

**BIG IDEAS FOR SCIENCE AND LITERACY**  
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by

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1. Science content is a fundamental ingredient of science and “science as inquiry” is one of the eight essential content standards highlighted in the National Science Education Standards. Since it underlies all the other seven content standards, it “is basic to science education and [is] a controlling principle in the ultimate organization and selection of students’ activities” (National Research Council, 1996). It is the basis of how we know in science, how a measurement or an observation was made, and of the degree of confidence in a scientific fact.
2. “Science inquiry involves investigating natural phenomena through experimentation, [observation], and/or higher order thinking (i.e. thinking that goes beyond mere recording of data or mechanically applying concepts.” (Lee & Paik, 2000).
3. Communication and discourse are an integral part of learning science as inquiry, inasmuch as they are a fundamental goal of literacy. Activities designed for students to develop abilities to do science inquiry, therefore, are a suitable vehicle for simultaneously developing abilities in literacy.
4. “Science discourse entails sharing scientific ideas, constructing collective understandings about science topics, and communicating scientific ideas and data in multiple representational formats” (e.g. words – spoken and written and read; numbers, charts, drawings, graphs, etc.) (Lee & Paik, 2000)
5. A model of a high quality science education for teachers first engages teachers themselves in educational activities designed to cultivate their abilities in science as inquiry and in the literacy associated with it, and then provides ample opportunities for collegial and assisted onsite applications of what they learn.

# A Model of Teacher Professional Development to Connect Science and Literacy

( Rebecca E. Dyasi, Ph.D.; Hubert M. Dyasi, Ph.D. )

## A Model of Teacher Professional Development to Connect Science and Literacy

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Connecting Science and Literacy in the Classroom  
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## Items of the presentation

- I. OVERVIEW OF SCIENCE CONTENT STANDARDS
- II. CASE FOR SCIENCE AND LITERACY
- III. A SUITABLE TEACHER PROFESSIONAL DEVELOPMENT MODEL
- IV. DISCOURSE ON THE MODEL

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UNIFYING CONCEPTS AND PROCESSES	systems, order, evidence, models, explanation; form and function; change, measurement, etc.
SCIENCE AS INQUIRY	abilities to do sc. inquiry; understanding about sc. inquiry
PHYSICAL SCIENCE	properties; position and motion; light, heat, electricity, etc.
LIFE SCIENCE	characteristics of organisms; life cycles; organisms and environments.
EARTH AND SPACE SCIENCE	properties; objects in the sky; changes in earth and sky
SCIENCE AND TECHNOLOGY	technology design; natural objects and objects made by humans.
SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES	personal health; populations; science and technology.
HISTORY AND NATURE OF SCIENCE	science as a human endeavor.

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## Case for science and literacy

1. Science content is fundamental ingredient of science and “science as inquiry” is one of the eight essential content standards highlighted in the National Science Education Standards. Since it underlies all the other seven content standards, it “is basic to science education and [is] a controlling principle in the ultimate organization and selection of students’ activities.”<sup>1</sup> It is the basis of how we know in science, how a measurement or an observation was made, and of the degree of confidence in a scientific fact.

1. National  
Research Council  
(1996).

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## Case for science and literacy (cont.)

2. “Science as inquiry involves investigating natural phenomena through experimentation, [observation], and/or higher order thinking (i.e. thinking that goes beyond mere recording of data or mechanically applying concepts.”

2. Lee & Park  
(2000)

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## Case for science and literacy (cont.)

3. Communication and discourse are an integral part of doing science as inquiry, inasmuch as it is a fundamental goal of literacy. Activities designed for students to develop abilities to do science inquiry, therefore, are a suitable vehicle for simultaneously developing abilities in literacy.

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Case for science and literacy  
(cont.)

4. "Science discourse entails sharing scientific ideas, constructing collective understandings about science topics, and communicating scientific ideas and data in multiple representational formats"<sup>2</sup> (e.g. words – spoken and written and read; numbers, charts, drawings, graphs, etc.)

2. Lee & Park  
(2000)

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Case for science and literacy  
(cont.)

5. A model of a high quality science education for teachers first engages teachers themselves in educational activities designed to cultivate their abilities in science as inquiry and in the literacy associated with it, and then provides ample opportunities for collegial and assisted onsite applications of what they learn.

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II. Model of Inquiry-based  
Science PD

- See Handout of Model

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## The Task

1. What will your first given name look like when written repeatedly from left to right, one letter per square on a five by five grid until all 25 squares are filled up?
2. When this task is completed please look for other participants that have the same shaded area of squares, seat together and as a group explore your pattern using the questions below and any other question your group generates.

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## Initial questions to guide your group observation and thinking

1. What do you notice about the pattern your name made?
2. What other patterns can you identify within your pattern?
3. How many times does your full name occur?
4. How many squares are shaded vs. not shaded?
5. How many ways can you organize and communicate the answer to question 4?
6. What questions do you have to further explore the given problem? Write the questions down on your chart paper.
7. Organize your group's work on a large sheet of paper for sharing with the whole group.

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## New question for each group to re-engage in an investigation.

- Using your first name, shading only the first letter of your name, writing your name left to right one letter per square, what one variable can your group change so that a selected name within the group can make the two different diagonals and vertical pattern on the board?
- OR
- Using your first name, shading only the first letter of your name, writing your name left to right one letter per square, what new patterns will your name make if you increase the number of squares you use to write your name? What happens if you decrease the number of squares?

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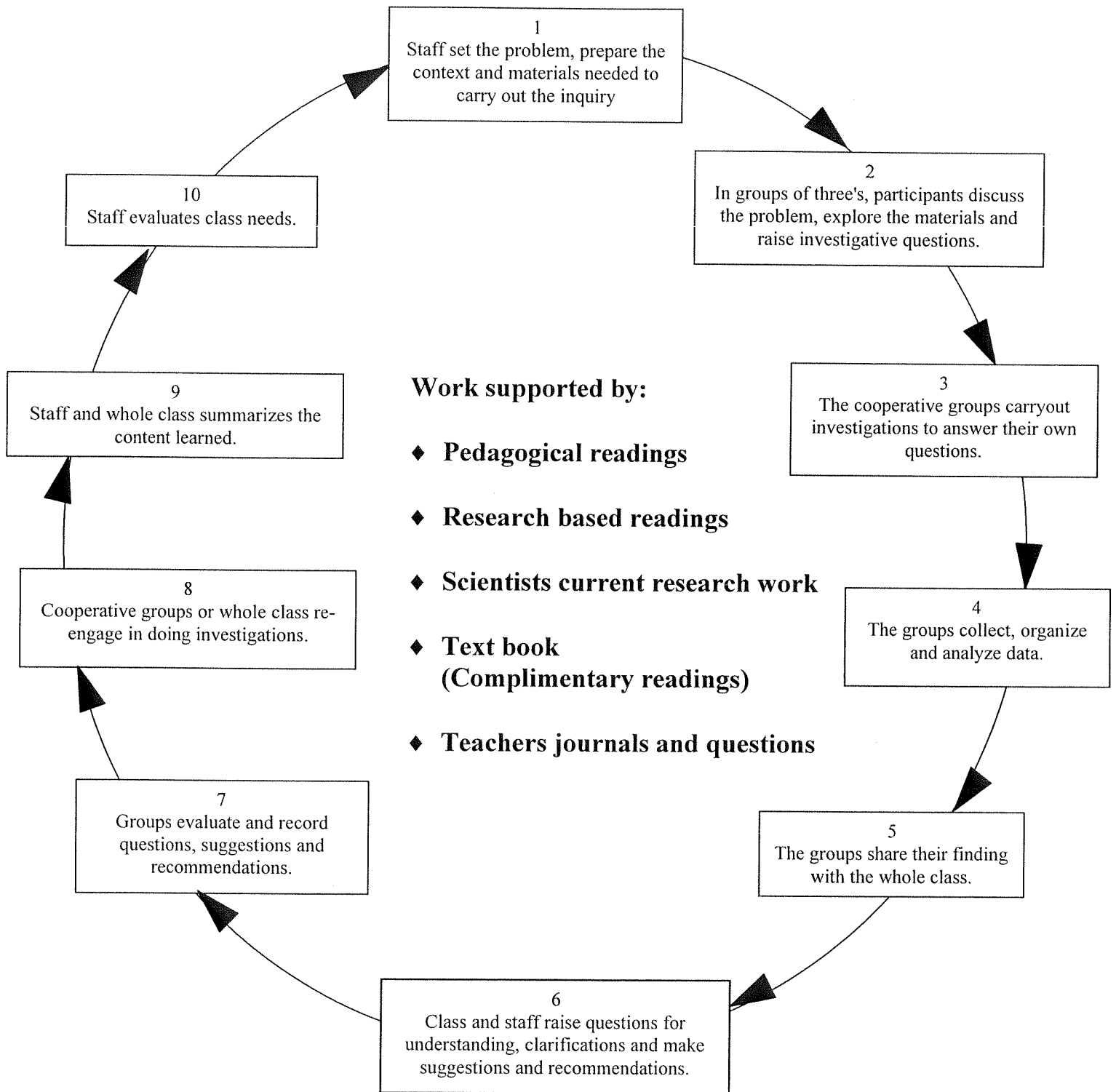
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## Science Inquiry Professional Development for Teachers: Phase I.



## Science Inquiry Problem

1. What will your first given name look like when written repeatedly from left to right, one letter per square on a 5x5 grid until all 25 squares are filled up?
2. When this task is completed please look for other participants who have the same shaded area of squares as yours, seat together and as a group explore your pattern using the questions below and any other questions your group generates.

### *Initial questions to guide your group observation and thinking*

1. What do you notice about the pattern your name has formed?
2. What other patterns can you identify within your pattern?
3. How many times does your full name occur?
4. How many squares are shaded, and how many are not?
5. In how many ways can you organize and communicate the answer to question 4?
6. What questions do you have to further explore the problem? Write the questions down on chart paper.
7. Organize your group's work on a large sheet of paper for sharing with the whole group.

## Science Inquiry Problem (cont.)

*New question for each group to re-engage in an investigation*

Using your first name, shading only the first letter of your name, writing your name left to right one letter per square, what one variable can your group change so that a selected name within the group can make the two different diagonal and vertical patterns on the board?

**OR**

Using your first name, shading only the first letter of your name, writing your name left to right one letter per square, what new patterns will your name make if you increase the number of squares you use to write your name? What new patterns arise if you decrease the number of squares?