Teacher Candidate Sample
(Note: This student selected the math work station "Differences and Dice" that was described by Diller (2011) in our course reading.)

Task 2: Prepare a Math Work Station
<u>Math Work Station Description</u>
1. Differences and Dice
2. 2nd grade work station
   - [NBT.B.5] Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
   - Mathematical Practices:
     1. Make sense of problems and preserve in solving them
     4. Model with mathematics
     5. Use tools strategically
     6. Attend to precision
3. Directions:
   - Take the supplies out of the plastic bin. Each student should get ONE recording sheet and write his or her name on it.
   - Place NINE cards from the deck face up on the ground and put the rest face down in a stack next to you.
   - Roll the dice. Whoever gets the highest number is player #1 and gets to go first.
   - Player #1 will roll the dice. Then choose TWO cards with a difference that is equal to the number on the dice that you rolled (King, Queen, or Jack equals 11, an Ace equals 1). You will keep these cards.
   - If you can't find two cards that have a difference of the number you rolled, then roll again.
   - Use the math talk card to SHARE your subtraction sentence with your partner then WRITE your subtraction sentence on your recording sheet. Make sure to DRAW a picture beneath your number sentence that shows me how you got your answer.
   - Replace the two empty card spots with TWO new cards from the face down deck.
   - It is now player #2's turn. Repeat these steps until you are out of cards in the deck. If you run out of cards before it is time to move on then shuffle the deck and start over.
4. Materials:
   - 1 dice
   - 1 set of playing cards (Ace=1, King, Queen, Jack=11)
   - 20+ copies of the subtraction recording sheet
   - 1 laminated math talk card: "I can take ____ and ____ because their difference is ____."
   - 1 laminated math talk card completed as an example

5. Assessment: The students will be assessed individually based upon the completion of the recording sheet. The teacher will assess the number sentence, answer, and visual representation of the number sentence. Each question will be worth 3 points based on these three important elements.

**Task 4: Analyze Students' Mathematical Thinking and Engagement**

A. Three Photographs with Two Paragraph Captions

I chose this picture because it encompassed the way that this student used mathematical vocabulary throughout this math work station. I observed that most students were confused about the word *difference* when they were reading the "Differences and Dice" directions, but as soon as they looked at the math talk card example, this word made sense. This student particularly used the math talk card every time he created a subtraction sentence as a means of support to share the sentence he created with his partner. This picture represents this student's ability to put his thought process and mathematical understanding into oral language. The student in this picture said, "I can take 5 and 1 because their difference is 4." This showed me that the student understood the order of the numbers in the sentence as well as how to solve the subtraction sentence. This picture also shows me that the student was able to create a

subtraction sentence when given a difference from rolling a dice and choosing from numerical playing cards. What stood out in this picture is that this student physically held the math talk card to help him share his subtraction sentence that he created from the cards in his other hand. There is not proof that the student was able to write this sentence in numerical form or represent this subtraction sentence in model form because the student had not reached this point in his turn yet.

This student is within the counting phase; however, he is approaching the transitional phase of the OGAP additive framework based upon this student's completed models and teacher observations of how this student interacted with each model. The next steps for this student would be to provide explicit instruction of mathematics academic vocabulary and reviewing the purpose and proper use of array models as mathematical supports. This student really benefited from the support of the math talk card so I think this student would benefit from structured practice and application of mathematics vocabulary to connect the content to oral language. Based upon this student's work, I also think that this student should start working with numbers ranging from 1-20 because as soon as he got familiarized with the game, the student quickly created appropriate subtraction sentences. I would also want to observe this student when solving more difficult subtraction problems to see if he is implementing different strategies than the ones he was doing during this math work station. This student marked the circles in his models by 1s; however, based upon how he designed his arrays, I think this student would benefit from explicit strategy instruction related to skip counting. I would then
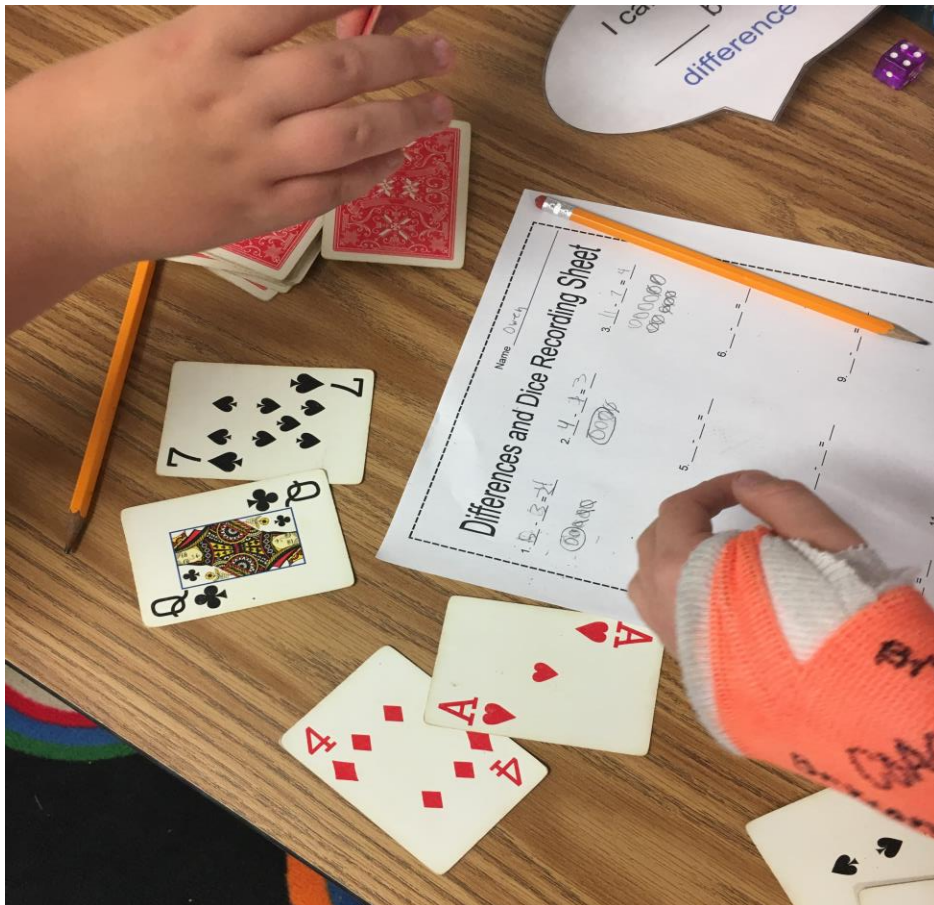
want to connect skip counting to arrays since this student seems to understand how to create uniform arrays, in order to increase model efficiency.

I chose this photograph because in this picture you can see that the student is showing progression in learning. The student started off creating one-digit by one-digit subtraction sentences (5-3=2 and 4-1=3) in round 1 and 2; however, once the student had gotten acclimated to the game, the students chose to create a two-digit by one-digit subtraction sentence (11-7=4) using a face card from the deck during round 3. This proves that the student is able to solve one-digit by one-digit subtraction problems and at least some one-digit from two-digit subtraction problems. Another reason I chose this picture was because this student utilized the strategy of circling his answer to represent the difference in his hand-drawn models. This shows that the student understands what the subtraction sentence means and can identify the difference rather than the subtrahend or minuend as the answer. There is not evidence of the students' ability to subtract one-digit numbers from larger two-digit numbers or two-digit numbers from two-digit numbers. There is also not evidence that the student understands the array model as an efficient model for solving problems because the students solved all of his problems by counting by 1s.

This student is within the counting phase according to the OGAP additive framework; however, he is progressing into the transitional phase based upon his efficiency in problem solving and strategy use. The next steps for this student would be to introduce and begin subtracting one-digit or two-digit numbers from larger two-digit numbers and reviewing array models. This student proved that he was able to solve one-digit by one-digit subtraction problems accurately. I would want to challenge this student in a small group to start working on subtraction of larger numbers, while still practicing one-digit by one-digit subtraction in order to become fluent. Another step that I would take with this student would be related to this students' array model knowledge. This student did not utilize an array, but rather used unorganized groups of objects. I would want to work with this student in creating arrays and using them effectively to solve problems through story problems and simple addition and subtraction sentences.
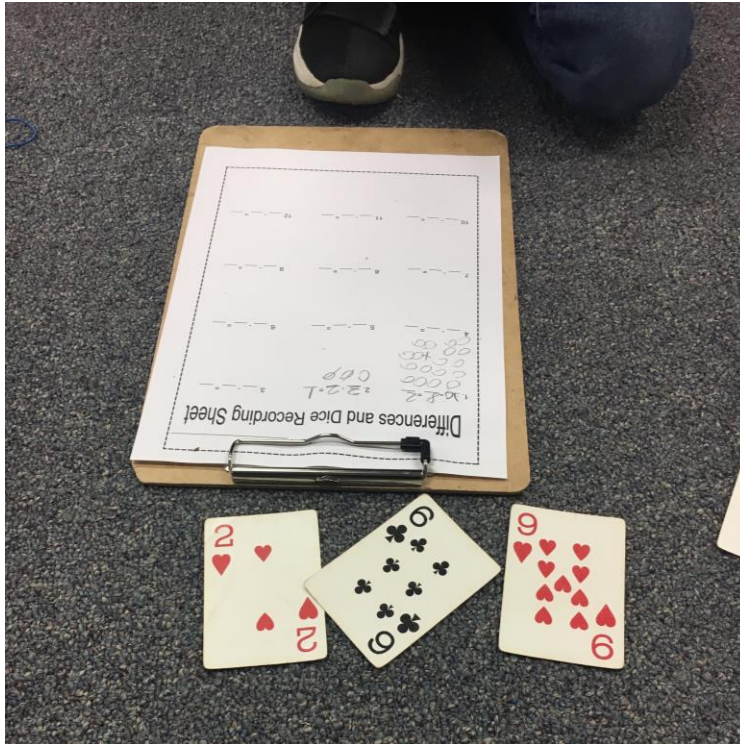
  I chose this photograph because it shows a misconception that is common among younger students. This student initially wrote a correct subtraction sentence; however, he showed a model that represented an addition sentence. Subtraction and addition can be confusing for students in the early grades to differentiate. This student wrote down the sentence 10-8=2 and then drew 10 circles plus 8 circles. This student was not able to draw a model that was representative of the appropriate subtraction sentence that he created and solved mentally. This student then shared with his partner that he drew 10 circles plus 8 circles. His partner did not catch this error. After this student completed another round of the game he noticed his error that he previously made and corrected it. Based on round number 2, this student can solve simple subtraction sentences and model his work. This picture itself does not show that this student can solve subtraction problems where one-digit numbers are taken away from two-digit numbers. This picture doesn't show the student's ability to correct his errors that I observed in person; however, this student was able to correct this error later on during the math work station.

  This student is within the counting phase of the OGAP additive framework based upon my observations of this student's thought process. The next steps for this student involve maintenance in differentiating addition and subtraction and spending time working on models as an effective mathematical strategy. This student completes a timed mathematics test each week so I would want to review his ability to differentiate between subtraction and addition on those tests in order to see if this was an isolated error. If this were a frequent error, I would begin working on differentiating addition and subtraction problems through explicit small group instruction with this student where he was working on both addition and subtraction problems. This would take practice; however, it is a vital skill in making mathematical progress to more difficult addition and subtraction problems. I would then want to spend some time reviewing different models that students

can use to support their mathematical learning. I would review how to create and use arrays and work on story problems while drawing concrete objects as models for both addition and subtraction. This student proved that he could complete one-digit minus one-digit subtraction problems. I would want to focus on mastery of one-digit by one-digit subtraction problems because of this student struggled throughout this math work station. I would want to utilize explicit strategy instruction to do this.

B. Standards of Mathematical Practice Paragraph

The students were engaging in mathematical practice #1 (make sense of problems and preserves in solving them), #4 (model with mathematics), #5 (use tools strategically), and #6 (attend to precision) throughout this math work station. The students were engaging in making sense of problems and persevering in solving them throughout the work station when they had to create a subtraction sentence when only given a difference. This encouraged students to think critically and work with the numbers that they had to create an appropriate subtraction sentence. This can be a difficult task especially if students were using face cards (=11) or aces (=1) because they had the translate the symbol to a number and then create a subtraction sentence that would have the difference that they rolled; therefore, this process took perseverance from many students. For example, one student created the subtraction sentence 11-9=2 using a Queen; however, it took him significantly more time to create this sentence because he used larger numbers. The students were modeling with mathematics as they created their own models that matched the subtraction sentence that they created. This was an open-ended model; therefore, the students could use any type of model they wanted. Most students used an array or simple list of shapes and then marked out the appropriate number of objects. Some students circled their answer, which showed the use of another effective strategy. The students were engaging in using tools strategically when they used only pencil and paper to solve their subtraction sentences. Paper and pencil are tools that are often used; however, they must be used appropriately to solve problems effectively and efficiently. The students also utilized the tool of a math talk card strategically to share their subtraction sentences orally. Sometimes this oral exchange helped students identify errors in their thinking. For example, one student realized that he wrote the order of the numbers in his subtraction sentence incorrectly once he shared it aloud. The students had to attend to precision throughout the math work station as they created subtraction sentences. The students had to be precise in the creation of their subtraction sentences to create a sentence that had the appropriate difference. For example, one student chose to use an Ace (=1) and a 5 to create the difference of 4. This student had to be precise and thoughtful in the creation of his sentence to create a subtraction sentence that was accurate.

C. Mathematical Language Paragraph

Every student who engaged in my math work station used mathematical language during each round of "Differences and Dice." The students would fill in the stem, "I can take ___ and ____ because their *difference* is ____" before they wrote down their subtraction sentence on their recording sheet. The students shared this oral statement with their partner to explain their choice of cards based on the number that they rolled as the difference. My station supported students' mathematical vocabulary use because of this

math talk card. In the directions for this math work station, the students were instructed to use the math talk card to share their sentence aloud before they recorded their subtraction sentence. This added support helped students clear up errors and misconceptions before they wrote them down and drew a model of their subtraction sentence. Initially, most students were confused about the word "difference" even though my cooperating teacher uses this academic vocabulary frequently. In the instructions I used the term "difference" and "equals" within the same sentence. This helped students better understand the term difference based on context clues. In the future I would want to encourage more student-to-student discourse by having students create subtraction sentences together. This station was set up more like a competitive game so the students were not working together and discussing as much as I wished they were. I would have had students work together to create either a subtraction sentence with the difference they rolled or had students try to each create a different subtraction sentence with the difference they had rolled. This adjustment would have had students engaging in discourse more frequently while also having students think critically and identify multiple ways to reach a certain difference. Another change I would have included to increase student-to-student discourse would be to include an extra element to the game where students are checking each other's work for correctness and explaining their thoughts aloud. On one occasion a student made an error and his partner did not catch it so I think this added support would have benefited most students.

D. Future Math Work Stations

After implementing this math work station, I can honestly say that math work stations are extremely engaging for students. The students in my class don't take part in math centers or work stations so the novelty of this work station naturally engaged them. Math work stations allow for students to work on mathematics; however, they may not even realize it because they are having so much fun. Based on observations, there are a few things that I would change about this work station in particular. The first thing I would change would be the instructions. I feel like the instructions used grade-level and age-appropriate language; however, they were long and detailed. Students often tried to read all of the directions rather than try to complete what each step said after reading it so it ended up taking students awhile to get started. Once the students have mastered subtraction from 1-11, I would want to adapt this math work station to more difficult skills. I would start to incorporate larger numbers by having students choose multiple numbers and dice based on place value. For example, a student could pull a 1 and 2 and create 12 or 21.I would also want to incorporate addition and subtraction into this workstation so that students are practicing and mastering multiple skills as well as differentiating operations.

In my future classroom I would want to verbally model the math station during a mini lesson at the beginning of the week for the younger students to decrease the time students spent trying to understand the math stations. I would include directions to help jog students' memory. One other thing I would change would be to allow for jokers or certain aces to act as 0s. I had one student who wanted to create a subtraction sentence using 4-0=4, but I didn't have a card that was equal to 0 in the deck. I would also want to differentiate this work station for students. As I observed students engaging in my work

station I realized that this skill was tough for some students because of the face cards and ace playing cards; however, this work station was too easy for some students. For students who were below-level, I would want to remove these cards and limit them to 1-10 and provide more support by pairing them purposefully with an on-level student. I would then want to challenge the above-level students by having students roll two dice, find the sum, and then create a subtraction sentence that had that sum using as many cards as needed. This would allow students to create two-digit by one-digit or two-digit by two-digit subtraction sentences. Overall in my future classroom, I would want to pair students up purposefully, model the math stations at the beginning of the week, and differentiate the station depending on students' specific needs.

Scored Rubric for Teacher Candidate Sample

	4	3	2	1
Content Standard	The game/activity specifically meets the content standard.	The game/activity generally connects to ideas in the content standard.	A content standard is included but it does not connect to the game/activity.	There is no content standard listed.
Standard of Mathematical Practice	There is a strong connection between the game/activity and the SMP students are engaged in.	The SMP connects weakly to the game/activity. There are other SMPs that students are more engaged in.	The SMP is included but a student would not be engaged in it during the game/activity.	There is no SMP listed.
Engaging for Grade Level	Students would really enjoy this station and be successful at the game/activity.	Students could be successful at the game/activity, but they also might be bored.	Students might struggle to be stay engaged and/or be successful at this station.	There was no activity to be engaged in.
Directions	The directions were clear and easy for at a student in this grade level to follow.	The directions were clear and easy to follow, but may not have been grade level appropriate.	The directions were confusing, but I was able to still figure them out.	I didn't know what to do at the station.
List of manipulatives/ materials	The manipulatives/ materials make the mathematics in the activity/game accessible.	There is a list of manipulatives/ materials included and they are used at the station.	There is a list of manipulatives/ materials but they were not really utilized to do the activity/game.	There was no list of materials.
Assessment	The assessment is aligned to the content standard and would provide documentation of learning.	The assessment is somewhat aligned to the content standard OR that does not provide documentation of learning.	The assessment does not assess the content standard.	There was no assessment identified.
Mathematical Thinking	The focus of the station is clearly on the math and rigorous mathematical thinking.	The focus of the station is on the math and procedural mathematical thinking. Students could just be following a pattern/ procedure to do the activity.	The focus of the station is mostly just on doing something "fun." There really is not much math.	There was nothing to do at the station.
Station Materials		The station contained all of the materials, station name, & student names.	The station contains most of the materials, but some things were missing.	No station was built.

Photographs & Captions	Photograph 1		Photograph 2		Photograph 3	
- Included	**1**	0	**1**	0	**1**	0
- Description	**2** 1	0	**2** 1	0	**2** 1	0
- Instructional Decision	**2** 1	0	**2** 1	0	**2** 1	0
Standards of Mathematical Practice	**2**		1		0	
Mathematics Language	**2**		1		0	
Future Math Work Stations	**2**		1		0	
				Total Points		/21

Name:

Each Photograph with Captions 7 points each x3 = 21 points)
Included
1 Point	A photograph is included.
0 Points	A photograph is not included.

Description
2 Points	The description is detailed, focused on the mathematics, and highlights specifics parts of the picture.
1 Point	The description may lack some aspect.
0 Points	There is no description caption.

Instructional Decision
2 Points	Instructional decisions are specific to the student work and demonstrate knowledge of learning progressions.
1 Point	Instructional decisions are vague or general. They could be for any student.
0 Points	There is no instructional decision paragraph.

Standards of Mathematical Practice
2 Points	The paragraph unpacks at least two Standards of Mathematical Practice (title, description, example). The author specifically makes it clear why what the student did (example) can be classified as this Standard of Mathematical Practice.
1 Point	The paragraph discusses at least two Standards of Mathematical Practice (title, description, example) but may lack justification or has inaccuracies.
0 Points	The photograph lacks a description.

Mathematics Language

2 Points	The paragraph unpacks the mathematical language students were using at the math work station and has a strong focus on supporting student discourse.
1 Point	The paragraph summarizes the mathematical language students were using, but may not analyze discourse for patterns or consider how to support student discourse in the future.
0 Points	There is no paragraph about mathematics language.

Future Math Work Stations

2 Points	The paragraphs includes specific details and examples of what the teachers plans to do next time, and bases these decisions on evidence from this experience.
1 Point	The paragraphs includes some lessons learned or may lack details.
0 Points	There is no paragraph about future teaching practice using math work stations.