Lesson plan format

1. Title of research lesson:

2. Authors:

3. Mathematical content/concepts addressed –

Foundation: required prior knowledge
Focus: math content of lesson
Future: this lesson provides foundation for …

4. Objectives:

May address Lesson Goals, Unit Goals, broad mathematical as well as non-mathematical goals, long term goals, mission and vision statements.

5. Research base:

Include resources and references as well as research questions, common student misconceptions to be addressed and specific teaching issues associated with this content.

6. Materials needed:

7. Instructional sequence

Learning activities & Key questions (with timing)	Expected student responses, questions, misconceptions	Teacher's support (follow-up questions/actions)	Formative assessments

8. Additional information:

- Related standards
- Relevant mathematical vocabulary

Goal: Formulate and test conjectures for pyramid/cone volume formula

Materials needed: Beans, hollow shapes

Learning activities & Key questions (with timing)	Expected student responses, questions, misconceptions	Teacher's support (follow-up questions/actions)	Formative assessments
Review volume of prisms/ cylinders (recently discussed)	Some students say "L×W×H" instead of "Base Area × Height"	What about a cylinder? (present cylinder as counter example)	All students show that V = Base Area × Height
Show that a right prism and right prism w/ same height and congruent bases. "How many times bigger is the volume of the prism?"	Likely guess is 2 times bigger. Some students may correctly guess 3.	Encourage guesses and explanations. Do not give answer!	Visually check that each student is making a conjecture and
Students explore (using beans and hollow shapes, including oblique shapes) and record answers on the board.	Beans are not precise (e.g., 43 beans compared to 15 beans may not seem to be "3" times as big).	Discuss possible refining of the answer if a better unit (say # of grains of sand) had been used.	Students should recognize that the volume of the prism is *about* 3 times the volume of the pyramid.
If the volume of a prism is represented $V_1 = Bh$, how can we represent the volume (V_2) of a pyramid?	Some may think that $V_2 = 3Bh$. Others will see the correct solution. "2" thinkers may be confused why it isn't 2 times as big. Some students want a more thorough proof.	Pyramids have more volume than a prism? How might a cone be related to a cylinder? Showing the triangular prism that actually is twice as big can help. Rigorous proof (based on a limit approach) or provide reference. (mathforum.org/library/ drmath/view/55041.html)	All students should believe the $V_2 = (1/3)Bh$ formula. Ideally all students will apply the formula to cone/pyramid volume problems.

Source: Matthews, M.E., Hlas, C.S., & Finken, T.M. (2009). Using Lesson Study and four-column lesson planning with preservice teachers. *Mathematics Teacher*, *102*, 504-508.