**Understanding By Design – Backwards Design Process**

**Katie Harris – ED 410**

Content Area: Math

Topic: Counting and Cardinality

Developmental Level: Kindergarten

Rationale: This lesson plan is designed to teach Counting and Cardinality to kindergarteners. It covers the ALSDE standards [K-CC3] and [K-CC4]. Through authentic experiences with hands on manipulatives in counting collections, the children will continue to develop number sense. This lesson follows the model of allowing the children to have experience with manipulatives, visual representations, and numerals when learning to count. Developmentally appropriate technology is also integrated throughout the lesson to increase the students’ engagement and build foundational technology skills by serving as a response system for assessment.

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| **Stage 1 – Desired Results** |
| **Content Standard(s):*** Write numbers from 0-20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects.) [K-CC3]
* Understand the relationship between numbers and quantities; connect counting to cardinality. [K-CC4]
* When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. [K-CC4a]
* Understand that the last number name sais tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. [K-CC4b]
* Understand that each successive number name refers to a quantity that is one larger. [K-CC4c]

**ITSE NETS Standard(s):**For Students* Technology Productivity Tools – use technology tools to enhance learning, increase productivity, and promote creativity
* Technology Research Tools – use technology tolls to process data and report results

For Teachers* Planning and Designing Learning Environments and Experiences – design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners
* Planning and Designing Learning Environments and Experiences – apply current research on teaching and learning with technology when planning learning environments and experiences
* Teaching, Learning, and the Curriculum – facilitate technology-enhanced experiences that address content standards and student technology standards
* Assessment and Evaluation – use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning

**P21 Outcome(s):*** Content Knowledge and 21st Century Themes
* Learning and Innovation Skills
* Information, Media, and Technology Skills
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| **Understanding (s)/goals**Students will understand that:* Numbers relate to actual, physical amount of objects.
* Counting helps us make sense of our world.
* Many different kinds of objects can be counted.

Students will know:* Students will know that numbers represent quantities.
* Students will know that each number that follows the last, when counting, means the quantity has increased by one.
* Counting collections may contain different objects but still have the same number of objects.
 | **Essential Question(s):*** Why is counting important?
* What kinds of things in our world can we count?
* What are some different ways we can record the number of items we count?

Students will be able to:* Students will be able to count objects, connecting an “abstract” number to the “physical” quantity.
* Students will be able to indicate their knowledge of counting orally, by drawing, and numerically.
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| **Student objectives (outcomes):**Students will be able to:* Students will demonstrate counting from 0-20 with counting collections.
* Students will record their data using drawing and numbers.
* Students will report their numbers by responding through their iPads.
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| **Stage 2 – Assessment Evidence** |
| **Performance Task(s):*** Students will complete a whole group/small group activity in which each table group counts the same counting collection aloud as the teacher does the same with virtual manipulatives on the Smart Board.
* Students will count individual counting collections (with all students having the same number of objects in each collection) and report their number to the teacher through polling.
 | **Other Evidence:*** Students will respond orally/in writing to the Essential Questions.
* Teacher will observe the students’ counting process.
* Students will describe both in writing and orally what has been counted in their collection.
* Students will respond by submitting their answer via iPad polling. (Students will have a chance to self-assess at this point in the lesson.)
* Students will complete an exit slip at the end of the lesson.
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| **Stage 3 – Learning Plan** |
| **Learning Activities:**[This is the core of your lesson plan and includes a listing describing in detail (usually in bullet or numbered form so easy to follow):* The teacher will introduce the lesson by asked some/all of the Essential Questions to determine the students’ prior knowledge and current level of understanding.
* The teacher will distribute jar and penny counting collections to each table that contains the same number of pennies.
* Each child will have a worksheet to record their finding both in drawing and numerically. (Combination of using manipulatives, visual representations, and the abstract numbers)
* The teacher will count the same number of pennies on the Smart Board using virtual manipulatives.
* The teacher and students will count aloud as they count the number of pennies contained in their counting collections. (This group experience will serve as a model for later individual work.)
* After counting aloud, the teacher will demonstrate the following dialogue with the students. The goal is for them to respond in a complete sentence, connecting that the number represents the number of pennies in the jar. (Numbers represent quantities of objects.)
* Teacher: “How many pennies are in the jar?”
* Student: “There are 12 pennies in the jar!”
* The children will record the number of pennies on their worksheet in both picture form and in number form.
* **To begin the individual exercise**, the teacher will distribute the classroom iPads.
* The teacher will then distribute different counting collections to each child. (all still containing the same number of items) (Giving them counting collections containing different kinds of objects helps them to understand that all kinds of objects can be counted and that the same number of objects can look different depending on the object.)
* After counting the items individually, each child will use their iPad to submit the number of objects in their counting collection using a polling system such as Poll Everywhere. This will give them practice in recognizing the number they just counted in a list of other numbers that make up the options for the poll.
* The polling tool will quickly allow the teacher to see how many students in the class understand the lesson.
* Students will also still record their findings in drawing and numerically on the worksheet, reinforcing through drawing the number of objects that the number they record represents a quantity of objects.
* The students will complete an exit slip at the end of the lesson.
* The teacher will distribute sheets of printer paper. The students will demonstrate their knowledge of the Essential Questions, “Why is counting important?” and “What kinds of things in our world can we count?”
* The students will draw a way in which counting would be helpful in their world and write a little explanation of their drawing at the bottom if they would like.

**Continuation of the Lesson: Activity for Daily Center-Time*** The students will each have their own iPad to access the “Number Frames” app.
* Using the app, they can practice counting using the number frames and lots of fun manipulatives.
* Each student will be required to create at least three different Five Frame configuration and draw them in their math journal.

Example of a Five Frame from the “Number Frames” app: |

**Assessment Rubric:**

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| --- | --- | --- | --- |
|  | **3**The student is proficient in this area, and they demonstrate their knowledge in various forms of assessment.  | **2**The student has an understanding, but still lacks the ability to consistently demonstrate knowledge. | **1**The student does not demonstrate an understanding of the concept. |
| **The student can count** **from 0-20both aloud and** **silently.** |  |  |  |
| **The student demonstrates** **an understanding that** **numbers relate to quantities.** |  |  |  |
| **Students can represent** **quantity by visual** **representations** **(drawings).** |  |  |  |
| **The student can represent** **quantity numerically.** |  |  |  |
| **The student has an** **understanding of the** **Essential Questions** **introduced in the lesson. (Practical Lesson** **Applications)** |  |  |  |

**Resources:**

https://www.alsde.edu/sec/sct/COS/2015%20Revised%20Alabama%20Mathematics%20Course%20of%20Study.pdf

http://www.p21.org/our-work/p21-framework

http://www.kelloggllc.com/tpc/nets.pdf

AMSTI Training

https://www.edutopia.org/blog/10-apps-for-math-fluency-monica-burns

**My Checklist based on UbD Design Standards**

 Yes No ?

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| --- | --- | --- | --- |
| 1. Have I included the appropriate standards? | x |  |  |
| 2. Does my rationale include what the unit is about and what the standards will do? | x |  |  |
| 3. Are my Enduring Understandings important and appropriate? | x |  |  |
| 4. Do my Essential Questions match the Enduring Understandings? | x |  |  |
| 5. Are the Essential Questions open-ended? | x |  |  |
| 6. Are the Essential Questions really intriguing as written? Is this the kind of question a real kid or adult would be interested in? | x |  |  |
| 7. Does my knowledge section identify the important facts and concepts needed to “uncover” the Enduring Understandings? | x |  |  |
| 8. Do the assessments demand higher-level thinking? | x |  |  |
| 9. Does the Performance Task assess for student grasp of the Enduring Understandings? | x |  |  |
| 10. Is the Performance Task authentic? | x |  |  |
| 11. Did I include an appropriate rubric(s)? | x |  |  |
| 12. Are all 3 stages aligned? (Enduring Understandings, Essential Questions, Knowledge, Skills, Assessment, and Learning Activities) | x |  |  |
| 13. Is there enough assessment evidence? | x |  |  |
| 14. Does the unit include student self-assessment and/or reflection? | x |  |  |
| 15. Is there sufficient variety, choice – differentiation? | x |  |  |
| 16. Do the Learning Activities have enough detail? | x |  |  |
| 17. Are the Learning Activities likely to be effective and engaging? | x |  |  |
| 18. Are *all* the Learning Activities necessary? | x |  |  |
| 19. Have I listed enough resources? |  |  |  |
| 20. Is there enough information/detail in this UbD unit for someone else to make sense of it and adapt it for themselves? | x |  |  |