5E Lesson Plan: Lucky Dip

Cal Teach Student Name(s): __Daniel Tsai_____

Grade Level and Subject: __9th-12th_____

Lesson Source(s):	The lesson is a modified version of a lesson plan developed by MAP (Mathematics Assessment Project) See http://map.mathshell.org/ for more information.
Focus/Essential Question:	• Understand conditional probability. • Represent events as a subset of a sample space using tables and tree diagrams. • Communicate their reasoning clearly.
Student Learning Objectives:	• Understand independence of conditional probability and use them to interpret data. • Calculate expected values and use them to solve problems.
California State Standards:	**Common Core State Standards** (CCSS) *Mathematical Practices in the CCSS for Mathematics*: 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.
Student Prior Knowledge:	Students can have a brief overview of conditional probability, but it is not crucial. The most important thing is for the students to understand what is going on in this "Lucky Dip" scenario, giving students a chance to assess the problem themselves.
Lesson Agenda for Your Students:	• Ask for two volunteers (one to role-play as Dominic, and one to role-play as Amy) • Narrate the story with the bag and balls • Hand out individual worksheets • Discussion in pairs • Whole class comes back together. Ask "Amy" and "Dominic" to come up to actually role-play the game. They will go through the game at least ten times. • Class discussion then wrap-up
Lesson Rationale:	By attempting to solve the "Lucky Dip" problem, students are encouraged to think about conditional probability concepts to determine whether Dominic or Amy has the bigger advantage.

Date/Time to be Taught: __December 2013_____

Materials and Technology List:	*Handouts*: Worksheet that includes: • Dominic's game • Pre-assessment questions (individual solution) • Joint solution (with partner) • Discussion section *In opaque bag* (one for the whole class): 3 black balls and 3 white balls
Preparation Tasks:	Photocopy handouts. Bring the bag and balls for a demo.
Safety Concerns:	Only safety concerns are with the bag and balls for the pairs. However, high school students should be mature enough to be safe with them.

5E Lesson Plan, continued: *Write the lesson plan as you would give it, providing yourself with a tool that summarizes flow and transitions, records age-appropriate wording for all instructions and prompts, and describes what you expect students to be doing and/or talking about at key points.*

Lesson Title: __Lucky Dip_____

	Evaluate: *Observe and adjust your lesson as you teach.*
Engage: *Activities that engage students' interest and build connections to their lives and prior knowledge.*	*Previous Experience and Baseline Learning*
The role-playing demo will allow students to see what the starting point of the story is like. Narrate Dominic's explanation of the game to Amy, but don't actually let Amy start the game. Dominic wins the game if Amy draws Ask the students whether or not they think the game is fair. Who is more likely to win? Dominic or Amy? (individual pre-assessment) **Time:** 10-15 minutes	Be sure everyone understands the game that Dominic devised. Each student will do an individual pre-assessment.
Explore: *Hands-on task designed to explore ideas and to develop skills together.*	*Focus, Involvement, Collaboration, Results, and Recording*
Get students into pairs to discuss: • What you like/dislike about your partners' math. • Any assumptions your partner has made. • How their work could be improved. After the pairs had some time to discuss, invite "Amy" and "Dominic" to come to the front of the class. They will role-play the game to the class: Amy will draw 2 balls from the bag, and the story will be repeated at least 10 times. On the board, record these results. **Time:** 20-25 minutes	After discussing, the pairs should develop a joint solution that supposedly would be better than their separate solutions. During this time, students have a chance to see if what they predicted would happen really is happening.
Explain: *Students explain the phenomena they explored and discuss their different ideas and perspectives.*	*Participation, Reporting, Debating, and Evidence-Based Reasoning*
After the role-play, students are given a chance to change their answers/math. If they do though, they should explain why they did. **Time:** 10 minutes	Allow students to have an open discussion. However, be conscious of group dynamics, giving students that are less outspoken a chance too.
Elaborate: *Teacher-stimulated application and clarification of concepts, skills, attitudes, processes or terminology.*	*Demonstrated Understanding, Use of Skills, and Other Applications*

Ask students if they ever played a game that stacked against them. Tell them that if they know conditional probability well, then they will be able to make more calculated risks. Let the class know the right answer to the question. **Time:** 5 minutes	The idea of this is to give students motivation to learn and understand conditional probability well. If someone already brought up the right answer, acknowledge it. If not, spend some time explaining it.