observations, or demonstrate understanding: What can you recall about adding and subtracting decimals? How do you add or subtract fractions? How would you define each of the above in your own terms?	**Teacher asks questions to summarize, analyze, organize, or evaluate:** How are adding and subtracting of decimal and fractions similar? Different? What's another way we could express our solution? Why did division change to multiplication in fractions?
Teacher asks questions to apply or relate: How do you know your answer is correct? Can you apply what you know to this real world problem? How does this relate to our project?	**Teacher asks questions to predict, design, or create:** How could you teach that to others? How would you do it differently? If you had access to unlimited resources, how would you have completed the task? How could you compose a story to help memorize the processes for adding, subtracting, multiplying, and dividing rational numbers.

Teacher Reflection: **How did the unit flow? What worked well? What needs to be changed for next time? What did the students learn? What evidence do you have to support student's learning?** **To Be Continued....**	