## Chapter 4

### COGNITIVE DEVELOPMENT 1: PIAGET AND VYGOTSKY

#### CHAPTER OUTLINE
- CASE STUDY: WHALE WATCHING
- PIAGET’S THEORY OF COGNITIVE DEVELOPMENT
  - Key Ideas in Piaget’s Theory
  - Piaget’s Stages of Cognitive Development
  - Current Perspectives on Piaget’s Theory
  - Educational Implications of Piaget’s Theory and Post-Piagetian Research
- VYGOTSKY’S THEORY OF COGNITIVE DEVELOPMENT
  - Key Ideas in Vygotsky’s Theory
  - Current Perspectives on Vygotsky’s Theory
  - Educational Implications of Vygotsky’s Ideas
- COMPARING PIAGET AND VYGOTSKY
  - Common Themes
- CASE STUDY: ADOLESCENT SCIENTISTS
- SUMMARY

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Common Student Beliefs and Misconceptions

- Some students will insist that they need to know only the characteristics of the age group at which they will be teaching—that they don’t need to consider those characteristics within the context of children’s overall development.
- Many students who have previously studied Piaget’s theory are likely to believe that his stages have been unequivocally validated by research.
- Introductory Psychology textbooks tend to present an unbalanced view of cognitive development. Piaget’s theory is often discussed to the neglect of Vygotsky’s theory and others’ theories.
- Students’ assumption that egocentrism is equivalent to “self-centeredness” is likely to interfere with Piaget’s meaning for this term.
- If students themselves exhibit aspects of concrete operational thinking, they will have difficulty understanding such formal operational capabilities as proportional thinking and reasoning about contrary-to-fact ideas.
- Students may believe that Piaget’s single contribution was the identification of stages. They are unfamiliar with his ideas about constructivism, adaptation, and so forth.

Concluding Case Study Analysis

A video and a CD simulation may be shown in conjunction with the Case Study: Adolescent Scientists at the conclusion of Chapter 4:
• Incorporate the viewing of the video *Designing Experiments in Seventh Grade* into this discussion. It shows seventh graders conducting experiments with a pendulum and Mr. Sowell providing teacher scaffolding.

• Assign use of “The Pendulum Experiment” on the *Simulations in Child Development* CD to students to practice and deepen their understanding of separating and controlling variables.

The following are the questions posed at the conclusion of the Adolescent Scientists case study, and suggested responses:

1. In what ways does Mr. Sowell scaffold the students’ efforts during the lab activity?
   He asks several questions that encourage the students to revise and reconsider their findings. He points out that they have simultaneously changed both length and weight and asks, “Why can’t you come to a conclusion by looking at the two frequencies?” He guides them toward identifying an error in their reasoning and then asks, “Can you think of a way to redesign your experiments so that you’re only changing weight?” In general, he guides them in their thinking but does not specifically tell them the “right” answer.

2. With which one of Piaget’s stages is the students’ reasoning most consistent, and why?
   Their reasoning is consistent with Piaget’s concrete operations stage, in which children have difficulty separating and controlling variables.

3. Use one or more of Piaget’s ideas to explain why Marina persists in her belief that weight affects a pendulum’s frequency, despite evidence to the contrary.
   Marina does not notice the inconsistency between what she has observed and what she believes to be true. In other words, she does not experience disequilibrium, and so she has no reason to undergo accommodation.

4. Drawing on post-Piagetian research findings, identify a task for which the students might be better able to separate and control variables.
   There are many possible answers to this question. In general, children are more likely to show formal operational reasoning with subject matter and tasks that are familiar to them.

**Video & Audio Material**

*Simulations in Child Development CD*: To better understand the role that the ability to separate and control variables plays in Piaget’s theory of cognitive development, students may conduct an experiment with a pendulum in “The Pendulum Experiment”, one of the virtual experiments provided on this CD-ROM. Note that this is a hands-on simulation of the experiment Mr. Sowell’s students conducted in the closing Case Study for Chapter 4.

**Brief Description**: The simulation lets students conduct virtual "experiments" with a pendulum. They can manipulate one or more of three variables (height of release, weight, and length), and the computer keeps an ongoing record of the oscillation rates that result. Following the student's experiment is an explanation of the role that the ability to separate and control variables plays in Piaget's theory of cognitive development. Implications for classroom teachers are presented. An optional "Educational Research" track introduces basic concepts and types of educational research and presents a research article concerning the effects of prior knowledge on children's ability to separate and control variables. Students can print out their responses and bring them to class. See the MultiMedia Guide for more detailed teaching instructions and information about the simulation.
Video segments available with this text: Suggested videos for Chapter 4 include:

(Refer to the outline at the beginning of this chapter for suggestions where to incorporate these videos in your lessons.)

**Double-Column Addition: A Teacher Uses Piaget’s Theory**
Portrays a second-grade classroom in which children invent and explain their own strategies for adding and subtracting two-digit numbers. Depicts the children discussing and defending a variety of creative strategies, many of which reflect a true conceptual understanding of place value. (This can also be used with Chapter 5.)

**Insights Into Learning: Using Balance Beams in Fourth Grade**
Shows fourth-graders working with weights and balance beams to discover how to make the two sides balance. Includes an in-depth study of several students’ reasoning, including two who quickly master the balance beam principle and two who do not.

**Insights Into Learning: Designing Experiments in Seventh Grade**
Shows seventh graders conducting experiments with a pendulum. Illustrates how middle school students often confound two or more variables when testing hypotheses and how, with considerable teacher scaffolding, they can be led to separate and control variables. Includes a transfer task as well.

**Insights Into Learning: Area in a Fifth-Grade Math Class**
Shows fifth graders working in small groups to determine the area of an irregular shape within the context of an authentic activity. Includes follow-up interview with several students to determine whether they can transfer what they’ve learned in the activity to new situations. (This can also be used with Chapter 5.)

**A Private Universe**
Illustrates the pervasiveness of misconceptions about two scientific phenomena—the seasons of the year and the phases of the moon—in high school students, college graduates, and Harvard University faculty members. One ninth-grader’s explanations and reasoning both before and after instruction are portrayed in depth.

**Merrill’s Observing Children in Classrooms Videos**

**ABCNews/Prentice Hall Child Development Videos**

Commercial videos for use with this chapter:


Discusses the work of Lev Vygotsky and Jean Piaget, showing the similarities and differences of their contributions to our understanding of the cognitive development of young children. Dr. Elkind uses their research and his own work to look at reasoning, visual perception and the use of language. Children are seen both in interviews and participating in a child care center.


Shows three successful public school classrooms: setting up an exemplary physical and organizational environment, making curriculum decisions and assessing child growth. There is variation in students’ socio-economic status, personalities of the teachers, and available resources among the classrooms, but they share a commonality in their pursuit of excellence.


Summarizes what is currently known about learning from brain research, cognitive development research, and contemporary educational practice. Designed to be used as an introduction to discussion of school and teaching practices, this video also serves as an introduction to the study of learning. Factors that lead to school success are presented.


Provides examples of how learning can be structured so children are active learners while teachers use their superior knowledge to meaningfully guide learning. Discusses Vygotsky’s concept of the Zone of Proximal Development (ZPD). Three essential elements of scaffolding are explained and demonstrated as children in four urban classrooms become more responsible for their learning.


Presents the life, vocabulary, and concepts of Lev Vygotsky. The video illustrates four basic concepts integral to his work: Children construct knowledge, learning can lead development, development cannot be separated from its social context, and language plays a central role in cognitive development. Lively classroom examples enable students, teachers in training, and classroom teachers to incorporate these concepts into their understanding of child development. With Elena Bodrova and Deborah Leong.


Includes footage in a public middle school and interviews, revealing the intellectual challenges of adolescents, who are constructing personal identities and new mental capacities. Describes the intellectual, emotional and social consequences that result from the changes in thinking.
Transparencies

These transparencies are also available on the CD PowerPoint Slides.

Transparency 4-1: Key Ideas in Piaget’s Theory
Transparency 4-2: Piaget’s Stages of Cognitive Development (Figure 4-1)
Transparency 4-3: Preoperational Versus Concrete Operational Thought (Table 4-1)
Transparency 4-4: Concrete Operational Versus Formal Operational Thinking (Table 4-2)
Transparency 4-5: Key Ideas in Vygotsky’s Theory
Transparency 4-6: Developmental Trends: Thinking and Reasoning Skills at Different Ages (2-6, 6-10)
Transparency 4-7: Developmental Trends: Thinking & Reasoning Skills at Different Ages (10-14, 14-18)

Handouts

These handouts are located at the end of the Instructor’s Manual.

Handout 4-1: Classroom Observation: Observing Thinking and Reasoning Skills at Different Ages
Handout 4-2: Classroom Observation: Guidelines for Assessing Young Children’s Play Activities
Handout 4-3: Conservation Tasks for Elementary Students

Discussion Topics

1. Why do children who are between ages seven and 11 perform more accurately on conservation related tasks than preschool-age children? Or alternatively, Why is it so difficult for preoperational children to understand conservation?

   **Answer:** In general, cognitive and developmental psychologists believe that with increasing age, the ability to manipulate internal images improves, which allows for attending to one facet of the problem while simultaneously attending to other facets. Piaget would say that as children develop they become increasingly better at organizing and integrating their thought processes.

2. Explain how a child’s cultural background can influence the age at which various task competencies emerge.

   **Answer:** Because of increased or decreased familiarity with a particular task (e.g., the textbook example of Mexican children whose families involved their children in the family business of making pottery), environment can affect when certain task competencies emerge. Ask students to generate examples from their own lives.

3. How can teachers help their students develop a greater repertoire of problem-solving skills, critical thinking skills, self-sufficiency, and increase their knowledge base?

   (Answers may be based on concepts associated with Vygotsky, such as zone of proximal development, scaffolding, his sociocultural theory that people and artifacts support cognitive development, etc. Some concrete examples are reading a more difficult level of book or trying a new book genre, completing more challenging story problems in math, and exploring solutions to problems in science.)
Classroom Observations
There are many tools provided in this chapter to assist students in your class with observing children’s development in classrooms, if that opportunity arises. They may use Handouts 4-1 and 4-2 in classroom observations. They may also replicate a conservation of area task using instructions in Figure 4-6 in the textbook. Finally, see the Cooperative Learning Activity and the “Create a Game or Make a Toy” activity presented later in this chapter.

In-class Activity #1: Water-Level Topic
This is an activity that will allow students to examine their own cognitive processes. You will briefly introduce it, students will participate by completing the activity quickly, and discussion will follow.

• Hand draw two bottles (such as a plastic 1-liter cola bottle) on one 8” x 11” piece of paper. The first bottle is completely horizontal (as if you tipped it over on a table it would be on its side). The second bottle is drawn at a 45-degree angle.
• Give each student a copy. Give the class the following verbal instructions: “These bottles are half full of water. Draw the water-level line for each bottle so that the pictures illustrate that they are half full.”
• Give them a minute to complete this part of the task. Once everyone has completed marking the water-level lines, ask them to write their gender at the top of the page. (Tell the class this after they’ve made their marks to reduce alerting them to the possibility that there might be a gender difference.)

If your class is typical, more men than women will mark the lines on their bottles parallel to the ground (i.e., the water line will be horizontal to the bottom of the page whether the bottle is tipped or upright.) This depiction reflects a basic understanding of the concept of gravity and an application of this concept, consciously or unconsciously, in their drawing of their water lines. (For research on the gender differences in the performance of such tasks, see Robert & Chaperon, 1989; Thomas, Jamison, & Hummel, 1973; Wittig & Allen, 1984.)

• Collect the papers or show students an example of a drawing with the water lines horizontal to the floor and ask students to raise their hands if they drew their water lines the same way. Then see if there are percentage differences between the way in which the men and women within the class performed these tasks—e.g., 70% of the men drew their lines horizontal to the bottom of their papers, while only 50% of the women did.

• Discuss with your class why this difference exists. Even if your class does not demonstrate a difference, you can explain that a difference usually does exist and then ask the class to discuss why. Why are men more likely in this instance to incorporate the concept of gravity into their pictures and to produce a more accurate depiction of how this phenomenon occurs in the real world? The discussion should address such issues as the different types of environmental influences (e.g., video games) that men and women tend to be exposed to. Have the class tie their discussion back to Piaget’s concepts of adaptation, assimilation, accommodation, and equilibration.

• Two references you can share with your students include:
In-class Activity #2: Carl Berger’s (1976) research titled: A Piagetian Like Task Considering the Double Variables of Mass and Volume by Preservice and Inservice Elementary School Science Teachers

First Volume Displacement Task

Materials: Two metal rods of equal volume, but different weight
Previous studies used rods that weighed 18 grams and 55 grams, but were equal in height and thickness. Two graduated cylinders (a container that’s marked with divisions or units of measurement) partially filled with equal amounts of water. You might try contacting faculty in the science department to borrow the equipment.

Procedure: If you can gather enough materials, have the students form pairs or small groups. If this isn’t possible you can ask for five volunteers and have them wait outside the classroom, conducting the experiment with one volunteer at a time.

Instructions to the participant(s): Take the lighter of the two rods and place it in one of the cylinders; note the measurement of the water level. Ask the participant(s), “If you were to place the heavier rod in the second cylinder of water will the water level:

a) rise higher than the cylinder with the lighter rod?

b) rise to the same level as the cylinder with the lighter rod?

c) rise, but not quite as high as the cylinder with the lighter rod?”

Next, ask the participant to explain his/her answer.

Blake, Lawson, and Nordland (1974) described this task as an accurate test of formal operations as the participants are required to do the following:

a) think abstractly about the concept of water displacement,

b) eliminate a contradiction (differing rod weights, but same water level),

c) focus attention on more than one feature (i.e. differing weights, principles of volume displacement

Berger (1976) conducted this experiment with 82 pre-service teachers (students) enrolled in a Methods of Elementary School Science class and 33 in-service teachers who had at least three years of elementary school teaching experience. See the table below for the results.

Pre-Service and In-Service Teachers’ Explanations Denoted by Either Volume or Weight

<table>
<thead>
<tr>
<th></th>
<th>Pre-Service Teachers n=82</th>
<th>In-Service Teachers n=33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume Response</td>
<td>80%</td>
<td>67%</td>
</tr>
<tr>
<td>Weight Response</td>
<td>20%</td>
<td>34%</td>
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</table>

Surprisingly, the experienced teachers performed worse than the teachers in training, however, when data was gathered on the participants’ explanations, Berger discovered that some of the participants who responded correctly exhibited reasoning errors in their explanations.

Second Volume Displacement Task

Materials: Three graduated cylinders with equal amounts of water; three marbles with the following characteristics:
1) large glass marble weighing 18.5 grams
2) large steel marble weighing 66 grams, but the same volume as the glass marble
3) small steel marble weighing 18.5 grams, the same weight as the glass marble, but less volume than both the glass marble and the large steel marble

Procedure: Show the participants all three marbles and describe their physical characteristics. Allow the participants to handle the marbles if they choose. Place the large glass marble into the first cylinder and have the participants note the water level. Ask the participant(s), “If you were to place the large steel marble in the second cylinder of water what will the water level be? Explain your answer: Is the volume or the weight the reason for the water level measurement prediction? And if you were to place the small steel marble in the third cylinder of water what will the water level be? Explain your answer: Is the volume or the weight the reason for the water level measurement prediction?"

Berger (1976) conducted this experiment with 519 Pre-service and In-service teachers. See the table below for the results.

<table>
<thead>
<tr>
<th>Pre-Service and In-Service Teachers’ Explanations Denoted by Either Volume or Weight</th>
<th>Pre-Service Teachers (n = 310)</th>
<th>In-Service Teachers (n = 209)</th>
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</thead>
<tbody>
<tr>
<td>Type of explanation given for large steel marble</td>
<td>Type of explanation given for small steel marble</td>
<td>Volume (correct)</td>
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<tr>
<td>Weight (incorrect)</td>
<td>Weight (incorrect)</td>
<td>17%</td>
</tr>
<tr>
<td>Volume (correct)</td>
<td>Weight (incorrect)</td>
<td>7%</td>
</tr>
<tr>
<td>Weight (incorrect)</td>
<td>Volume (correct)</td>
<td>3%</td>
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</table>

The marble and water task has an advantage over the water and rod task in that this task adds a response consistency component. In this experiment there wasn’t a significant different in explanations between pre-service and in-service teachers. While the majority of the participants exhibited correct reasoning, it is noteworthy that a considerable number of participants are having difficulty with cognitive reasoning processes in which individuals in the formal operational stage are expected to demonstrate competency.

When Berger conducted his experiments most of the participants in the marble-water task demanded to see for themselves what the water level measurements would be with each marble. This post-experiment discussion would provide an excellent opportunity for your students to apply Piaget’s principles of accommodation, assimilation, and equilibration.
Cooperative Learning Activity: Develop Piagetian-Like Tasks

Group students according to the age group or grades they are going to teach and then further break them up into groups of four or five unless, of course, your students are homogenous and then you can simply divide them into small groups.

- Have them create original Piagetian type tasks appropriate for the age group they are going to teach. For example, if the grade they are preparing to teach will consist of children who are learning to master concrete operations, they might expand upon Piaget’s conservation of length task in which he used sticks by identifying a different type of material (i.e., a garden hose is the same length regardless of being stretched out or coiled). For formal operations they might consider evaluating word puzzles or using mystery-solving vignettes. Types of conservation include:

  1. Conservation of number
  2. Conservation of substance
  3. Conservation of length
  4. Conservation or distance
  5. Conservation of area
  6. Conservation of volume
  7. Conservation of height, weight

- In advance, make available a variety of conservation resources from which they can choose to do their research. See the reference list, Chapter 4 Web Links on the Companion Website (www.prenhall.com/mcdevitt), and/or show the Conservation interview segment on the Merrill Observing Children in Classrooms video.

- As a variation of this activity, give each group of students Handout 4-3, Conservation Tasks for Elementary Students, to use with children in an elementary classroom. Students could choose several of the 7 tasks presented, conduct task analysis and interviews with children, and write a report on their observations. Alternatively, as an in-class activity, this handout could be used to show examples of conservation tasks, and then students could create their own conservation tasks.

- Consider publishing their responses on a class website.

Individual Learning Activity: Create a Game or Make a Toy

Neysmith-Roy (1994) designed the Make a Toy project to enable students to develop a higher level of understanding of children’s psychological and physical needs. This activity is a good alternative to experiential-based activities if students do not have an opportunity to interact directly with children. (It could also easily be worked on by a small group of students or in pairs, thus making it a cooperative learning activity.) The assignment and some variations on it are described below.

- Students are expected to construct an age-appropriate toy from scratch for a child between the ages of newborn and four-years-old.

- Remind students to consider the children’s developmental abilities (i.e. physical, cognitive, social, linguistic) for the age they are targeting.

- To include students who plan to work with older children and adolescents, ask them to design a game (i.e. card game, board game, physical activity game) that is age-appropriate and takes into account the children’s developmental abilities.
Variations include:
• Students identify and analyze a commercially recognized toy or game (i.e. Pokemon, Junior Scrabble, checkers, capture the flag, Kings in a Corner card game, Uno, Connect Four, Candy Land, Dressy Bessy doll, plastic house and family people, blocks, computer games, etc.).
• Students teach a child a new game using Vygotsky’s principles of scaffolding and zone of proximal development. For example, students could teach four children how to play the Kings in a Corner card game, which includes elements of counting, seriation, patterning, organization, combining, turn-taking, etc. Within several sessions, the four children should be able to play the game with minimal help from their instructor.

• The second component of this activity is a writing assignment. Students should include the following information and analysis:
  a) identify the targeted age group or grade
  b) analyze the toy’s positive and negative characteristics for children of the targeted age (including safety issues)
  c) describe how the toy is age appropriate; how it should contribute to the child’s cognitive, emotional, and physical development; and explain why
  d) convince the reader that Vygotsky would agree that your particular toy would contribute to children mastering increasingly complex cognitive processing skills

Additional Resources for Instructor and Students
Books & Articles
Berger, C. (1976). A Piagetian like task considering the double variables of mass and volume by preservice and inservice elementary school science teachers. Paper presented at the meeting of The National Association for Research in Science Teaching. [See Companion Website, Ch. 4 Web Links, for Internet access]


**Other resources, by topic:**

1. **Classification**: Grouping according to similar characteristics (i.e., shape, color, type); Inhelder and Piaget’s class inclusion problems demonstrate that preoperational children have difficulty understanding hierarchical classification.


2. **Seriation**: Arranging objects in a logical progression


2. **Transitive Inference**: Inferring the relationship between two pieces of evidence by knowing their respective relationships to a third


4. **Transductive Reasoning**: Reasoning from a specific instance to another specific instance rather than reasoning from a specific instance to a general instance or a general instance to a specific instance; Piagetian term for a type of reasoning exhibited by preoperational children

Handout 4-1
**Classroom Observation: Observing Thinking and Reasoning Skills at Different Ages**

Take the opportunity during various classroom observations (of various grades) to look for evidence that either supports or contradicts Piaget's and Vygotsky's theoretical principles. First, observe children exhibiting the characteristics described in the table below. Then, record how old they are. Third, describe the context in which you observed them and provide concrete examples of these characteristics. (What are they doing or saying that reflect the characteristics you see in the left-hand column?) Finally, state what these characteristics imply for teachers; what specific things can teachers do in the classroom to meet the students where they are cognitively and help them advance in their thinking and reasoning skills?

<table>
<thead>
<tr>
<th>What you Might Observe</th>
<th>Age</th>
<th>Examples</th>
<th>Implications for Teaching</th>
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</thead>
<tbody>
<tr>
<td>• Rapidly developing language skills</td>
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<td>• Thinking that, by adult standards, is illogical</td>
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<td>• Limited perspective-taking ability</td>
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<td>• Frequent self-talk</td>
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<td>• Sociodramatic play</td>
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<td>• Little understanding of how adults typically interpret events</td>
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<td>• Display some forms of adult logic, such as the ability to classify multiple objects simultaneously or the ability to draw logical inferences from given facts</td>
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<tr>
<td>• Can explain their reasoning about something</td>
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<td>• Play group games or on teams; follow rules</td>
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<td>• Ability to participate in adult activities, such as converse with adults or attend events adults attend (perhaps peripherally)</td>
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<td>• Limited ability to reason about abstract ideas</td>
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<tr>
<td>• Emerging ability to</td>
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</table>
reason about abstract ideas

- Increasing scientific reasoning abilities (e.g., formulating and testing hypotheses, separating and controlling variables)
- Emerging ability to reason about mathematical proportions
- Emerging idealism about political/social issues, but often unrealistically
- Increasing ability to engage in adult tasks

- Abstract thought and scientific reasoning skills in some content areas
- Idealistic notions accompanied by more realistic considerations
- Are able to understand or articulate multiple perspectives on an issue
- Ability to perform many tasks in an adultlike manner

**Other notes or observations:**
Handout 4-2  
Classroom Observation: Guidelines for Assessing Play Activities

Observe a group of children playing. Use the behaviors described in the left-hand column to guide your observations. In the Example column, describe the context in which you observed these behaviors and provide concrete examples of them. (What behaviors or words reflect the characteristics you see in the left-hand column?) Also indicate the child’s approximate age or grade in the Example column. Finally, state what these characteristics imply for teachers; what specific things can teachers do in the classroom or on the playground to help them learn?

<table>
<thead>
<tr>
<th>Look For</th>
<th>Example</th>
<th>Implications for Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Extent to which children play with one another</td>
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<tr>
<td>• Extent to which children in a play group coordinate play activities</td>
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<td>• Extent to which children use one object to stand for another</td>
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<tr>
<td>• Extent to which children incorporate imaginary objects into their play</td>
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<td>• Extent to which children display behaviors that reflect a particular role</td>
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<td>• Extent to which children use language (e.g., tone of voice, specific words and phrases) associated with a particular person or role.</td>
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<tr>
<td>• Extent to which children coordinate and act out multiple roles within the context of a complex play scenario.</td>
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</tbody>
</table>
### Handout 4-3

#### Conservation Tasks for Elementary Students

<table>
<thead>
<tr>
<th>Conservation Task</th>
<th>Start State of Object</th>
<th>Transformation of Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>Measure the height of a cardboard picture of a person. For simplicity make sure the person is an even number of feet, say 4ft., so the child can reach it. Ask the child how many feet tall the person is.</td>
<td>Ask the child to now measure the person in inches. Ask the child if the person’s height is the same despite being 4ft. tall and 48” tall. Then ask the child to recall the two measurements. Has the child's height changed? Has the child grown taller/shorter?</td>
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<tr>
<td>Weight</td>
<td>Materials: 20 LEGO pieces all the same size and same color for sake of simplicity. Scale. Make two identical formations out of 10 LEGOS each and weigh them.</td>
<td>Take one LEGO formation and separate all the pieces and ask the child if the formations will still weigh the same.</td>
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<tr>
<td>Liquid</td>
<td>Materials: Two tubes of two different liquids that won’t combine when mixed until you shake it. The liquid should separate again after a period of rest. Use different food coloring to dye the liquids so they may be differentiated easily.</td>
<td>Ask the child if there’s still the same amount of colored liquid in the tube that’s shaken as there is in the tube that’s at rest.</td>
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<tr>
<td>Mass</td>
<td>Materials: 2 sections of newspaper each exactly the same size. Crumple one up.</td>
<td>Ask the child if there’s still the same amount of newspaper in the crumpled one as the straight one.</td>
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<tr>
<td>Mass</td>
<td>Materials: OREO cookies. Show two identical OREO cookies.</td>
<td>Separate one OREO cookie into two halves and ask child if there is still the same amount of cookie.</td>
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<tr>
<td>Number</td>
<td>Materials: 20 Toy soldiers. Line up the toy soldiers, 10 on each side, in the same formation facing each other.</td>
<td>Spread out one group of soldiers and ask child if one group has more soldiers than the other group.</td>
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<tr>
<td>Number</td>
<td>Materials: 20 wooden blocks</td>
<td>Stack the blocks vertically in two groups of 10 each and ask child if you were to scatter one stack of blocks all over the floor if there would be the same amount of blocks as the stacked pile</td>
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</tbody>
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