Lesson: Determining Truth Values, Counterexamples, Justifications for Statements

Unit: Logic and Proofs

1. Benchmark/Standards:
   1. [CCSS.Math.Practice.MP2](http://www.corestandards.org/Math/Practice/MP2) Reason abstractly and quantitatively.
   2. [CCSS.Math.Practice.MP3](http://www.corestandards.org/Math/Practice/MP3) Construct viable arguments and critique the reasoning of others.
2. Behavioral Objectives: After this lesson, students will be able to evaluate conditional statements as true or false based on a truth table. Students will also be able to write conditional statements and determine counterexamples for statements they find to be false.
3. Anticipatory Set
   1. Add the biconditional statement to their already created flip-book. Truth table activity involving given statements.
4. Objective/Purpose:
   1. Today, we will be working with truth tables to determine the validity of advertisements. Students will participate in a truth table activity to get their brains thinking about what it means for a statement to be true. Students will use this knowledge to put their advertising statements into a table with the statement’s given truth value and a justification of that decision.
5. Input
   1. Task Analysis:
      1. The learner should be able to determine the truth value of a statement that is given to them and apply this understanding to a statement they personally develop.
   2. Thinking Levels:
      1. Comprehension- Students will understand that false statements require the hypothesis to be true and the conclusion to be false. Students are able to give a justification for true statements and a counterexample for false sentences.
      2. Analysis- Students will show their knowledge of truth values through the use of whiteboards, discussion at their tables, and their ability to accurately fill out their statement table for their ongoing project.
   3. Learning Styles
      1. Interpersonal: Students will be working as a whole class and will be able to have guided learning time in a relaxed manner.
      2. Remediation: Students will be given a specific conditional statement to evaluate. During project work time, students can work on the computer or use their books for notes.
      3. Visual: Students will be given statements in “p” and “q” form first and then given the associated statement.
      4. Extension: Students will be asked to use their knowledge of writing various statements and determining their truth values on their chapter project.
   4. Methods and Meanings
      1. Ways of presenting: We will be having a class activity involving immediate assessment through whiteboards. A class discussion will follow. Students will also have time to be in small groups to discuss their thoughts on a small scale.
      2. Materials needed: white board, Smart Board, worksheet, whiteboard markers, pencils.
6. Modeling
   1. We will use the Smart Board to display the conditional statements from a PowerPoint. Students will use individual whiteboards to show their comprehension. As a class we will write up the correct statements on the front board.
7. Checking for understanding
   1. What is a biconditional statement? What is an example?
   2. What is it mean to have a justification for a true statement?
   3. What is a truth table? How would you use a truth table in advertising?
   4. What is a counterexample? What is an example?
8. Guided Practice
   1. Students will engage in a class discussion at the start of class using whiteboards.
   2. Model to students how to determine the truth value of a statement.
   3. Students will work on their chapter 2 project with guided assistance.
   4. Teacher will circulate to answer questions and help extinguish any confusion.
9. Independent Practice
   1. Students will work on their chapter 2 project.
   2. Students will complete guidelines for the project at their own pace.
10. Closure
    1. Evaluate the effectiveness of the lesson based on the students’ success with the truth table activity by evaluating their statements table.
    2. Reflect on what worked and what can be changed and do so for the following school year.