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ABSTRACT

This unit of the Flexible Learning System (FLS) describes the development of children's concepts and presents ways that adults can facilitate conceptual learning in children between 2 and 8 years of age. Concepts are described as representable, sharable and organized knowledge formulated around interests, susceptible to agreement and disagreement, and in some cases, capable of being forgotten. Suggested activities for adults involve analysis of adult concepts and their representation, adult classification activities, interviews of children, classroom observation, and thought problems. Activities are designed to explore ten characteristics of concepts; how concepts are organized; how the organization of concepts changes with mental development; how concepts are represented; how interests determine the formation of concepts; and guidelines for educational practice that support conceptual growth. Written material provides an introduction and follow-up to each activity. The appendix contains notes on clinical interviewing of children and a bibliography. Familiarity with the content of the series "Exploring Children's Thinking," also a part of the FLS, provides a foundation for understanding this book. An understanding of the mental development of classification skills is considered prerequisite. Other related FLS materials: "The Growing Mind"; "Developing Children's Sense Perception"; "Using Toys and Games with Children"; "Understanding Children's Play Through Observation"; "Problem Solving with Children." (Author/SB)

LEARNER'S GUIDE

working with children's concepts

Working with Children's Concepts

Preschool - Third Grade

by

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in association with

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TABLE OF CONTENTS

OVERVIEW

WHAT THIS BOOK IS LIKE.

This book is composed of five chapters arranged sequentially, each building on the preceding ones. Each chapter contains a number of activities. These activities are the backbone of the book. While you can read this unit as a book, you will get far more from it if you supplement your reading by completing the activities. In addition, this book is designed to be used in conjunction with other adults who are also learning about children's concepts. You will gain much richer insights by sharing with others.

YOU WILL LEARN...

What concepts are, how they develop, and how children's concepts are different at different stages. By learning about the nature of concepts, you will gain a better understanding and appreciation of the conditions that help children learn new concepts and extend ones they already have.

THE SPECIFIC CONTENTS OF THIS BOOK ARE...

- Ten characteristics of concepts.
- How concepts are organized.
- How the organization of concepts improves with mental development.
- How concepts are represented and how interests determine the formation of concepts.
- Guidelines for educational practice that supports conceptual growth.

INTRODUCTION

HOW TO USE THIS UNIT TO YOUR OWN ADVANTAGE

The real insights are those you invent for yourself; they cannot be written and handed to you by someone else. This unit provides some activities to help you create your own insights. One of these is reading and you will gain more from this book if you read it carefully. Still richer experiences will come from the activities that require sharing with others, observing others, working with others, and solving problems. It is by doing that you acquire skills at doing. This unit is about doing something; both now as you learn, and later as you apply what you've learned.

YOU WILL LEARN ABOUT CHILDREN'S CONCEPTS AND HOW TO WORK WITH THEM

This book has two purposes. The first is to provide a fuller and richer understanding of children's concepts. This includes exploring how mental development affects the way children acquire concepts, and how development affects the concepts themselves. Secondly, and more importantly, this book concerns ways you can work with children's concepts. You will learn how interests support concept learning; discover children's interests; relate classroom activities to these interests; and learn to provide activities for children that will help them acquire new concepts and enrich ones they already have.

"Concepts" are WHAT YOU THINK AND KNOW

To say that this book is about concepts is to say that it is about knowledge.[1] It is written for adults who work with children in the preschool and primary school years, ages two to eight. As such, it deals with children whose knowledge is becoming increasingly conceptual.

There are many things we call concepts. We will examine some types of knowledge you have as an adult, and in this fashion you will expand your understanding of concepts and the ways they vary. At the same time, we will help you explore and work with different types of concepts held by children. You will work with children, so that you can relate the concepts we talk about to real experiences.

Since this unit concerns children and their concepts, you will want to know something about children's thinking, and about its character at various stages of mental development. Piaget, a dominant force in the study of children's thinking, has shown that children think in a different way than adults; and that children's thinking progresses through specific, identifiable stages. Children know less than adults, in that they possess fewer accumulated facts; but more importantly, because they think differently, what they know is not just less, it is fundamentaly different.

BEFORE WORKING THROUGH THIS UNIT

Before working on this unit, it will be to your advantage to read

1. Not all knowledge is conceptual. For example, Jean Piaget views knowledge constructed by the child during the first two years of life (Sensory-Motor period) as a form of knowledge that is not conceptual. It also might be said without much exageration that all knowledge gained from early childhood on is, in some form, conceptual. (Piaget, J., The Construction of Reality in the Child.)

[illegible] part of the [illegible] learning system, titled Exploring Children's Thinking (ECT). It deals with the different forms children's thinking takes as it develops.

In ECT, the topics of classification (Part I) and ordinal relations (Part 2) are particularly important. Most of the concepts you will explore in this book have something to do with classification and/or relations. How things are similar and how they are different are issues of classification, and have a great deal to do with concepts. Issues that involve relationships such as between, older than, north of, also have a great deal to do with concepts.

LIKE ALL KNOWLEDGE, CONCEPTS ARE MADE UP BY THE KNOWER: THIS OCCURS BEST WHEN THE INVENTOR IS INTERESTED

Any book on education begins with some assumptions about learning and the worth of different educational practices. This particular book has two underlying assumptions. The first is that all knowledge is constructed or made up by the knower.[2] The second is tnat the needs and interests of children are an important part of the educational process, as in the Responsive Model Head Start, and Follow Through Programs.

The term "responsive" emphasizes the belief that the educational environment should respond to the learner and relate as directly as possible to the child's ways of viewing things. "Responsive" does not mean that children "run" the classroom or force everyone to satisfy their whims. It means that the educational environment is structured to respond to the

2. This view follows directly from the work of Jean Piaget. See ECT to get a better sense of this position.
3. Responsive Educational Program Staff, A Description of the Responsive Education Program.

knowledge, skills and interests of the individual child.

Learning is not just an abstract concept. It is a real thing that happens in real time and under real circumstances. And the learner is always the central force determining whether learning takes place, under what conditions, and with what value.

In keeping with this Piagetian view of education, you should note that this unit is not designed to teach specific concepts such as "shapes," "colors," or "sharing." You will not find a list here of things children should know, or a set of recipes for teaching them. We leave the issue of what children should know to your own judgment and to others in the educational community. Rather, we take as our focus the process of helping children to acquire and to extend concepts that are of interest to them, in a manner that is consistent with their levels of development. As you acquire skills in helping children in this way, you will also acquire techniques to aid them in learning whatever specific concepts you or others feel are important.

The ability to create a climate in which interests emerge is the mark of an ideal teacher. To help a child satisfy his/her own educational needs, and to do so through stimulating and responding to the child's own interests, is responsive education. There is no question that children must learn the concepts of their social environment. But learning can take place only when new experiences and ideas are related to old ones. To try to effect such relations without taking into account the child's own interests in a new application of his/her own knowledge, is to inhibit the pride and joy in the learning that good education promotes.

HOW WELL YOU LEARN DEPENDS UPON HOW MUCH YOU DO WHATEVER YOU NEED TO DO TO LEARN

The single most important factor in determining this unit's value is you. Ideally, you wish to know more about concepts in general, as well as how to work with those of children. Your interest is important. And it is not enough. You also have to trust yourself as the best authority on what concepts mean to you, how you can explore them, and how you can learn about their character in children.

As an adult, you have acquired an enormous number of sophisticated, complex, and widely differing types of concepts. To learn about their nature, and the nature of concepts in general, you have to turn your thinking back upon itself: think about your thinking. For some people, this is a familiar habit; but most of us spend little time contemplating our own thinking. To learn about anything requires thinking about it. What better examples of thinking can you find than your own? You are deeply familiar with your own concepts. If you turn your attention to them, you'll find vivid, rich examples of all types of concepts in all degrees of complexity.

By providing guidelines for examining your own concepts and exploring those of children, this unit will expand your concept of "concepts." But how far your concept expands depends upon your willingness to explore the richness of your own knowledge, and to be inventive in discovering the best ways to explore it. After all, it's your knowledge; you should be the best judge of how to get around in it. You also should be the best judge of how to acquire new knowledge or concepts; because you are the one who's learned everything you know.

Of course, we'll make statements about what's true and what isn't true; we'll give instructions, and so on. We're going to leave you with new understandings that you can apply as skills, so it's natural that we suggest things to do, and pass on insights held by others. You may end up doing some of the activities differently than we suggest; you may disagree with us; you may have to wrestle with the purpose or meaning of something you're not clear about. But the only way you'll achieve a personal understanding of the material in this book will be to take an active role in deciding how you can learn what you need to know.

If you're doing this unit by yourself, you will not have a chance to do the activities that require sharing and generating ideas with a group of others taking the same unit. In this case, create your own ways of achieving the purposes of the activities. If an activity involves finding out how others define some concept, check a dictionary or do other reading, or question a friend. Whatever enables you to gain new insights is a method that works for you.

Similarly, there are activities that involve observing and talking with children. It is hard to replace these activities with reading and thinking. But you don't need to deal with children in a classroom. You can work with your children at home, or with those of friends or neighbors, or even with children in parks or public places. You can talk to parents or others who work with children. However you do it, the closer you come to working with children, the more you will learn about Working with Children's Concepts.

CHAPTER 1

CONCEPTS BELONG TO THE PEOPLE: AN INTRODUCTION TO CONCEPTS

YOU DO IT WITH CONCEPTS

Think of the things you know and understand; of these, think of the ones you could describe. Those are concepts.

Most of what you know you can express. You may have to say something is or is not an example; or point to it. You may have to make something, shake something, or take something. You might write a letter, send a present or have a chat. Whatever your means, you can let others know a large number of your thoughts. These thoughts are concepts.

All of what you know, you know because you do it and you use it; and you keep it around because it's useful. You use it until it's useless and then you replace it with something more useful. Even then, you're likely to remember concepts you no longer hold. I recall thinking that radios had little people inside. Most of what we know, and most of what we forget, is conceptual.

Our daily activity is guided by concepts. You may cook, clean house, buy groceries, and take care of the kids. Then again, you may not. You may drive the car, go to work, and do your job. Or you may not. You probably have some things you like to do, and you probably like to do some more than you like to do others. Whatever you're doing, you're the one who's doing it. And whatever you do you do it with concepts.

CONCEPTS KEEP YOU WORKING

Everyone works, even though a lot of people don't get paid. Everyone's

pushed, pulled, or carried something from one place to another, and limited as it may seem, even such an elementary form of work is guided by concepts. For example, not until some time after they can walk can infants be asked to deliver something from one place to another. Moreover, it's some time before such requests can be followed consistently.

Consider trying to reason with a two year old, "You should pick up your toys because if you don't, you'll make additional work for others." You'd probably be more successful using another line of attack, choosing concepts that are comprehendible to the child. Adults can understand that if you make a mess and if it has to be straightened out, if you don't do it, someone else will; they can also understand that under certain circumstances that situation is unfair. And that's a rather complex concept--even if understanding doesn't guarantee action.

Carrying something in a container is a behavior that develops late in infancy. Think of all the times you've put one thing into another and carried them both. That's a concept. You understand it, can think about it, and can express it to someone else. Think of the concepts involved in moving your house, moving an army, or taking bananas to the moon.

Here's a riddle. Three couples must cross a river using a boat which cannot hold more than two people. None of the men will allow his wife to be on the same side of the river, or in the boat, with any other man or men unless he is present also. Assuming that both the husbands and wives can row, how do the three couples get across under the stated conditions?[4] With the right concepts, and enough patience, you'll find the solution. You'll find also that even to understand the answer re-

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4. Kaplan, Philip, Posers. See end of Chapter 1 for answer.

quires some conceptualizing activity.

The point is that: to do something (and thinking is a form of doing), you must have an understanding of what needs to be done, what the restrictions are, what the possible means are, what the possible results are, and how to put all these concepts together. In our work, or doing, we take each step consciously, unconsciously, or sometimes habitually. the steps exist in our heads, and when we represent our "doing" to ourselves or to others, the steps become concepts.

We are not born with the power of mental representation, of which "seeing pictures in your head" is an example. And for the very same reason, we are not born with concepts. In its most literal sense, "doing something" such as sucking on a bottle, crawling on the floor, or mowing the lawn, is not a concept. It is the representation of any such action, to yourself or to others, that constitutes conceptual activity. While infants gradually acquire the ability to do a number of things, it's a whole new ballgame when they can represent what they're up to, to themselves and to others.

Representation takes numerous and complex forms. A simple form is imitation--using one object, such as a block of wood, to stand for another, such as a car. Children learn to imitate somewhere between 15 and 18 months.[5] Imitating is a representational activity that takes time to develop; and when it does, the infant becomes a child and begins to share his/her concepts with others as s/he understands them. At the same time, the child begins to use concepts in thinking and working. In a broad sense, concepts keep you working.

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5. Piaget, J., Play Dreams and Imitation in Childhood.

CONCEPTS ARE IN YOUR HEAD. DON'T LOSE YOURS!

Nobody has all the concepts, and no two people have all the same concepts, and everyone shares some concepts. Yet, no two individuals sharing the same concept share it in the same way. For that matter, the human species as a whole does not have all the concepts it can expect to have. Nor does any individual have all the concepts s/he can expect to have.

When we talk about concepts we should consider seriously the fact that we don't have an inkling about a good many concepts used by others. It's hard to imagine a concept you don't have; but to know you don't have it is to know something conceptual in itself. Since others have concepts which you do not have, people can learn from one other. There are different skills, opinions, insights and viewpoints among different people.

As individuals, families, cultures, nations, and as a species, we share concepts. The sharing not only provides the basis for achieving powerful modifications of our own concepts, but also provides the means of acquiring concepts that are totally new to us. That we share some concepts to some degree does not mean that you and I necessarily have the same things in our heads. It means that we can know whether we have the same things in our heads; and we won't know until we share. This is what makes learning from others a rich aspect of social experience.

Things that can be shared are shared. This is the fabric of social relations. Concepts can be shared because they can be represented. If two people have the same concept, and if they are interested in the concept, and if they happen to get together, odds are good that they'll share the concept socially. Then they'll find ways in which they agree and dis-

agree. This, in part, is how concepts are acquired and modified. It's what keeps civilization in its constant state of coming together and coming unglued at the same time.

YOU'VE ALWAYS BEEN INTERESTED IN SOMETHING .

We're always up to, into, or onto something. From the time we become mentally active we're engaged in the pursuit of interests. All the concepts we've acquired, we've acquired because at one time or another we were interested in them. "Interest" can take many forms, from simply paying attention to pursuing a life-long enterprise. You pay attention to what interests you.

In part, it is interest that makes concepts social, since all social relations involve sharing interests. The interests of the group become those of the individual, and individual interests become group interests. For example, as a parent, I'm very interested in my son Matthew's growth, his well being, needs, interests, etc. And he is very interested in his new experiences, as well as in the activities of adults, other people in general, and his parents in particular.

As Matthew arrived at an age where he could form concepts, I was remodeling part of the house. I was building new doorways and hanging some doors. Matthew was especially interested in my door-related activities. He would go back and forth through the doorways, and ask his mother what I was doing--in simple terms like "Daddie?" He'd swing the newly hung doors back and forth, imitate my use of tools, etc. All this time he was saying "door!" He had "door" on the brain. Everytime he'd see a door, he'd point it out and either assert that, or ask if, it was a door.

He was acquiring the concept "door" because he was interested in his father's exciting and frantic activity.

This condition holds for many of his concepts. On the other hand, there are activities of his own for which he has formed concepts, and because of my interests in him, we share them and they become social. For example, he once heard a loud whistle and said, "What's dat?" to which I replied, "Choo choo." Every since, he's been interested in choo choos, and he shares that interest, and his concept of choo choos, with me at every opportunity. He shares his interest while looking at pictures, riding in the car, playing with blocks or talking on the phone. He even has me drawing them.

I pick the simple examples of a two year old, not only because I'm interested in my son, but because it makes clear that even the simplest and earliest concepts are guided by interests. The same is true of more complex concepts acquired later in life. We've always been interested in things, and we form concepts to represent and share our interests.

CONCEPTS KEEP YOU OUT OF TROUBLE

Concepts allow you to anticipate or look ahead: to see what's coming, probably coming, going to happen, might surely happen. Imagine driving a car, climbing a mountain, talking, making food, cutting a diamond. Imagine how these activities might be carried out if there was no anticipation, and therefore no idea of what result any action might have.

All concepts anticipate, and some concepts anticipate absolutely. I know absolutely that there are either the same number of, or more, flowers than roses. I know this for the world, for my house, for the

desert, for your house, for all rose gardens.

Concepts anticipate in simpler ways as well. For example, suppose your concept of "boat" includes the idea that boats float on water. When someone says "boat" you'll anticipate that s/he is talking about something that floats on water. This is what Matthew does. When I say "boat" he generally says "water." He is expressing his anticipation of what I mean.

While concept have the capacity to anticipate, how well they anticipate depends on how well they are organized, and how well they represent what has gone before. If your concept of car involves representation of the fact cars roll, then you probably won't drive one without brakes; because you can anticipate...

...THINGS THAT ARE CONCEPTS

By now you should have a fairly good sense of what concepts are. They're things in our heads that we can represent to ourselves and others, that we can share, that are subject to agreement and disagreement.

To round out your introduction to concepts, we'll explore a wide variety of them briefly. When Matthew hears a whistle and says "choo choo," he's using a concept. When an astronomer looks at his/her findings and says, "The speed of the galaxy indicates that it's five billion years old," s/he is using a concept.

When I was a two year old, we took my father to the train depot for his departure to the "European theater." For the following few years, I thought that World War II was being fought in the train depot. For a while it made a lot of sense; but after a time it raised more problems

than it solved and I was forced to abandon this view. Concepts have a way of changing on you.

Once upon a time a three year old became depressed prior to her family's trip to Europe. For months her parents prepared her for the upcoming flight. They even took her to an airport to see the airplanes departing for distant places. Shortly before the trip she tearfully blurted out that she couldn't go to "urp" with them because she hadn't learned to fly.[6] Her concept of flying had something to do with standing on the front lawn and flapping her arms. Well? That's what birds do.

Concepts don't have to be expressed in words. Recently I observed Matthew looking intently at a toy chair and taking a posture as if he were sitting down. His body posture was saying, "That looks like a chair." He was representing his concept of "chair." Further, some concepts cannot be expressed by words. Picasso's great concepts never would have emerged if he hadn't painted something. An architect's concept of how a space should be used is expressed in drawings, models, and construction far better than it would be in words.

One can have concepts of racism, sexism, communism, baptism, and isms in general. These concepts can include theories, beliefs, values, examples, ways of behaving, and so on. There are self-concepts,[7] conceptual art, and conception itself.

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6. Fraiberg, Selma H., The Magic Years.

7. DeAnda, N., Helping Children Develop Healthy Self-concepts,--unit of the FLS.

THINGS THAT ARE TRUE ABOUT ALL CONCEPTS

So far we've explored some things that are true about concepts, and some examples of concepts. The following list contains 10 things that are true of all concepts. These 10 things are not all the characteristics of all concepts, but they are important characteristics with important implications for working with children's concepts. Also, these 10 issues are not independent of one another: they are not entirely different things, they simply reflect some significant concepts about concepts.

1. All concepts are in the head.

   In the sense that a concept exists in one person's head, it is personal. What the concept is or means depends upon the experiences and characteristics of the person who holds it.

   In another sense concepts can be shared and the same concept may be in the heads of a number of people. Then the meaning of the concept has to do with agreement between those people about how it is used. In this sense a concept is social.

2. All concepts are invented or constructed by their owners.

   Even if you don't invent a concept in the sense that Edison invented the light bulb, to have a concept in your head is to have created your own personal sense of its meaning.[8] You cannot give a concept to someone else the way you can give an object. The learner of the concept must reinvent it for his/her own use.

   When Matthew asks, "Is that a choo choo?" my answer does not teach him what trains are or are not. He asks the question about

8. Piaget, J., To understand is to Invent: The Future of Education.

something that he is curious about for reasons that are his own, and and he is the one who will make use of my answer. I am not teaching. He is constructing, and his interaction with me is part of his constructive activity.

3. All concepts are learned because the learner is interested.

Concepts are formed when you direct mental energy toward something. Directing energy in this way is what I mean by "interest." Unless you are sufficiently interested in something to pay attention to it, and to master some personal meaning of it, you will have no conception of it.

4. All concepts have organization or structure.

Concepts are not random collections of things; they are products of the intellect. All products of the intellect have organization. Concepts are complex. Each concept has many components. These components are organized to form the concept just as the parts of an object are organized to form the object.

5. All concepts reflect the past and hint at the future.

New understandings are constructed out of old ones. A concept is a represented understanding about something, and involves some understanding and representation of the past. By the same token a sense of the past makes it possible to anticipate the future--when you can figure out what has happened, it's a lot easier to guess what's likely to happen.

6. All concepts involve an understanding or an assertion about something.

A concept says something about something. "Radios have little people in them." "The earth is the center of the universe."

"By following the instructions you can put bananas on the moon."

7. All concepts are used and can be reproduced or re-applied.

Concepts are not destroyed by use. Matthew says "boat" every time he sees something that reminds him of one. At a more complex level, people can reuse, reproduce or re-apply an argument developed to support their beliefs.

8. All concepts involve representation.

To represent something requires the ability to make up a second thing that stands for the first. Words, symbols, mental images, pictures, models, and actions are all constructed by their users to represent something that they themselves are not. We can represent concepts to ourselves, and also to others.

All words stand for concepts because words represent understandings and assertions. Even words like to, for, as, and and stand for concepts, because they stand for meaning relations: "I went to bed for a good night's sleep, and as I shut my eyes...." Words themselves are not concepts. They stand for concepts. This distinction helps us to distinguish the words of a parrot and those of a human; in one case, concepts are referred to and in the other there are no concepts--only sound.

9. All concepts become social when they are shared.

Most forms of representation are social, because they depend on agreement. For example, words stand for things, and to the degree that there is agreement between people about what things the words stand for, we can use them to communicate, to express concepts.

Some forms of representation are not social: a child may use a

block of wood as a symbol for a car. But as soon as the symbol is used socially--as soon as someone asks, "Where is your car going?"--a social issue of agreement arises between what the child means by his symbol and what another person thinks he means.

Because most concepts can be shared, most concepts are, or at least have the potential to be, social.

10. All social concepts involve issues of agreement.

Concepts cannot be shared with others without raising issues of agreement and disagreement. People may or may not understand what others are trying to communicate. Or, they may understand and disagree. Concepts are always the source of agreement and disagreement.

Activity 1: Exploring 10 Characteristics of Concepts

This Activity should be carried out with a group of fellow learners, although it can be done individually.

Each member of the group will take a Focus Card and explore a concept according to instructions on the card. The purpose of the activity is to help you explore the 10 preceding "Things that are True about All Concepts" by experiencing them in concepts generated by the group.

INSTRUCTIONS FOR ACTIVITY 1:

1. Selecting a Focus Card.

This should be done in a way that insures that you get one of the five cards by chance. Members of the group might choose a number between one and five and take the corresponding Focus Card (page 14-15.) Or, you might use the alphabetical order of people's last names with the first name getting the first Focus Card and so on.

2. Nature of Focus Card tasks.

The first item on the card is an instruction for you to think of a particular concept. Take one minute and, without talking with others, think about the concept. You might close your eyes and let your mind explore the concept freely.

Next, think of an "expert" on the topic.

Do not read beyond this point until you have picked your Focus Card and thought about it. (Pages 14-15.)

3. After you have thought about the concept on your Focus Card, do the following:

Select any two of the following 10 issues, and compare your concept of the Focus Card subject with that of the imaginary expert. Think of how your concepts might be similar and different. There are no right or wrong answers to this activity.

a. How might you and the expert have the concept in your heads?

b. How might you both have learned or invented the concept?

c. How might you both be interested in the concept?

d. How might the concept be organized in both your heads?

e. How might you both use the concept to anticipate something?

f. What might you both understand or be able to assert about the concept?

g. How might you both use or re-apply the concept?

h. How might you both share the concept with others?

i. In what ways might you agree or disagree about the concept?

Think about your answer, with specific examples for two of the above 10 questions. Look at the follow-up to Activity 1 if you are

unclear about the instructions.

4. Sharing:

After you have taken about five minutes to complete the Focus Card instructions, you should share what's on your card, and your two examples of how you and the imaginary expert are similar and different.

Focus Cards for Activity 1:

1. Think of your concept of "house" in terms of how to build one.
Think of a house-builder.
Pick two of the 10 topics to compare how your concept of "house-building" and that of your imaginary house-builder might be similar and how they might be different. Be as specific as possible in your example.

2. Think of your concept of acting in terms of how one learns to act.
Think of an actor or actress.
Pick two of the 10 topics to compare how your concept of "learning to act" and that of your imaginary actor might be similar and how they might be different. Be as specific as possible in your examples.

3. Think of your concept of how an airplane keeps from falling out of the sky.
Think of an airplane designer.
Pick two of the 10 topics to compare how your concept of "how airplanes fly" and that of your imaginary airplane designer might be similar and how they might be different.
Be as specific as possible in your examples.

4. Think about your concept of playing poker.

Think about a professional poker player.

Pick two of the 10 topics to compare how your concept of "how to win at poker" and that of your imaginary poker player might be similar and how they might be different.

Be as specific as possible in your examples.

5. Think about your concept of how to get elected to public office.

Think about a campaign manager.

Pick two of the 10 topics to compare how your concept of "how to get elected" and that of your imaginary campaign manager might be similar and how they might be different.

Be as specific as possible in your examples.

FOLLOW-UP TO ACTIVITY 1:

EXAMPLES OF HOW I MIGHT COMPLETE ACTIVITY 1

In the head

A house builder may know how deep and thick foundations must be for a given kind of structure. I at least know that houses often have foundations.

How the concept is learned or constructed

An actor learns how to act by working with other actors. I must construct my concept out of less direct experience, but I do know that learning to act involves social imitation.

How the concept is organized

An airplane designer can predict exactly how much power it takes to give a certain wing "lifting power." I'd be a poor risk if an airplane company hired me as its designer. But if they were real

patient, I could learn.

How the concept is understood

A professional poker player's concept of poker involves a refined appreciation of facial and body gestures and their relationship to betting. I look for silly grins.

How a concept is used or re-applied

A campaign manager might re-apply a previous, successful campaign strategy in the next election. If I were to apply my understanding of campaign strategies, I would probably do so in a discussion rather than in an election campaign.

How the concept might be represented

The house builder can represent his/her concept of building a house with vocabulary I don't understand, sentences I don't understand and costs I don't understand. But I know enough to get one to build something I want.

How the concepts are shared

An actor can share his/her theories on acting at a professional meeting between actors. If I said anything to an actor about how acting is learned, I'd try to phrase it as a question.

Agreement or disagreement

If I told an airplane designer that the lifting power of a wing has to do with the different distributions of air molecules above and below the wing surfaces, s/he might not agree.

My examples may be very different from your own. That is alright. The purpose of this activity is simply for you to think about ways in which all concepts are similar. In doing this activity and sharing your

findings with others, you can see that no matter what type of concept you consider, it involves understanding, sharing, representation, re-application, anticipation, interest, and issues of agreement. It is even more obvious that concepts reside in the heads of people, and are learned and organized by their users.

CAUTION: EXPERTS MAY BE HAZARDOUS TO YOUR HEALTH

I selected concepts or areas of knowledge in which I hoped you wouldn't be experts. I purposely wanted you to think of ways in which an expert may know more than you do. In order to do this, you have to have some understanding of your own concepts: you have to know in which respects you are less knowledgeable than an expert. Such understanding is an important aspect of how concepts grow. For example, even if you can't produce tears at the demand of a movie director, at least you know that this is something actors must learn; and in knowing this, you demonstrate that you already know something about the concept "learning to act." What you presently know provides the foundation for what you will learn later.

I don't want to give the impression that experts are the final authority on the meaning of concepts. People who use a concept frequently in their activities may have refined its distinctions and definitions and may, therefore, have a good deal to say about it that is useful. But insight always is moderated by a person's goals and interests, his/her prejudices and immediate concerns, and the fact that all sides of an issue cannot be seen at a single glance. A dictionary, for instance, is not so much an authority on the meaning of words as it is a record of how words are used, generally; or of the uses on which people generally agree.

Optional Activity 1A: You're an Expert

This activity is not required, it is here for you to do if you want to increase the knowledge you acquired doing Activity 1. Use it, also, as an example of ways in which you can create your own supplementary activities. If you do Activity 1A you should carry it out with a group of fellow learners so that you can derive maximum benefit from intra-group sharing. The activity can be done with a single partner. It cannot be done alone.

INSTRUCTIONS:

1. Choose a partner.
2. Without talking with your partner or anyone else, select a concept on which you can regard yourself as an expert. The concept might involve your job or your occupation, your hobby, or some idea you have thought about extensively: changing a diaper; driving a car; cleaning a rug; having $1 million; being boss; the state of contemporary theatre in Bulgaria: all these are examples of concepts on which you might be an expert.
3. Take one minute and, still without talking, simply think about your concept. You might close your eyes and let your mind explore the concept freely.
4. After you have thought about your concept for one minute, tell your partner what your concept is. Have him/her select any two of the following 10 issues.
   a. how does s/he have the concept in his/her head?
   b. how has s/he (just) learned or invented the concept?

c. how is s/he interested in the concept?

d. how is the concept organized in his/her head?

e. how might s/he use the concept to anticipate something?

f. what does s/he understand, or what can s/he assert about the concept?

g. how might s/he use or re-apply the concept?

h. how might s/he share the concept with others?

i. in what ways might s/he agree or disagree with you about the concept?

5. Focussing on the two issues, have your partner tell you about his/her concept of your concept for two minutes (use attributes, values, examples, etc.). When the two minutes are up, tell your partner about <u>your</u> concept of the concept, still focussing on those same two issues.

6. With your partner, explore how your concepts about this concept are different, and how they are similar.

7. Change places with your partner, and repeat the activity using his/her concept.

<u>SHARING:</u> When you are finished with the activity, spend a few minutes discussing what you found out in your group. Share what your concept was, and how your concept of it was similar to and different from your partner's concept of it. Focus on the two issues you chose to consider with regard to your partner's concept, and have him/her focus on the two issues s/he chose to consider with regard to your concept.

If you are doing this activity in a group of 10 or more people, see that each of the 10 issues is covered by at least one person. If you are doing the activity in a group of less than 10 people, or if you are doing

it alone with your partner, consider repeating the activity until all 10 issues have been covered. The more issues you can explore, the richer your own results will be. There are no right or wrong answers to this activity.

FOLLOW-UP QUESTIONS TO OPTIONAL ACTIVITY 1A

1. What did you learn about yourself and about your concept? About your partner? About his/her concept?
2. Did your self-concept change? Did your concept of your concept change? Did your concept of your partner's concept change? If so, how? Did it change in terms of the two issues you chose to focus on? In other ways?
3. With regard to the eight issues you did not focus on, how has your concept changed? How is it the same? Be specific about each of the eight, either by sharing the answer to this question with your group or partner, or by writing the answers down for yourself.

Activity 2: Expanding Concepts

This is an activity you can do for yourself, although it may be fun to share your insights with others. It requires reading a newspaper or watching television and finding one instance in which your concept of something changes or in which you acquire a new concept.

The purpose of the activity is to provide further experience with how all concepts share the 10 properties discussed in this chapter.

INSTRUCTIONS FOR ACTIVITY 2:

1. Read the newspaper or watch television at your leisure. When you feel a new concept coming on, or feel an old one change, go on with the activity. You are more likely to gain a new concept if you read or watch something that is unfamiliar to you--for instance, read the sports, business or arts section of the newspaper if you generally pass over these parts, or watch a soap opera if you usually watch football.

   You may find it difficult to decide what is or isn't a "new concept" or a change in an old one. Your intuitions are the best guide. Ask yourself, "Do I have a new understanding of any personal importance or interest to me?" If you do, you have a new concept. It may be about how film is edited or papers printed, it may be about why you get sad and scared at the movies, or anything else.

2. Answer the following questions, and share your answers with your partner or group. Remember that there are no right or wrong answers to these questions. They are provided simply to help your clarify your understandings of similarities and differences among concepts.

QUESTIONS FOR ACTIVITY 2

1. What is your new concept? Think of one way in which your present understanding of the concept is different from your earlier understanding of it.

2. Who invented what you learned?

3. What is interesting to you about your new concept? Who might share your interests?

4. What is one specific past experience (an idea) that helped you form your new concept? What is one thing your new concept will allow you to anticipate about the future?

5. What is one job or activity in which you could use your new concept?

6. If you learned the new concept from someone else, how was it represented to you? Using words, demonstrations, gestures, examples, models, etc., how would you represent your new concept to someone else?

7. Why or under what circumstances might you share your new concept? With whom might you share it?

8. Who might agree with your new concept? Who might disagree with it?

FOLLOW-UP TO ACTIVITY 2

The eight questions you have just answered are intended to help you illustrate for yourself the principles we listed in "Things That Are True About All Concepts" on page 9. Turn to that list and consider each of your answers in light of our discussion following each of the principles. We did not ask a question about the organization of your new concept. That issue is taken up in Chaper 2.

Here is the answer to the riddle of the river, boat, men and wives found on page 2.

If we designate the 3 men A,B and C and their respective wives a, b and c, the crossings can be shown in diagram form as follows:

	ABCabc	
Step 1	ABCa →	bc
Step 2	ABCab ←	c
Step 3	ABC →	abc
Step 4	ABCa ←	bc
Step 5	A a → BC	bc
Step 6	AB ab ← C	c
Step 7	ab → ABC	c
Step 8	abc ← ABC	
Step 9	a → ABC	bc
Step 10	ab ← ABC	c
Step 11	→ ABC	abc

CHAPTER 2

CONCEPTS ARE CLASSES AND RELATIONS: THE ORGANIZATION OF CONCEPTS

A PREREQUISITE TO THIS CHAPTER

It is critical at this point that you be familiar with the unit called Exploring Children's Thinking, because in the next two chapters we will talk about "classes" and "relations" and how they affect children's concepts. As minimum background, view the four videotapes contained in the ECT unit.[9]

AN INTRODUCTION TO CHAPTER 2

Any concept is organized knowledge. When we share our thoughts with others, we are representing concepts; and when we understand others, we are recognizing concepts. One of the educational rationales of this book is that by knowing how your own concepts are recognized and represented, you can work more effectively with children's concepts.

To understand how concepts are recognized and represented requires an examination of their organization. In Parts 1 and 2 of ECT we explore the development of class and ordinal relations. These two books present Piaget's demonstration that the organization of children's thinking about similarities and differences (classification), and about sequences such as first, next, last,(order relations) goes through a series of

9. The ECT unit is part of the FLS. It consists of three books and four 30 minute color videotapes from the series called The Growing Mind: A Piagetian View of Young Children's Thinking.

stages. Each stage has its own characteristics. Prior to the concrete-operational stage (which describes the thinking of most seven through 12 year olds) the child's thinking about classes and order relations (from now on called "relations") is quite different from adult understandings.[10]

The importance of this difference in understanding lies in the fact that all concepts are either classes, or relations, or both. A person's concepts are organized and understood as things that are similar and different, and/or things that stand in relation to one another. Because the child's ability to think about classes and relations is different from the adult's, so too are the child's concepts different from adults' concepts.

In this chapter we'll explore the organization of concepts by talking about properties of specific concepts (such as, "squares have four sides"). When we represent or recognize concepts, we do so in terms of how we organize their properties. In a sense, concepts are an organization of the properties of examples. We will talk about these properties in terms of "attributes and values" of examples. We will talk about the organization in terms of the organization of classes and relations.

In the following section we will discuss how concepts, classes, relations, examples, attributes and values are related to one another. It's important to keep in mind that all these are interrelated. For example, a description of the organization and meaning of a child's concepts requires a consideration of what the child regards as examples, attributes, and values of the concepts. And at the same time, each of

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10. Inhelder and Piaget, The Early Growth of Logic in the Child; and Piaget, J., The Child's Conception of Numbers.

the examples, attributes, and values recognized and represented by the child is a concept in itself.

Here's what Chapter 2 is all about:

1. All concepts are made up out of an organization of examples, attributes, and values.
2. All examples have one or more attributes.
3. All attributes have one or more values.
4. All examples, attributes, and values are classes or relations or both.
5. All examples, attributes, values, classes and relations are concepts if they are represented and sharable.
6. Children below the age of eight generally have not acquired a systematic conception of classes and relations and therefore have not acquired systematic concepts.

A DEFINITION OF TERMS AND THEIR RELATEDNESS

In the following definitions, we will use the concept "pencil" as an illustration.

CONCEPTS: Concepts are organized knowledge represented by the knower. The representation can be mental and internal--as with images or thoughts--or external--such as pointing to or constructing examples, or describing attributes and values. All concepts are either classes, relations, or both.

The concept "pencil" might be defined as "an instrument with a solid lead, used for writing and capable of

marking paper."

CLASSES: Classes are groups of things that can be regarded as similar, or sharing similar properties. For example, a group of different sized and colored squares is a class because all members of the group share the property "squareness." Knives, forks, plates, and glasses constitute a class when they are all viewed as things used for eating. Concepts are classes in the sense that a concept of something is like a definition. It tells what is true of all things represented by the concept. For example, there is something similar about all things called "pencils."

All pencils can be used to mark paper; some pencils have red lead; pencils are only some of the things made of wood: all these statements are statements about classes and their relationships.

RELATIONS: A relation is the reference between any two or more things that can be defined only in terms of one another. For example, on top of, inside, between, to the right of, north of, older than, shortest, and yesterday are all relations. All these relational terms are also concepts.

The concept "pencil" is not a relational concept. However, a concept of how a pencil is made does involve a use of order relations. Look at a wooden pencil and

try to figure out how it was made. What was the first step, the second step...the last step? Understanding the order of events required to make a pencil requires more than knowing about manufacturing processes. It also requires understanding the order of events.

CLASSES AND RELATIONS: Some concepts are organized out of classes and relations. That is, the properties of the concept are organized according to similarities and differences, and according to relationships. The concept "pencil" is not an example of classes and relations. However, the concept of a "#2 pencil" is such an example. It's a class of all the pencils that have #2 hardnesses of lead, "hardness" is a relation. And #2 hardness is defined as all the pencils that are harder than #1 pencils and softer than #3 pencils.

A concept is composed of a class and/or a relational organization of properties (attributes and values) and examples.

EXAMPLES: An example is an illustration of a concept. If the concept is a class concept, then the example may be an example of a class. For example, a pencil is an example of the class of things called "pencils" if it is considered to be an example of the concept "pencil." The longer of two pencils may be an example of a relation "longer than" if it is used as an example of the concept "longer than."

ATTRIBUTES AND VALUES: An attribute refers to the basis of comparison between things; it is the kind of property used to compare two or more things. Values refer to the way things are different within a particular attribute. For example, "color" is an attribute and "red, blue, green" are values of the color attribute.

Values are classes within attributes. That is, "all blue things" is a class of things within the larger class of "things with color." Values are classes within classes, and attributes are classes of classes.

Attributes and values define each other. Furthermore, a value can be an attribute and vice versa. For example, "color" is an attribute in comparison with "blue"; but it is a value if we say that color is one class of things that the human eye can detect. Blue is a value in comparison with "color," but it can be an attribute if we are referring to a number of types of blue (baby blue, dark blue, sky blue).

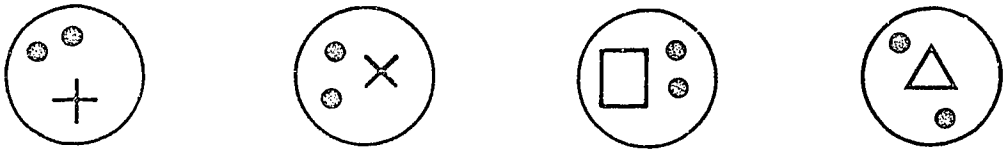
Class concepts are composed of attributes and values. For example, one concept of pencils is that they are "things to write with that use lead." "Things to write with" is an attribute, and "lead" is a value. There are things used to write which do not use lead, and that have different values, such as "ink."

Relational concepts are also composed of attributes and values. For example, the concept that one pencil

is shorter than another involves a comparison of the attribute of length with the value "shorter than."

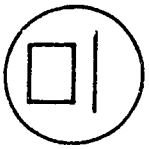
SUMMARY

1. A class is a group of things that are the same. The types of ways in which its members are the same or different are attributes, and the specific ways in which they are similar or different are the values of the attribute.



- These objects constitute a class because they are all the same in some way.
- The number of dots is an attribute, because it is one of the ways in which they objects are the same.
- Two dots is a value of the attribute "number of dots," and in this case it is the specific way in which all the figures are similar.
- Interior geometric shape is another attribute, but in these examples the values of this attribute differ, i.e., there are

2. A relation is the reference between things. Types of relations are attributes and the specific ways in which a relational attribute varies are its values.



- The figures within the circle have a relation, one of whose attributes is "height." Another attribute is "width."
- A value of the attribute "height" is "taller than" (or "shorter than") and a value of "width" is "fatter than."

3. (a) All concepts are either classes, relations, or both.
   (b) All classes and all relations are concepts.
   (c) All concepts have examples, attributes, and/or values.
   (d) All examples, attributes and values are concepts.

The diagram below illustrates how the terms concept, class, relations, examples, attributes, and values relate to one another. It represents the first five statements on page 27.

ALL CONCEPTS ARE EITHER CLASSES, RELATIONS OR BOTH. ALL CLASSES AND ALL RELATIONS ARE CONCEPTS.

ALL CONCEPTS HAVE EXAMPLES, ATTRIBUTES, AND/OR VALUES.

ALL EXAMPLES, ATTRIBUTES AND VALUES ARE CONCEPTS.

	Classes	Relations	Classes and Relations
Examples			
Attributes			
Values			

Activity 3: Two Pencils

The purpose of Activity 3 is to illustrate some relationships between concepts, and some ways in which examples of concepts are talked about. You will use the concept "pencil" and compare the similarities and differences between two pencils. We start with the assumptions that you have a concept of "pencil," that you can

find two examples of "pencils," and that you can describe the examples in terms of attributes and values. This activity is more fun if done in a group.

INSTRUCTIONS TO ACTIVITY 3:

1. Pick two pencils that are as different as possible from each other.
2. List as many ways as you can in which the two pencils are the same.
3. List as many things as you can that you can say about one pencil but not the other. If you can list 10 you're doing excellently. If you do 15, you're super. Let your mind run free. Pass the pencils around and get everyone's suggestions. Keep a group record on large sheets of paper or on a chalkboard.

POINTS FOR DISCUSSION

1. Everything you listed is a concept.
2. Everything you listed could be a class and/or a relation.
3. As you selected things to list, you were thinking of attributes and values.
4. The two pencils are examples of your concept "pencils."

FOLLOW-UP TO ACTIVITY 3

15 SIMILARITIES AND 10 DIFFERENCES BETWEEN MY TWO PENCILS

15 similarities	10 things true of only one of my pencils
made of wood	is yellow
have points	black lead
sharp	4.5 inches long
metal tips	has an eraser
used to write	silver metal tip
have lead	"Pandora" brand
have six sides	been chewed on
belong to someone	has two erasers
made by man	bought at Atlas Stationers
bought in a store	metal tip has many rings
have writing on them	
have numbers on them	
used-worn down	
narrow	
straight	

1. Since you've read Chapter 1, it should be fairly clear to you that all the terms in my list refer to [illegible]pts.

   "made of wood;" the concept "being made of something;" the concept "wood";

   "having points;" the concept "point";

"sharp:" the concept "sharp";

etc.

2. Each word in my list stands for a class and/or a relation.

"made of wood:" belonging to the class of things made of wood;

"narrow:" belonging to the class of things that are narrow, which is defined as a relation to "wide";

etc.

3. Each word in my list is used as an attribute, a value, or both:

"having lead:" used as an attribute because there are different values of lead (red, black);

"yellow:" used as a value (the other pencil was red). Yellow could also be an attribute if I had been comparing different types of yellow;

"metal tip:" used as an attribute because there are different types of metal tips: silver, gold, with and without rings;

etc.

CONCEPTS AND CLASSES

Up to now we have emphasized that relations and classes are both involved in conceptual activity. It's important to keep in mind that the nature of classes and relations is the key to understanding the organization, use, and development of concepts. For the remainder of this chapter we will focus on the relationship between classes and concepts.

It's obviously not necessary that you have a firm grasp of the logic of classes in order to work with children's concepts--which is the title

of this book. Every mother in the world works with her child's concepts. But a reasonable grasp will allow you to see both how and why children's concepts are different from those of adults, to see the implications of these differences for teaching activity, and, in general, to better understand how children represent and recognize concepts.

A class is an organization of attributes and values. And concepts are both the representation of attributes and values and are represented by attributes and values. For example, all social concepts use examples, attributes and values as their means of representation and as their basis of sharing. When the comedian impersonates a president, s/he does so with examples, attributes and values. If I ask for your verbal definition of the concept "square," you'll give me a description of attributes and values. If I don't ask for a verbal definition, you might point to an example, draw a picture, or imitate one with your hands. Whatever you did, it would work. (Imagine how long "square" would last in a game of charades.) You would do it with examples, attributes and values.

Activity 4: Does Advertising Make it Happen? Pick a Picture

The purpose of this activity is to focus on the ways in which classification relates to your concepts. It might be more fun, and certainly will be more informative, to do it with a partner.

INSTRUCTIONS FOR ACTIVITY 4:

Follow the instructions below one step at a time, as if they were a recipe.

1. Select a magazine with lots of full page color picture-advertisements in it.
2. Rip out every full page ad you come across after the first page. Rip out at least 20 pictures. The more pictures the better. If your magazine doesn't have enough full page ads, get another magazine or cut out smaller ads. As you rip out the advertisements, think about what product or service is being sold. Think of a "product-name" for it; e.g., for a picture of a refrigerator: "refrigerator" or "household appliances."
3. After you have 20 or more pictures, group them so that the ones selling the same type of thing are together. (You will probably end up with about 10 groups). Write down the product names of your groups for use later.
4. Now combine your groups so that there are fewer groups, but all things grouped together are similar types of products. Record the product-names for your new groups. (Try to keep more than five groups.)
5. Combine these groups even further, along the same lines as in step 4. Make a list of your "product" names.
6. Come up with one concept for all 20 pictures.

FOLLOW-UP TO ACTIVITY 4:

You should explore some of your own classification abilities by answering the following six questions and sharing what you discover. This should give you a better idea of what is meant by classes and relationships between classes.

1. Were you able to come up with concept names (product names) for all of your groups? Did the name of each group apply to all the things in it?
2. Were there more liquor ads or more ads? Explain. Can you tell without counting?
3. Could all the things have been classified in a completely different way? Name 10 attributes that could be used for sorting advertisements in general.
4. Did your product-names at step 5 reflect more general concepts than those at step 3? For example, "household appliances" is a more general class (concept) than "washing machines." (Give some examples and explain.)
5. Are there more things in the world that are not advertisements or more things that are not product advertisements? Explain.
6. Take one word from your lists at step 5 and treat it as a concept. Define what the concept means. Are all the objects in that group examples of the concept?

Your answers to these questions reflect how you think with and about classes and how you coordinate one class with other.

You are able to take any word you generated in the activity and

express it as a concept; if you arrive at a systematic and consistent definition of the concept (such as "squares are geometrical figures with four sides connected at equal angles"), you will do so through a coordination of all and some of the attributes and values found in examples of the concept.

As an example, let's say you put together a number of pictures of cigarette advertisements and said that they belonged together because they all concerned cigarettes. If you were asked to define your concept of cigarettes, you might say they have tobacco in them, that all cigarettes have tobacco in them. If you were asked whether a tobacco barrel is a cigarette, you'd probably say "No," reasoning that your concept of cigarettes involves more than having tobacco, that not all things with tobacco in them are cigarettes. You might then try to refine your conceptual definition. You might eventually come up with a definition such as: cigarettes are small, hollow cylinders of paper, open at both ends, filled with tobacco, and used for smoking. The first definition (cigarettes are things with tobacco in them) and this more refined definition--as well as all the possible definitions in between--are the result of your using understandings of all and some and similarities and differences and the coordination of the two in your consideration of attributes, values and examples of cigarettes.

Classes are groups of things (objects, ideas, events, etc.) that have some property in common: they share common attributes and/or values. Classes always involve:

1) judgments of similarities and differences among and between properties; and,

2) judgments about all and some--all the things in a class share common properties; some things in a class have other properties; all the things in one class are only some of the things in other classes.

An understanding of similarities and differences and all and some requires a consideration of the relationships between classes. The class of things-that-are-similar is defined by considering things-that-are-different. To consistently recognize examples of your concept of square is also to know what is not an example of a square. Likewise, to know that all squares have four equal sides is to know that some, but not necessarily all, things with four sides are squares: rectangles have four sides and are not squares. It is impossible to reason systematically about similarities and differences without considering the relations between classes.[11]

Concepts, as represented knowledge, involve the same issues. For example, your concept of square involves judgments about what is similar and different about things you think of when you think of squares. Likewise, it involves judgments about all and some. Some squares are big and some small, but all have four sides. Some things with four sides are squares, some are not.

One of the most significant findings in the study of child development, and one of the most significant differences between children and adults, is that adults can coordinate relations of similarities and differences with some and all to form classes and concepts with systematic relations between them; and young children cannot. This ability

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11. See Part 1. of ECT: The Development of Classification.

gives adults the power to think systematically, to form concepts that are logically consistent, and, in general, to invent all the powerful concepts evolved by mankind throughout history.

Most children younger than six or seven years of age do not and cannot form systematic classes or concepts.

THE CHILD'S CONCEPTS DO NOT INVOLVE A LOGICAL RELATIONSHIP BETWEEN CLASSES: BETWEEN SOME AND ALL

All action tends to have organization, pattern and structure. In that sense, children's concepts are logical. But their logic is different from that of adults. Here, "logical" refers to an understanding of the types of relationships referred to above as "some and all."

In Chapter 1 we emphasized that children have concepts; that from the moment children can represent understandings to themselves and others, they are constructing and using concepts. So far in this chapter we have emphasized that all concepts involve classes and relations. But as the remainder of this chapter will show, the classes children use are very different from those adults use. This is because the child does not co-ordinate relations of some and all with relations of similar and different.[12]

If one class of things belongs to a larger class, it follows logically that there are more objects in the bigger of the two classes than in the smaller one. If you give a typical five year old eight wooden beads and a few yellow wooden ones, s/he will probably be able to reason that all the beads are wooden; that if all wooden beads are taken away, none will

12. Inhelder and Piaget, Early Growth of Logic in the Child.

remain; that if the red ones are taken away, the yellow ones will remain. But when asked whether there are more red beads or more wooden beads the child will say that there are more red ones. You'll get the same response having the child compare girls vs. children, roses vs. flowers, good people vs. people, or cigarette ads vs. all ads.

PRE-SCHOOL CHILDREN DO NOT HAVE "TRUE" CONCEPTS

We have said that a "true" conception of classes requires a coordination between some and all and similarities and differences. Let's look at this issue more closely and start with our definition of a class as a group of things that are similar in some way.

To simplify the matter, we'll start with an imaginary situation in which you have a number of shapes to sort and you put all the squares together. If I point to the squares and ask why you put them together, you'll probably say that they're squares, or that they're the same shape. Your answer will imply a coordination between some and all with similarities and differences. In effect you say, "The ones I put together are similar and the ones I didn't put with the squares are different." Your answer implies that you understand that not all the shapes are squares, that some of the shapes are squares, that all the squares are only some of the shapes and that all the shapes-that-are-not-squares are only some of the shapes.

To form any "true" class you must exclude everything that does not belong in the class; and you can do this only by considering a larger class to which both that which is included and that which is excluded belong. For example, both squares and non-squares belong to the class

"shapes." Shape is an attribute or class that includes a number of sub-classes or values such as squares, circles, triangles, etc. To form any "true" class, then, requires an understanding of the relationships between at least three classes: the class of things that belong together, the class of other things that do not belong with the first class, and the class (or attribute) that includes them both. Unlike the child's, your understanding of these relationships allows you to reason that if there are 10 square shapes and three circle shapes, there are more shapes than squares.

Because concepts themselves are no better than the types of classes and relations that make them up, it is fair to say that children cannot form "true" concepts any more than they can form true classes.[13]

MORE NOTES ON THE CHILD'S CONCEPTION OF "ALL"

The pre-school child does not form concepts about what all of anything is, in any complete sense. This seems peculiar, because an infant's first concepts show some understanding of "all."

When Matthew began to form his first concepts, if we were looking through a picture book and something caught his interest--such as a balloon--he would point to it and say something like "What's that?" Irrespective of my response he'd point to all the other balloons on the page, one after another, and generally ask "What's that?" each time. This same thing occurs with a wide variety of concepts. There's no

13. Again we emphasize that we are not examining the child's conception of relations such as "longer than," "between," etc. But the logic of relations is similar to that of classes, and children do not understand relations any better than they understand the relationships between classes. See Part 2 of ECT: The Development of Order Relations.

question that it is purposeful and intelligent conceptual behavior, involving some appreciation of the concept "all," although "all" is not yet part of his vocabulary, nor would he give "all" of anything on request.

By four years most children can tell you that a pile of red objects are "all red" and follow your request to give you all the red blocks in the box, or all the cigarettes on the table. A four year old does have the concept "all." If a four year old can't give you all the "red ones" it's because "red" is not a social concept for that particular child.

But a child of four would have difficulty constructing, or even conceiving of the need to construct, a concept about what makes all of anything similar. If an advanced four year old gives you all the squares and you ask how all of them are the same, s/he'll say that they're all squares. If you then ask what is the same about all of them the child will be unlikely to acknowledge the question, or find it of any particular interest. If s/he does, it will be with some difficulty; and what s/he will do will be to point to a value of the square. S/he will point to corners, or gesture, or point to the sides of the squares or stack them on top of each other.

A four year old will never come up with a coordination between the attributes and values so that s/he can determine all the attributes and values that are similar about all squares in front of him/her or in the world. You will never find a normal four year old concept which coordinates attributes and values at a level where there is perfect coordination of similarity with differences and some with all.

CHAPTER 3

CONCEPTS UNDER CONSTRUCTION: THE DEVELOPMENT OF CONCEPTS

HOW WE GET WHAT WE GOT

We are not born with concepts, yet we manage to survive because of our concepts. So it's natural to ask how we got them. We got them by making them up; and we make them up by interacting with, and acting upon, the world.

Concepts are organized knowledge. The mind organizes actions and experiences, and the nature of the organization changes with development. In the early years of life, the patterns of organization are not very systematic. There are contradictions and inconsistencies within the concepts, and the tendency of the mind is to work these inconsistencies out in order to arrive at a better and more useful organization.

These patterns of organization are called "mental structures." A mental structure might be thought of as a potential level of organization. From birth to late adolescence, the mind constantly is developing more systematic ways of organizing experiences. This progress can be defined in stages, with each new stage being more complete and better organized than the preceding one.

At any stage, the nature of the child's concepts are limited by the nature of his mental structures. As more and more concepts are organized, inconsistencies begin to appear and the underlying structure changes, becoming somewhat more complete.

As the child moves from one stage to another, old concepts are reorganized and new ones added on. The fact that a child is at a given level of development and has certain mental structures, as revealed by his/her thinking, does not mean that all his/her concepts will be organized at that level. It means simply that as the child evolves a concept, s/he will tend to adapt it to the level of organization characterizing his/her stage of development.

There is no limit to the number of concepts a child can acquire at any stage, including the last stage of childhood, roughly between 16 and 18 years of age. As adults we continue to develop concepts, although our potential level of mental organization has reached its zenith. Thereafter we acquire more experience, more interests, and so on, and we tend to organize our concepts about these matters in terms of the mental structures that already underlie our thinking.

WHO'S YOUR MOTHER?

We've all heard it said that it's a wise man who knows his own father. No particular credit seems to be given for knowing your mother. That's neither fair to mothers nor a fair estimate of the problem. It's no easy matter to form a concept of who your mother is, let alone to arrive at a social conception of mothers in general.

By looking at how your concept of "mother" might develop, we'll illustrate how the form of a concept changes with development. We simply are using the concept "mother" as an example. Certainly not everyone has the same "mother" experiences. The focus is on how experience is organized.

Typically, when your mother first saw you, she cried, laughed,

screamed, groaned or prayed. But you could not have cared less. Other than sucking, burping, or crying in response to her actions, you were hardly aware of her existence during the first month of your relationship.

One day, somewhere around a month after your birth, you smiled at some of her doings: maybe she was feeding you, changing you, or cooing with you. That was the first sign she had that you knew her.

Not long after that you were cooing and smiling at Mom with regularity. You became secure enough to do it with other folks around and you even smiled and cooed for some of them. Mother wondered what went on in your little head. You couldn't have told her. All you knew was that certain sensations, appearances, feelings, sounds, smells, and rhythms were outside you in some way, but they were yours and you smiled and cooed at them because you were pleased to recognize them.

For a few more months you had this simple view that there were things going on out there, some more familiar to you than others; but you really didn't think in terms of "mother" and people who were "not mother." You weren't afraid of strangers because they really weren't all that strange. In some sense, everybody was the same.

By the time you could walk, at about one year, you started to get it sorted out. There was your mother and there were others, and some of the others were familiar and some strange. You had no means of expecting such a world, but it didn't surprise you either.

You started giving things to your mother, following her around the house, imitating some of her actions, like waving bye-bye, and following some of her commands like "no" and "hot." Doing these things were part of your "mother" concept. You were just beginning to be able to represent

her in her absence. But as yet you had no real way of sharing your understanding with others.

Around 16 months, you started developing some simple words. One of these was "mama." Before long, when you saw things she used, or things associated with her, you'd say "mama." "Mother" was becoming not only sensations, but also a person with many aspects you could isolate: her shoes, her purse, a brush, etc.

By two years of age, it was mama this and mama that. You'd say "mama" when you heard her outside, when you heard her in a room, when you saw something that belonged to her, when you wanted her, and so on. Mama was the giver of answers to "What's dat?" and the giver of comforts and commands. She was the sacred keeper of bed times, nap times, eat times, and peepee times. At the same time you generally felt that everything was going along just as you had planned it.

It would seem that you had acquired the concept "mother," or at least a concept of your mother, and so you had; but you also started calling other people "mama" when they did things that your mother did, or when something reminded you of her.

As time passed, you started reserving the word "mama" for your own mother, and when a playmate called his/her mother "mama" you corrected him/her--in effect, told your playmate that his/her mother was not "mama, that your mother was "mama."

By three or so, you started to allow that other people had mothers as well. You started incorporating imitation of mother into your play. But to play the role of mother, you had to behave in certain ways and do certhings that your mother did. If those things didn't match up, they weren't

"mother" no matter what their claim.

If, by four, you were asked what a mother was, you would have replied that it was someone who cooks for you or takes care of you or loves you. Whoever didn't do these things was not part of your concept of "mother." You probably still thought that your mother was also your father's mother. After all, she cooked for him as well. The wife of the man next door was his mother for the same reasons. If your mother told you that your grandmother was her mother, you would have been confused. How can mother be a mother and not be a mother at the same time? Impossible. There's little people and big people. Big people can't also be little people, or children.

Between you, the four year old, and you, the adult, there's a lot of distance. Whatever your own experiences are, you have a complexly organized concept of motherhood, and an even richer one of your own mother.

As for your general concept of motherhood, you know that your father's mother is your grandmother; that your grandma has a grandma who has a mother; that each person has a natural mother; that there are more people with natural mothers than any other kind; that some people are raised by their natural mothers and some are not; that there are more people who are raised by someone than there are people who are raised by someone who is not their mother; that some mothers cook and take care of the home and children and some do not; and of those who do, some wish they didn't have to.

There is an endless number of similar "mother" concepts that can be generated and understood which are true for all adults. This is so because the organization of these "mother" concepts constitutes a system of classes (where all and some are coordinated with similarities and

differences) and relations (such as "mother of" and "daughter of"). Such reasonings are not dependent upon particular and specific experiences, but upon the broad power of reason that grows out of all mental experience.

The four year old has not developed that broad power of reason that is supported by a system of classes and relations.

Activity 5: The Young Child's Concept of Mother

In this activity you will interview children to find out what their concepts of mothers are. The purpose of the activity is to begin to explore children's concepts and to see how they differ in their organization from your own. This activity should be done with others so that you can benefit from their insights and experiences, and they can benefit from yours.

INSTRUCTIONS FOR ACTIVITY 5:

1. Work with a group of other adults and discuss how, as a group, you can manage to interview children ranging between four and eight years of age. The wider the age differences between the children, the more likely you'll be to see different forms of reasoning. Each person should consider at least two interviews with two different children.
2. Discuss how you will record the interview to share it with the group.
3. Think of ways through which you can get children to reveal their thoughts about what "mother" means. Maybe you can enter into their play or ask them questions while reading an appropriate story to them, while making something for mother or painting a picutre of a mother.

4. Think of the age of the children you'll interview and think of things you can ask. Your group should brainstorm on this. Pay attention to what the child is likely to say and what you'd ask in response. REMEMBER TO ASK CHILDREN TO EXPLAIN THEIR ANSWERS AND STATEMENTS. Here are some ideas:

   How do you know if someone is a mother?

   Can anyone be a mother?

   What makes some people mothers and some not?

   Does everyone have a mother?

   If a person is a mother, is she always a mother

   Can you be a mother if you don't take care of anyone?

   Could there be a world with no mothers in it?

5. As a group, discuss the notes on interviewing children in relation to the questions you would ask (Appendix A).
6. Interview at least two children and record or be able to re-create what you asked and what the child said.
7. After everyone has interviewed some children, share and discuss your findings. Think about the nature of the mother concepts held by children. How are they similar to and different from yours, how are they similar to and different from each other? Are the concepts of older children different from those of younger ones? What other questions could you have asked?

FOLLOW-UP TO ACTIVITY 5

In the following discussion, we will draw heavily from the sections on classification and order relations from the ECT unit, and from Chapter 2 of this unit.

In LCT we stated that children's thinking between four and eight years could be divided into three distinct stages, each with its own form of reason: the pre-conceptual stage, the intuitive stage, and the concrete-operational stage. In this follow-up we'll examine how a developing concept of "mother" might fit into these three stages.

When you talked with the child, if you said, "What's a mother?" you asked, in effect, "What are the characteristics of mothers?" That is, you asked about his/her "mother" concept. The rest of your exchange would have been about examples, attributes and values: you talked about things mothers do, what they look like, how they're related to other people, or what one mother has in common with other mothers, and ways in which mothers differ from one another.

If a child said,"Only girls are mothers," s/he implied an attribute of sex with the values of "boys" and "girls." If you talked about mother being someone you like or don't like, then you were talking about the attribute "how you like mother" with the values "do" and "don't." If you talked about mothers doing things for you, then you talked about the attribute "what I get out of it" and the values "food," "love," "place to sleep," etc.

The child develops in his/her coordination of examples, attributes, and values, and up to about eight years of age, his/her coordination isn't very refined from an adult standpoint. At four years of age, a child has essentially no well-coordinated attribute-value relationships. S/he does not think to him/herself that people are of both sexes and mothers are only of the female variety. The four year old instead thinks, and represents to him/herself, that mothers are things called girls or women and women have certain properties like long hair, dresses, soft

voices, or whatever the child experiences as "women."

The four year old's concept of mother is, in essence, a picture. It is composed of everything the child experiences as "mother." But it is not a conception in which all examples of "mother" are recognized as similar to each other in some respects and different from each other in others. Rather, it is a disorganized collection of values, examples and attributes.

During the pre-conceptual stage, to which most four year olds belong, the child does not think of things as similar and different, but as belonging together. This is the "graphic stage" of classification development, because the child does not sort on the basis of values, but rather uses values to create an image: a row of squares, a house, a household scene, similar looking towers, etc. The four year old's concept of "mother" is a collection of values or represented characteristics that belong together because they make up his/her mental picture of "mother." This is the nature of all the pre-conceptual child's concepts.

The typical six year old, on the other hand, is beginning to consider similarities and differences. S/he is interested in how things are similar, or what the common values are which are used to describe examples of a concept. Some of those values have the properties of attributes. For example, the six year old recognizes that mothers are women. "Women" is a value of the "mother" concept examples. But it is also an attribute because there are many kinds of women, i.e., many "women" values. If you ask the six year old if there are different types of women, he will give you a reasonable answer. However, what distinguishes the six year old from the adult is that the six year old does not coordinate attributes and values at the same time.

It's easier to think about this in terms of similarities and differences. The six year old thinks of all women as similar in that they conform to his/her general concept of women. S/he also thinks of women being different, e.g., some are mothers and some are not. But the typical six year old does not consider both these issues at the same time. S/he does not consider that all mothers are women and, at the same time, that some women are mothers. If the child was able to consider both these relations simultaneously, s/he would realize that there are more women in the world than mothers, and give as a reason the argument that all mothers are only some of the women. But the six year old's conceptions are not yet that sophisticated.

Similar problems arise with all the possible coordinations of similarities and differences and relations. The six year old may know that some women are mothers, that all mothers are women, and that everyone has a mother, and yet not be able to reason that, therefore, all mothers are daughters but not all daughters are mothers.

The average eight year old has just begun to consider similarities and differences simultaneously; s/he has just begun to coordinate attributes and values of examples. This coordination marks the child's entrance into the concrete-operational stage of development, which lasts until approximately 12 years of age.

SQUARE REVISITED

In Chapter 2, we emphasized that all examples, attributes and values are, in themselves, concepts; and that they go together to make up concepts. Further, we emphasized that all concepts involve classes and

relations or both. We also saw that classes and relations go through a developmental progression in which they become better coordinated and that, as a result, the growing child's concepts become better organized.[14]

A common view of how children form concepts is that they associate words, like "square," with examples of squares; that the child sees certain properties in the examples of squares, and by associating the properties s/he sees with the word "square," forms a concept of "square." This view appeals to common sense, although it greatly oversimplifies matters. We've seen already that finding the properties common to all examples is beyond the grasp of most four and five year olds. More importantly, the properties of concepts are themselves concepts that the child must construct.

For example, consider the properties (values and attributes) of squares. Squares are closed figures, they have four straight sides, the sides are connected at right angles, there are four corners, the sides of squares are parallel to each other, and so on. Each of these properties is itself a concept, and to have a well developed concept of any one of the properties is beyond the grasp of most children under eight years of age.

Most four year olds who have been exposed to the word "square" and who have been shown examples of squares have a concept of squares. Thus, the four year old is able to represent some of the properties of squares. This knowledge is enough to give the child some concept of squares--enough so that s/he can find a square for you if s/he is asked to.

In the remainder of this chapter, we'll explore the young child's

14. The nature of this development is the focus of Parts 1 and 2 of ECT.

concept of square.

Before doing Activity 6, try the following warm-up exercise. Using no more than one or two sheets of paper, a straignt edge, and a pencil, draw (without tracing) as accurate a square as you can. Make the sides of the square at least four inches long.

Chec! the following points to see if your square is a perfect one.

a. Are there four connected straight lines?

b. Are all the lines the same length?

c. Are all the internal angles equal?

Write down as many of the things that you did and thought of as you can.

Activity 6: The Child's Concept of Square

In this activity you will work with children to learn about their concept of "square." There are eight major tasks (I-VIII), some with variations. You should try to do at least three tasks with any one child. This activity should be done with other learners so you can share your findings and insights.

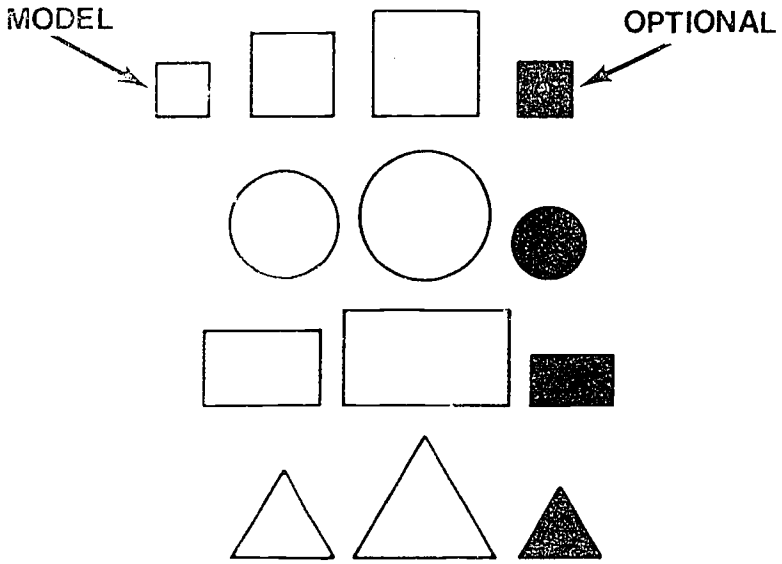
INSTRUCTIONS FOR ACTIVITY 6

1. The group should share and discuss each of the eight activities and their variations. It might be ideal to have each person in the group present a task and its variation to the whole group.

   I.1 Finding a square (with model)

   Use the materials illustrated in Figure 1.

Figure 1: Materials to be used in parts of Activity 6.



Do	Say
Put shapes out in front of child and mix them all up. Hold up the model square.	This is a square. Find me a square (pointing to a pile of shapes). Are there any more? Find all of them.

This activity can be made somewhat more difficult by doing it without sight. You can put the shapes in a bag and have the child reach into the bag and find the square by feeling the shapes.

I.2 Finding a square (without model)

Use the materials illustrated in Figure 1.

Do	Say
Put out shapes in mixed order.	Find me a square. Is that all of them? Would this (pointing to a rectangle) be all right, would it be a square?

The same variations suggested in I.1 can be used.

I.3 Classification

Use materials illustrated in Figure 1.

Do	Say
Put out shapes in mixed order.	Put together all the shapes that are alike.

II.1 Drawing (with model)

Use pencil and paper. If child is over six, you may provide a ruler or straight edge.

Do	Say
Put out a model of a square. Give the child paper and pencil.	See this square (pointing to the model), draw me a picture of it. Draw me a square.

II.2 Drawing (without model)

Use pencil and paper. If child is over six, you may provide a straight edge.

Do	Say
Put out paper and pencil.	Draw me a picture of a square.

III.1 Finding squares in the room (with prompting)

Say

Find me a square in the room. Let's walk around and see if we see one.

Prompting

Point out shapes and ask if they are squares. Point out some that are and some that aren't. Consider things like: door, windows, ceiling and floor tile, bulletin or chalk board.

III.2 Find squares in room (without prompting)

Say

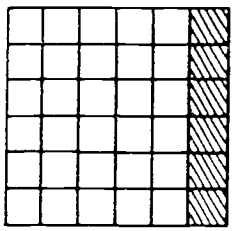
Find me a square in the room. Let's walk around and see if we see one.

IV. Constructing a square

Use a large number (50) of one-inch cubes. Large blocks can be used if they are all the same sizes and there is enough space to lay out a square.

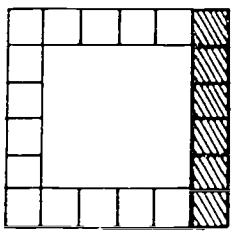
Do	Say
Put out the materials and make a row six blocks long.	Use these blocks to build a square. Use this row (six blocks) as one of the sides of the square.

Note: the square can be solid



or open.

It is a harder task to do it "open."

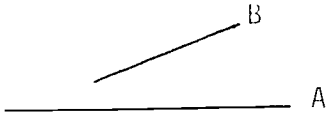


V. Describing a square (group)

Do this activity with a group of children.

Say

I am going to do exactly what you tell me. You tell me what to draw and I'll draw it. Let's pretend I never heard of a square and you are going to tell me how to draw one. OK? what's my first instruction? (Continue by questions and probing until you have drawn the child's best approximation of a square. Do as exactly as possible what you are told. Do not make any assumptions. For example, if you've drawn a line (A) and the children tell you to make another one (B), you have to find out where they want the second line drawn and how long it should be.



VI. Describing a square (individual)

Say

What is a square? How does a square look? Can you describe what a square is? How would you describe it to a friend who never heard of a square?

VII. Drawing a perfect square

Use a small square, a sheet of paper and a pencil.

Do	Say
Put out materials	Draw me a picture of a square. Make it as perfect a drawing as you can. Make it bigger than this small square. You

can use anything on the table.

VIII. Square in a stadium

Say

How would one person make, out of string, the biggest possible square that would fit inside a football stadium? How would you know you had the correct angles?

(Elicit from the child exact details about how s/he would measure length and angles.)

2. After the group is familiar with the tasks, each person should consider the approximate age of the child s/he will interview. Using Tables 1 and 2 as a guide, select three tasks that you will interview the child on.

Table 1

Tasks that children of given ages can try

3 year olds

I.1	Finding a square (with model)
	This can be done with or without sight
I.3	Classification
II.1	Draw (with model)

4 year olds

I.2	Finding a square (without model)
I.3	Classification
II.2	Draw (without model)

III.1 Find a square in room (with prompting)

5 year olds

I.3 Classification

II.2 Draw (without model)

III.2 Find a square (without prompting)

IV. Constructing a square

6 year olds

II. Draw (without model)

IV. Constructing a square

V. Describing a square (group), OR

VI. Describing a square (individual)

7 year olds

V. Describing a square (group), OR

VI. Describing a square (individual)

VII. Draw a perfect square

8 year olds

VI. Describe a square (individual)

VII. Draw a perfect square

VIII. Square in a stadium

Table 2

Order of Difficulty of the Child Tasks

For Activity 6

Those tasks with higher Roman numerals (I, II, III, ...VII are harder.

Within a Roman numeral, those tasks with higher numbers, are harder (e.g., I.1, I.2, I.3)

3. Group members should discuss how they will bring back a record of how their children performed on the tasks. The more detailed the record, the more insightful your discussion will be.
4. After conducting the interview, read the follow-up material. This will help you formulate what you can share with the group.
5. Share with group members what you found out in the child interviews.

FOLLOW-UP TO ACTIVITY 6:

All the above tasks, involving the child's concept of square, can be divided into three types.

1. Pointing out examples of the concept

   In those activities where the child was asked to find squares or point them out, the child represented his/her concept of square by finding or pointing out an example.

   The classification task, as used in Activity 6, also involves examples. Here the child is asked to put together shapes that are alike, and the classes s/he creates are examples of what the

child regards as "similar shapes."

2. Constructing examples of the concept

   Those activities in which children draw or build squares are ones in which they represent their concepts of square by organizing the properties of square as they conceive them.

3. Describing the concept

   The remaining tasks are ones in which the children verbally describe the characteristics of squares as they conceive them.

Each of the above is one of the means by which concepts are shared. It describes ways in which the person who has a concept can represent it to someone else. How well the concept is represented depends upon how well developed it is. By examining the performance of children in each of these ways, we can get a picture of their "square" concept.

POINTING OUT EXAMPLES OF THE CONCEPT

1. Finding examples of squares (I.1 and I.2)

   In task I.1 the child was shown a square and asked to find one in a pile of shapes. This is probably easier than task I.2 where the child didn't have a square to match and had to rely on the word alone.

   Whether Task I.1 or I.2 was used, the following represents a typical trend in how children deal with this task:

   The youngest children who can respond to the instructions (around three years of age) will be able to find shapes that match some of the properties of squares, but not all of them. For example, they might select a triangle or a rectangle because it has straight lines and corners. They might also select a

square, but they probably won't select all the squares out of the pile of shapes.

Somewhat older children will have trouble distinguishing rectangles and squares. They might exclude shapes like circles and triangles, but probably will include rectangles with squares. Probably they also will fail to give you all examples of squares even when asked to do so.

By the time the child can select squares consistently, s/he will still fail to select all squares if the squares are of very different sizes, colors, textures, etc.

By around six years of age, most children who have had lots of "square" experiences can select all squares out of a collection of shapes.

2. Finding examples of squares (I.3)

In task I.3 children are given a number of shapes to classify. As you learned in ECT, the development of classification goes through many stages and is not very systematic until approximately eight years of age. In task I.3 we are just looking at how squares are treated, and not how classes are related to each other. The typical three or four year old doesn't put all squares together. There are probably no piles with all squares in it. Squares are probably mixed up with other things.

Next you can expect to see squares being separated by themselves, but probably not all the squares are put together.

By six years of age, most children with "square" experiences can sort the shapes so that all squares are together.

3. Finding examples of squares (III.1 and III.2)

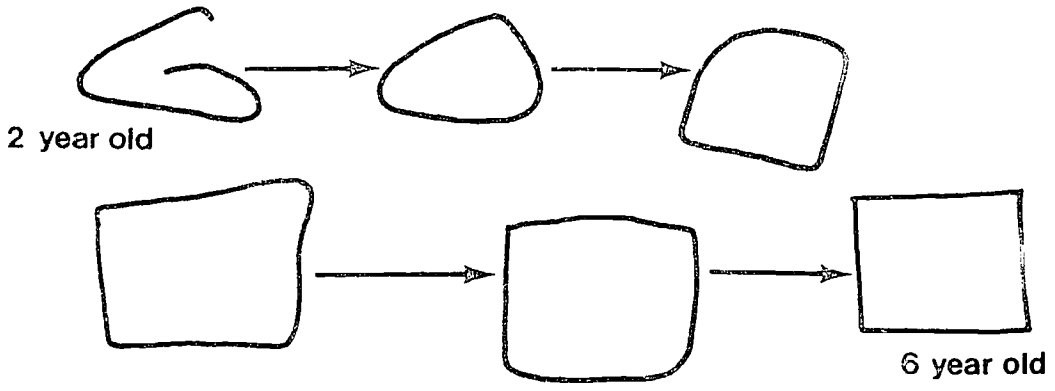
In task III.1 children are asked to point out squares in the room and they are given help in finding shapes to consider. In III.2 they are not given any help. These tasks are probably somewhat more difficult than finding squares in a pile of shapes because children have less experience with "squares" as they occur in our environment: the window is called a "window" and not a "square." Yet, with shapes, the square is almost always called a "square." Performance in tasks III.1 and III.2 should not be very different.

CONSTRUCTING EXAMPLES OF THE CONCEPT

1. Drawing-freehand

In task II.1 children are asked to draw a square freehand. This same task is used in many intelligence tasks and there is a great deal of data on how children perform.[15]

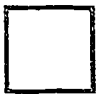
Here is an approximate developmental sequence of children's drawing.



Most children below the age of six will not use a ruler to make

15. Bettye Caldwell's Preschool Inventory is an example.

straight lines, or to measure lengths. Some six year olds will use it for straight lines, but generally not for length. An eight year old may use a ruler for both. An adult could use the ruler to measure lines on a geometrical drawing of a square, knowing with certainty that if the four lines are equal length and connected, the angles must be equal.



2. Drawing a precise copy of a square

   On task VII children are given a small square and ruler and asked to draw a bigger square and to make it as perfect as possible. The small square can be used to copy a right angle, and as a unit of measure.

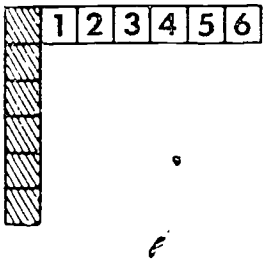
   The typical six year old will not use the small square as a unit of measure for either the angles or the length of the sides. Nor will s/he use the ruler to measure equal length sides. By seven most children have been taught that squares have equal sides, and they may attempt to draw sides of equal length (using the ruler); but they will have problems connecting the sides because their angles probably will be off. There will be a trend toward refining the square; but by and large, children under nine will not be able to draw a perfect square.

3. Constructing a square with blocks

   In task IV, children are asked to construct a square out of blocks when you build one of the sides for them, using six

blocks. Children who are first able to attempt this task will not use counting as a means of establishing the length of the square.

When children start to use counting (trying to make each side six blocks long) they will have difficulty. For example, they will attempt to add six blocks along one side, which will actually make one side seven blocks long.



By about seven years of age most children will be able to handle this problem and construct a model of a square.

DESCRIBING SQUARES WITH WORDS

In tasks V, VI, and VIII, children are asked in one way or another to describe what a square is.

The youngest children who can respond to this task will not describe the geometric properties of squares, i.e., straight sides, right or equal angles, four sides, and so on.

By about six children begin to describe some of the geometric properties of squares but they do not give an exhaustive definition of squares; i.e., they do not describe what must be true for something to be a square.

By about eight, most children can give a definition of a square as a shape with four equal length sides.

Each of the above activities, I-VIII, involves ways of sharing the concept "square" socially. The activities either involve pointing to or finding examples, putting together things with the same values (from the child's point of view), reconstructing examples, or describing attributes and values. All these activities involve use of the concept square, and they all involve social representation of the concept.

The concept square also is used by children on their own without sharing it--at least on purpose. For example, a child may be playing with blocks and intentionally may build a square or consider the properties of a square in constructing a tower. If you know what to look for, the child is representing his/her concept of square in ways that we can see. By looking at the child's actions we can see his/her use of the concept. In that fashion, s/he communicates to us what the concept is. Of course, the child represents concepts in his/her head. While the child is thinking of squares, there is internal representation that we cannot share.

The fact that a child learns the word "square" does not really represent his/her understanding or concept of square. The concept square is represented to us only when we know what the child means by it. We may have to infer this from what we see, or set up conditions whereby we can see what is meant. The child may point to one and say "that's a square" or describe one and say "a square is a shape like a box." The word "square" either represents a concept internally--i.e., what the child thinks of when s/he says or hears "square," or externally, when the word "square" is embedded in some context, such as when we ask, "Name some types of shapes." Or "What is another name for a four-sided polygon with equal length sides?"

Words themselves are not concepts; they stand for concepts. Nor

does a word tell us what the child's concept is or how it is organized. A concept is always in the process of becoming better organized through its use in conjunction with other concepts. To see how a concept is organized requires knowing something about how the concept is contructed and put together, and knowing how it can be represented. When you have some sense of this, you can create situations and make observations that tell you what's behind the child's use of a word like "square," or any other word that means something to the child.

CHAPTER 4

NO CONCEPTUALIZATION WITHOUT REPRESENTATION AND INTEREST

WHERE ARE WE GOING

Concepts always are represented, and a person's interests always are reflected in his/her constructions. There is no conceptualizing without representation and interest. You and I can't share a concept unless our interests lead both to its construction and to a desire on our parts to share. Furthermore, we must develop ways of representing the concept that are mutually understood.

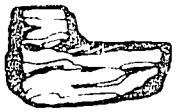
In this chapter we'll explore how concepts are represented both by children and by others in the child's social environment. We also will explore how interests enter into concept development, and how to share in the child's conceptual interests.

REPRESENTATION: WHAT YOU SEE IS WHAT YOU GET

In the last chapter we focused on the sample concepts "mother" and "square." To discuss the representation of concepts it will be to our advantage to open our focus back up. In Chapter 1 we talked about concepts as represented understandings, and said that because concepts can be represented, they tend to be shared, to become social, and to raise issues of agreement and disagreement.

A fundamental form of "social agreement" is simply recognizing something for what it is intended to be. For example, the other day Matthew

was playing with a piece of wood about the size of a penny. He made it move along with deliberate imitation, oblivious to my interest. I asked, "Is that your car?" and he said, "No. My boat," and proceeded to mumble something about wa[illegible] Well, it looked like a car to me, but he was emphatic. "It's a boa[illegible]



This observation illustrates two points. One is that certain properties of the piece of wood resembled properties of boats. The resemblance was minimal but it was enough for Matthew to use the piece of wood as a means of representing his concept of boat. The other point is that once his concept was represented externally, social issues of agreement and disagreement became possible. For a moment we disagreed: it's not a car, it's a boat.

With the inventive power of his imagination, Matthew had created a boat out of a piece of wood. Within [illegible]ew months, Matthew will be arranging blocks to represent boats, and later still, drawing pictures of them; possibly at some point he will be carving a boat out of wood, or even building one in which he can sail. All these possible constructions will represent his concept of boat. And by their presence as objects, they will share with us a part of that conception.

When an author writes a book; a painter paints a picture, a builder builds a house; a director directs a movie; or a chef cooks a stew; a concept is being represented. And because the representation is external, we can share it.

Trying to unravel all the ways in which such representations reflect

concepts, and all the ways in which such constructed representations are shared, is an impossible task. It's a infinite layer cake. When a painter paints a portrait it may reflect the artist's concept of the person being painted, a concept of what a portrait is, a concept of "good portraits," of what the client wants, of what will sell, and/or of how to handle color, line, and composition. And the portrait can be shared in an equal number of ways. Whether others see in the portrait what the artist intended is an issue of agreement.

Concepts are represented in ways other than by constructed imitations of reality such as paintings, novels, or pieces of wood called boats. They are represented by examples, and by attributes and values. If I want to share my concept of a good portrait, I can't do it by painting one: I haven't the relevant expertise. However, I could point out examples, or describe what I regard as the characteristics of good portraits. In such a manner I could demonstrate and share my concept.

There are numerous instances in which concepts are shared without any intention to do so. Consider, for instance, the boy who, when asked how old he was, said "My mother told me to say I won't be 12 until next month." The questioner comes away with the impression that the mother's self-concept was that she was getting old too fast. She probably didn't intend to convey that concept, nor is it likely that her son intended to pull the cover off his mother. But we won't know until we do some sharing.

Consider this riddle. A man and his son were driving down the road and got into a terrible accident. The father was killed. His son was seriously injured and required immediate surgery. The doctor came into the operating room and said, "I can't operate on this boy. He's my son."

If you don't already know the answer, give it a little bit of thought.

DON'T READ ON UNTIL YOU HAVE THOUGHT ABOUT THE RIDDLE AND TRIED TO SOLVE IT.

The answer to the riddle is that the doctor is the boy's mother. If you had trouble answering, it's probably because your concept of doctor does not strongly suggest to you the value "woman." Your attempts to solve the riddle represent this aspect of your doctor concept, even though you probably didn't intend them to.

While concepts involve representation, and concepts are shared by being represented, representation itself does not make a concept. That is, just because you represent a concept to someone does not mean that s/he forms a concept of what you intend to represent. One cannot form a concept passively simply by being the recipient of someone else's representation.

There are numerous, documented cases of children of deaf parents who are, themselves, capable of hearing and who spend a great deal of time watching and listening to T.V. Yet, these children do not learn to talk until quite late in childhood. To learn how to talk, one must talk with people. Listening to them is not enough.

A national research organization studied the educational effects of Sesame Street and found that watching the program did not lead children to develop the concepts the program worked so hard to impart. However, if parents spent some time watching the program with their children, and interacted with them regarding its content, the children acquired new concepts, vocabulary, etc.[16]

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16. Ball, S. and Bogatz, A., The First Years of Sesame Street: An Evaluation.

Activity 7: Basic Charades

The purposes of this activity are (1) to help you to discover ways in which concepts are and can be represented; (2) to help you to discover ways in which you can expand your own representation of concepts by putting together a series of representations; and (3) to help you to discover ways in which you form concepts by organizing your understandings of them and of other concepts.

The form of this activity is the grand old game of charades. It's easy, it's fun, and it is impossible to lose: all answers are correct answers.

INSTRUCTIONS:

1. Select a concept which you can represent by a single gesture. For instance you might represent the concept "writing" by scrunching your fingers together as if you were holding a pencil, and scrawling in the air as if across a sheet of paper. Represent your concept to your partner or group without using any words, drawings, models or examples.
2. When your partner or group guesses the concept you are representing, expand your concept by adding one new gesture. For example, you could expand the concept "writing" to the concept "writing a book" by adding a representation of the concept "book"--holding an imaginary book in your hands and shuffling through the pages.
3. When your partner or group guesses the second part of your concept, add a third gesture. You could represent the concept "writing a book of plays" by adding the concept "play"--skipping, jumping, pretending to hit a baseball, etc.

4. In the spirit of fun and mutual participation, rather than in the spirit of competition, see how many gestures you can add to your single, complex representation of a concept.

5. When everyone has had a turn representing a complex concept according to the instructions, discuss ways in which the group found it easy or difficult to recognize and guess different concepts people represented. Basically, the game of charades consists of discovering concepts within concepts: finding attributes (which are concepts in themselves) or values (which are also concepts) which epitomize, or best exemplify, or best represent in themselves some other concept. "Scrawling" is a concept, which is also a recognizable attribute of the act of "writing."

CLASSROOM REPRESENTATIONS OF CONCEPTS

IT IS NECESSARY THAT YOU READ THIS SECTION BEFORE DOING ACTIVITY 8.

We're going to invent a classroom where children and adults can represent concepts by talking and represent concepts by doing things other than talking.

Here are the talking-listening things that people in the classroom can do.

1. Make spontaneous statments: state a concept.
2. Ask spontaneous questions: ask about a concept.
3. Answer questions: give a concept.

Here are all the things (other than talking) that people in the classroom can do:

4. Follow instructions: understand concepts.
5. Interact with others (active and mutual participation--may involve talking): use concepts.
6. Making things: represent concepts.
7. Imitating things: represent concepts.
8. Solving problems: use concepts.
9. Reading: read about and use concepts.
10. Writing: represent concepts.

Table 3

Diagram of Classroom Representation of Concepts •

	TALKING/LISTENING	DOING
1. Making a statement		
2. Asking questions		
3. Answering questions		
4. Following instructions		
5. Interacting with others		
6. Making things		
7. Imitating things		
8. Solving problems		
9. Reading		
10. Writing		

Now that we have a sketch of our classroom, we can start to fill in the details. Our purpose is to look at various concepts that children represent in their talking and doing. In some instances, the child may intend to share a concept with us, and in other cases we simply observe the concept being used.

1. Concept Statements

   When a person states something that is a concept, we'll call it a "concept statement." For example, if a child says "you can't play mommy because you're a boy" s/he is making a statement about his/her concept of "mommy."

2. Concept question

   Anytime someone asks a question about some concept, we'll call it a "concept question." For example, if a child asks, "What's the green stuff on the side of the fish tank?" s/he is asking about the concept "stuff that grows on fish tank walls."

3. Concept answer

   Anytime someone answers a question and makes a concept statement in the process of doing so, we'll call it a "concept answer." For example, the teacher may ask, "Where does milk come from?" and a child may answer "From the store." The child is expressing part of his/her concept of milk.

4. Following instructions

   Anytime someone is asked to do something, either through writing or talking, and s/he tries to do it, s/he is following instructions. How s/he follows instructions reflects his/her concepts. For example, if the teacher says, "All the children with blue on can stand up," standing up reflects the child's concept of blue.

5. Interacting with others

Interaction involves communication other than talking, although talking may be involved. It involves participating with others such as by playing games, making things together, or dancing. Concepts are reflected in the child's ability to relate his/her activity to the activity of others. When children play hide and seek, they use concepts such as "hiding," "seeking," and tagging."

6. Making things

Whenever a child makes something, whether it involves painting, drawing, building, cutting, pasting or some other, similar activity, what s/he is building represents his/her concept of whatever it is s/he is making.

7. Imitating

Anytime children pretend that something is other than what it is, they are imitating. Whether they are playing house, performing a play, or playing with toy cars, the thing being imitated is a concept.

8. Solving problems

Some examples of solving problems are: putting a puzzle together, resolving a personal problem, and figuring out how to get a table through a doorway. Anytime a problem is being solved concepts are being used.

9. Reading

Anytime a child is reading something, whether instructions, comics, cereal boxes, or newspapers, what s/he understands are concepts.

10. Writing

Anytime a child expresses his/her thoughts in writing, whether that

writing is a love note, a word, a sentence, or a book, the thoughts s/he expresses in writing are concepts.

The purpose of listing these 10 "talking-doing" issues is to provide a focus for you when you observe in the classroom. Obviously, they overlap in a number of ways, and some behaviors are related to a number of different categories. You need not worry about these issues. Your job will be to select a few from the 10 categories and to observe for concepts that are expressed in terms of these categories.

Activity 8: Observing How Concepts are Represented in the Classroom

The purpose of this activity is to explore some of the ways in which children's concepts can be seen in the classroom. This activity requires observing children in the classroom. You should participate with other adults in preparing for the observation and in discussing what you observe.

INSTRUCTIONS FOR ACTIVITY 8

1. Group members should discuss the precedding section, "Classroom Representation of Concepts." Discuss each of the 10 categories listed in Table 3 (page 79). Talk about how and under what circumstances you would see them in the classrooms you are already familiar with.
2. Each person in the group should plan to observe for at least three things listed in Table 3. The group should work this out so that all the types of activity are covered.

3. Observe three or more of the 10 things in the following way:

   a. Pick a class time when the children are active and busy.

   b. Observe any number of children.

   c. Find one example of each of the three or more things you are observing for.

   d. When you find an example of the type of concept you are looking for, write down what it is in enough detail that you can share it with others later.

4. After observations have been made, the group should share the concept they tried to find and specifically discuss what concepts each was representing. Keep a group record of the concepts found. It might look something like this:

Sally's concept - "House"
form of representing

Activity 9: Different Representations of the Same Concept

In this activity we will look at something you could do to get a child to represent a concept in one of the 10 ways outlined in Table 3 (page 79). Try to think of concepts different that the ones you observed in Activity 8.

INSTRUCTIONS FOR ACTIVITY 9

1. Each person in the group should think of two concepts s/he might want to teach to children.

2. Assign each person in the group three of the 10 ways of representing a concept (Table 3). Make sure that each of the 10 ways will be dealt with by at least one member of the group.

3. Once you have determined which three ways you will focus on, think about how you will set up conditions for a child to represent one of the two concepts you decided on in step 1, in each of the three ways. Think of activities both you and the child will enjoy. The situations can be imaginary or natural ones in which the concepts might be represented by children.

The following are examples of how the concept "being fair to others" might be represented in each of the 10 ways.

1. Concept statements

   Tell me what you think "being fair to others" means. Tell me about some things that are unfair and/or some things that are fair.

2. Concept questions

   Think of an unfair situation appropriate to the children and have them try to guess what it is by asking you questions.

3. Concept answer

   Ask a child to tell you what being fair to others means. Present various examples and ask if they are fair.

4. Following instructions

   When two children get into a minor dispute (one in which it is not necessary, in your judgment, for you to solve their problem for them), instruct them to resolve the problem in a way that is fair to both. Observe (without interfering) what they do.[17]

5. Interacting with others

   Put out a game for some children who like to play the game together. As they play the game, observe their actions and words to

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17. Yinger, Joanne, Problem Solving with Children-a unit of the FLS.

find out what their concept of being fair to others is.

6. Making something

Ask a child to draw a picture, or a number of pictures, that tell about something that happened to him/her that was fair or unfair.

7. Imitation

Have children put on a play act of an unfair situation and a fair one.

8. Solving problems

Same as the example for #4 (following instructions), except that you may see children trying to resolve problems to achieve "fairness" even though you did not suggest it.

9. Reading

Have children read--or if they are too young, read to them--a story dealing with the concept of fairness.[18]

10. Writing

Have children write a story, or a sentence, or some words they associate with the concept "fairness." If the children are too young to write, take dictation from them.

INTEREST MADE ME DO IT!

There are burning, passionate, life-time, casual, strong, personal, property, multiple, brief, consuming, national, local, world, group, family, new, old, political, legal, crooked, company, military, society, momentary, immediate...INTERESTS.

Everything mankind has done has been done because someone was interested in doing it. Interests come with a variety of motivations, inten-

18. Taylor, JoEllen, Enriching Literature Experiences of Children,--a unit of the FLS.

sities, and periods of duration. We have different interests, different motives for the same interests, different interests for the same motives, interests that are terribly important or not so important, interests that are momentary and interests that take more of our attention.

In Chapter 1 we introduced the notion that shared interests are the fabric of society. This is true of small groups, nations, and cultures. We also introduced the idea that concepts grow out of interests, that concepts represent organized knowledge about something that was or is of interest to the people who form the concepts; and further, that concepts become socially shared because of mutual interests. We see that the issue of interest is important to our discussion of concepts.

In this section we will explore some sources of children's interests, how they're expressed in the classroom, and how to work with children's concepts in a way that taps their interests. A list of the things that most, if not all, of us find important looks something like this:

1. other people
2. social survival
3. physical well being
4. our fears
5. our successes
6. developing new skills
7. emotional well being

These areas of personal importance are not entirely different things; they are very much interconnected, and overlap with each other.

In different situations we have different interests. Consider your

own life and think of the interest you share with loved ones at home, people you work with, members of the community, and so on. Your daily exchanges, your sharing of concepts are different for each group and setting. There are things you feel comfortable sharing with some people but not with others.

Interests change from one situation to another. No one has a static, fixed number of interests. New ones arise and old ones become unimportant; interests are dynamic, and always changing.

Interests also vary in terms of intensity and duration. It is clear that some things are very important to us while other things are not so important. You might think of this in terms of how long one pursues an interest, or how much energy one puts into its pursuit. Some things are terribly important for social, physical or emotional survival, while other things are not so terribly important. Sometimes we are very interested, but filled up, saturated, tired of the interest. We put it aside to be picked up later. In other cases, we become absorbed with an interest for a short period and then drop it with no intention to return. Maybe it's a situation that has arrived and demanded our attention and then it passed and we no longer need to consider it. Maybe it's a passing curiosity, which once satisfied loses interest for us.

Activity 10: Exploring Children's Interests

In this activity you will observe or interview children, and adults who are familiar with the children, to discuss some of their interests. The preparation, and the discussion following your classroom observations, will be much richer if you are involved with a group of

other learners.

INSTRUCTIONS FOR ACTIVITY 10:

1. There are three different kinds of information-gathering activities
   A. Interviewing a child (See appendix A)
   B. Interviewing a child's parents (if possible) and a child's teacher(s)
   C. Observing a child

   The group should arrange to gather information about the interests of as many children as possible. Each member of the group should be responsible for gathering information on at least one child. If possible, do all three information-gathering activities for each child.
2. As a group, you should discuss various ways in which you can find out about children's interests through talking with children, talking with adults who interact with the children on a regular basis (such as parents and teachers), and observing. You should also discuss ways in which you can specifically identify some interest or interests of each child's.

   In your discussions, and in your actual interviews with children and adults, keep in mind that your questions are only a means toward an end. Your real goal here is to discover something real about the interests of a child.

   Here are a few suggested questions. Use them as indicators of the kinds of questions you might ask; do not be limited to or by them.

Interviewing the child

- What kinds of things do you like to do: with your best friend; at school; with your parents?
- What kinds of stories do you like? What do you like about them? What's your favorite TV show(s)?
- Who are your favorite people? Your heroes? Why are they your favorites?
- What do you want to do when you grow up? Why do you want to do that?
- What kinds of things scare you?
- Who's your best friend? What do you like about him/her?

Interviewing adults about a child

- What kinds of things does the child like to do, watch, read, play, spend a lot of time doing, etc.?
- What kinds of things is the child curious about?
- What kinds of concerns, problems, hopes does the child express?
- What kinds of things does the child enjoy doing with adults?

Observing the child

- What does the child spontaneously talk about with friends, with adults? (Specify which adults and which children.)
- What does the child do during free time?
- What does the child paint, draw, make, imitate?
- What does the child share during show and tell?
- What holds his/her attention for only short periods of time?

3. Group members can prepare for the interview activities by interviewing

each other. Interview a partner about his/her interests. Interview a partner about his/her child or about someone else's child.

4. In selecting a child whose interests you are going to explore, consider children whom teachers or others regard as having difficulties in school.
5. Carry out the interview and observation activities. Make a special effort to record your questions, answers, and observations with a tape recorder or by taking notes. It is important that you bring back a record of your experience to share with others in the group.
6. After you have conducted the observation and interviews, share your findings with others in the group.

   Focus on the following issues:

   - What kinds of things interest the child? How do interests vary from situation to situation, i.e., in school, out of school, during structured activities, during free time, etc.?
   - What things seem to be most important and least important to the child?
   - What is the range of things that interest the child?
   - Is there some similarity between how the child perceives his/her interests and how the adult sees them?
   - In what ways do you think the child's interests are tapped in school? Are non-school interests explored by the child in school?

Activity 11: Extending Concepts Through Representation of Interests

The purpose of Activity 11 is to explore ways in which you can help a child represent concepts that are of interest to him/her. This is principally a brainstorming activity, so you really have to do it with other adults. You can make the activity more rewarding if you try some of your ideas with a child or a group of children.

INSTRUCTIONS FOR ACTIVITY 11:

1. With your fellow learners divide into small groups. Each group will focus on one interest expressed by a child.
2. Go over the information you gathered in Activity 10 to select the area of interest your small group wants to work with. When you have selected an interest, brainstorm on ways that a child might represent to him/herself concepts that are important to his/her interests; ways that a child could express his/her understanding of something that interest him/her.

   Be specific in your thinking. Consider the following points:

   - What kinds of things would the child(ren) do?
   - What materials and resources might s/he use? (Physical resources, people resources)
   - When would the activity(ies) take place?
   - How long might the child(ren) work at the activity for any one period of time?
   - How many days or weeks might the child(ren) be involved in the activity(ies)?

3. Discuss among yourselves some of the skills and knowledge the children you're considering are expected to acquire. Select one of these and explore ways in which your suggested activity(ies) might contribute to this learning.

CHAPTER 5

SO WHAT?

Now that you've learned what concepts are, how they're organized, represented and so on, it's fair to ask how you can put this knowledge into practice. I made it clear in the Preface that this book is not intended to tell you how to teach a given list of concepts to children. Its purpose is to give you a better understanding of what concepts are and how they're acquired. With this knowledge you can become more inventive and more responsive in teaching individual children.

Equipping you with specific concept-teaching recipes would be, ultimately, a disservice to you. Education is filled with teaching recipes and it's not long before they become boring both to the teacher and to the child. In addition, without a firm understanding of the theory underlying a given teaching recipe, it's not long before the recipe is carried out incorrectly.

More importantly, equipping you with recipes would be a disservice to the children with whom you will come in contact. Standardized recipes rob children of the chance to learn in ways that are responsive to their own experiences, needs, interests, and styles of learning.

Rather than provide simple answers to complex teaching problems, I'm suggesting that you inventively use your own intuitions about what concepts are and how they're learned, in order to help children acquire the education they need in a way that is personally enhancing and that regards the learner as the source of learning.

To help you bring what you've learned about concepts into an educa-

tional focus, we'll discuss a number of things you should keep in mind when you're helping children learn. You could call these "principles of teaching" or "criteria for responsive teaching" or whatever. They are simply some common sense suggestions that relate to what you have studied in the four preceding chapters. Whether they constitute good educational practices depends entirely on whether you can turn them into good practices. If you do, you will see a change in your teaching, you will see children enjoy learning more, and you will see them learn at least as much as before. However, remember these guidelines can only work through you.

A summary of the main points of this book may be helpful at this time.

In the first chapter, we said that concepts are nothing more or less than organized and represented understandings made up by the learner to meet his/her needs and interests. Most of our sharing with others involves concepts, and most concepts are social. Concepts are constructed out of interests held by the learner, and most interests are shared with others. To the extent that we do similar things and have similar needs, we tend to have similar concepts. Whenever concepts are shared, issues of agreement and disagreement arise. Concepts develop, in part, because of our considerations of other people's views.

In Chapter 2 we said that the organization of all concepts could be described as the organization of classes (similarities and differences among and between examples, attributes, and values) and the organization of the examples, attributes, and values of relations.

In Chapter 3, we extended our discussion of the organization of concepts to show that the ability to form concepts, and concepts themselves, undergo a developmental progression. The underlying character of develop-

ing concepts can be analyzed as a development of class and relational reasoning. The nature of this development and its expression in the child's constructed understanding of reality (such as number and spatial concepts) is explored in two parts of the unit called Exploring Children's Thinking. The fact that there is a systematic development of concepts, and the fact that the child's early concepts are systematically different from views held by adults, indicates how concepts are constructed by the child and not simply acquired from adults or other children.

In Chapter 4 we focused on how concepts are represented by children in the classroom, and how the interests of children can be brought into the classroom learning situation.

The representation of concepts is a theme that is woven throughout each of the four preceding chapters. In Chapter 1 its importance is discussed in terms of the definitions of concepts, and the fact that it is the representation of concepts that is shared with others, agreed upon, and so on. In Chapter 2 we discussed the fact that the things that are represented are either examples, attributes, or values of concepts. In Chapter 3, we explored the development of concepts as they are expressed in their representations by children. Chapter 4 brings the issue of representation into clearer focus and explores some of the diverse ways concepts can be represented in educational settings.

Interests underlie a person's willingness to work at learning a concept. In essence, they are what the concept is about and why it is learned. Interests are important not only with respect to which concepts are learned, but also to the social learning of concepts. Society is impossible without the conceptual representations of shared interests. The examples, attributes, and values of a person's concepts are those

interests she/he focuses on, and that catch his/her attention or interest. It is not necessarily the case that previously acquired concepts, or examples of earlier concepts, are always a person's foremost interest. But while concepts are being formed, there is interest in the purpose that the concept will serve and interest in the conceptual elements (examples, attributes, and values) that the person is organizing.

Devoting an entire chapter to representation and interests--though these are only two aspects of concepts--follows from the position that education is a practice of establishing mutually understood means of representing mutually interesting concepts, between children and themselves, children and teachers, and between children and the broader social environment to which they belong.

The following educational guidelines are concepts for you to acquire. Like all other concepts, you will learn them through your own active process of using them, representing them, finding examples to include and exclude, and so on.

These guidelines are not distinct. They are interrelated in a number of ways. For example, any suggestion that you try to help children share concepts is related to a suggestion that you try to help children develop ways of representing their concepts.

All the following suggestions are related to some general guiding criteria for teaching concepts in a manner that is responsive to individual children.

GUIDING CRITERIA FOR TEACHING CONCEPTS RESPONSIVELY

1. Concepts should be explored in a climate of interest.

An ideal educational situation is achieved if children are able to pursue concepts that are of personal interest to them. This refers not only to interests the child may have learning particular concepts, but also to the child's interest in immediate activities. One of the important practical suggestions for responsive education is that children be allowed to join and leave activities as they choose. If a child is no longer interested in a puzzle, workbook activity, or story, she/he should have the opportunity to leave the activity. Likewise, if a child wants to pursue a conceptual interest, the classroom should provide opportunities to do so.

This guideline is simply stated but not easily put into practice. Most of the skills a responsive teacher must acquire require learning how to give children this freedom, and at the same time maintain a smooth running learning environment. Many teachers in the Responsive Model Follow Through, and Head Start programs have developed these skills.[19] As you read the remainder of this chapter, you will share some of the ways in which educational activities can be made more interesting to children, and some of the ways children's interests can be built upon in the classroom.

2. When learning concepts, children should be actively involved in experiencing the concepts in diverse and enjoyable ways.

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19. Responsive Educational Program Staff, A Description of the Responsive Education Program.

We acquire in a limited way when we have to passively absorb someone else's concept definitions. Children, even more than adults, must actively construct a concept through a variety of actions with respect to the concept.

They may have to look for examples, make up representations, ask others, use the concepts in play and make-believe, and so forth.

As adults we are used to learning abstract concepts from others. But we deceive ourselves if we think we really learn concepts in any complete sense by absorbing other people's ideas passively. College courses, for example, frequently appear to teach through lecture. But, in fact, the majority of learning occurs when the student tries to reproduce or represent the concepts s/he has been told about. The student's learning may involve discussions with classmates or others, writing papers, taking exams, doing projects, conducting experiments, or any of a large number of personally involving experiences. The learning is in the doing. Listening is only one form of doing, whether doing occurs in the elementary classroom, in college, on the job, or elsewhere in life.

Like adults, children not only get ideas from others, but through talking, making, answering, doing, trying, and so on. The difference between children and adults is that the child is less able to judge reality--including the reality of other people's view--accurately. The younger the child the more this is so; as a result, the younger child must have more freedom in exploring and discovering how concepts are pursued, represented, and understood. The younger the child, the less emphasis there should be on "right" answers, and the more there should be on exploration and "finding out."

Children should be able to explore concepts without fear of the consequences.

What we learn, how we go about learning it, and how we feel about it depends very much upon the consequences of our participating in the learning. There are many ways that learning can be threatening. When we first learn something we may feel ignorant or inferior to others who already know it. If we are judged according to our understanding, we may become cautious, worried about being right or wrong, and less willing to take risks or to be inventive in our thinking. Concepts do involve issues of right and wrong, at least insofar as they depend on agreement with others. But concepts cannot be acquired with any completeness unless there is an inventive quality to their acquisition--an exploration, an opportunity to be wrong without having to suffer as a result.

This does not mean that if a child calls a cow a "dog" the teacher shouldn't say, "It looks like a dog, but it's called a cow." It means that the child should not be punished--for instance, by ridicule--for his/her mistake. In the world of adult experiences, when we don't know something we "should," we are graded in some fashion. Adults must come to understand that for children, all concepts are incomplete, filled with inconsistencies and contradictions; they are, in large part, bound to be incorrect--from an adult's view.

Even as adults, though many of our concepts are quite sophisticated, our new ones are only partially formed, incomplete, and inconsistent. We have means of exploring new concepts in ways that do not subject us to punishment. We might discuss some idea about what to do on a job before we try it out. There are countless ways in which we

explore concepts in situations in which we feel reasonably secure. To create an educational environment where most of the child's activity is subjected to grading, approval and disapproval, ridicule, being placed in "slow groups," etc., is to stifle the inventive activity required for conceptual learning.

4. The teaching of concepts should always support the child's inventive capabilities.

In structured curricula, such as teacher-directed exercises, or exercises prescribed by an educational product, the child's ability to invent stands a risk of being passed by. One of the characteristics of all concepts is that they are formed by the learner in an active process of organizing experiences. There is a long course of small experiences that have contributed to our learning anything we know. These experiences cannot be programmed in advance. Nobody, including yourself, could specify exactly what should be done to acquire any of the concepts you've managed to learn. The same is true for the child.

This does not mean that teachers and curriculum developers should not try to plan activities that will help a child to develop specific concepts. But the activity should include an active and exploratory role for the learner. And the more the learner can direct this exploring activity toward achieving the desired goal, the closer the teacher has come to creating a satisfactory and satisfying relationship between the creative powers of the learner and the educational goals of the classroom.

The four preceding criteria can be used to judge the responsiveness of any learning situation. The six criteria which follow explore somewhat more specific guidelines to help children learn new concepts and extend ones they already have.

As I said earlier, these four preceding points are guidelines: they are interrelated, and not entirely distinct from one another. Similarly, the six following points are also guidelines, interrelated themselves, and interrelated with the four guidelines above. If it seems to you that this mode of approach is a bit general, bear in mind that all these points are suggestions whose purpose is to assist you to learn about concepts. You will actually learn only those concepts which you reinvent for yourself; and you will learn them, as you learn all concepts, by using them, exploring them in terms of the other concepts you already hold, and determining the nature of their validity to and for yourself.

The six points that follow do not intend to be exclusive: they do not constitute all of everything that should be done in teaching concepts. The examples do not exhaust the boundless possibilities that could be used to illustrate these points. They are merely sample exercises I use here and now to illustrate specific facets of the that point under whose heading they are contained.

The activities which accompany each example are, like the points themselves, exemplary: in pursuing the examples, and in doing the activities be inventive, use your imagination, create your own examples and activities--and concepts. Don't simply follow my examples; as I say, they do not embody every characteristic of each conceptual point. The characteristics I employ are ones I found in my imagination. They can be replaced with examples, activities and concepts which may appear to be quite different from these, but which are suitable to you.

It is my wish that you explore and expand your own concepts about concepts, not only because this book will be more richly rewarding to you if you do so, but also because the degree to which you allow yourself the freedom to discover concepts on your own is directly related to the freedom you will allow to the children you teach.

SPECIFIC SUGGESTIONS FOR TEACHING CONCEPTS

1. Concepts and their Use.

Concepts are the content and the tools of thought. They are learned because they serve a purpose. Concept learning activity should be structured so that children experience the purposeful aspect of having concepts, and in ways that allow children to use concepts in personally interesting and satisfying ways.

Here's a sample.

A group of eight year olds is learning multiplication and already knows that 5 x 6 = 30 is the same as saying that 6 added 5 times or 5 added 6 times equals 30. During a group discussion, the teacher asks the children to talk about how multiplication and addition are the same, how multiplication saves time when counting, and to make up situations where multiplication could be useful or to think about things that people do (jobs, etc.) that are helped by multiplication.

Activity 12: Concepts and their Use

How does the above example illustrate using a concept? Make up an example of your own, using a different concept for children of any age.

2. Recalling the past.

Concept learning depends upon using past skills and knowledge. It's desirable to lead children to reflect upon the past when expanding their understanding of a concept. This may involve recalling past experiences of the concept, previous situations in which the concept was shared with others, previous understandings, or things they made in the past that reflect their earlier understandings.

Here's an example.

A small group of six year olds is learning about holidays. The teacher has each individual say what s/he thinks holidays are. Then the children discuss holidays they have experienced and what they did to celebrate those holidays. The teacher records this discussion. The following week, the teacher has the same group of children listen to the recording and discuss any new ideas they have about what holidays are.

Activity 13: Recalling the Past

How does this example demonstrate the use of recalling the past to understand a concept?

Make up a similar example for teaching a different concept to a small group of children.

3. Anticipating outcomes.

Because concepts are organized understandings, they make it possible to anticipate what is likely to happen, or what is likely to be true. How accurately a concept predicts depends upon its degree of development and organization. One way in which concepts become better

organized is through predicting what is likely to happen or what is likely to be true. When such predictions turn out to be false, the concepts become modified. Of course, the extent to which anticipating and discovering actual results can lead to modifications of concepts depends upon the child's stage of development. For example, a child might predict that things that are heavy will not float. The fact that boats are heavy may lead an eight year old to predict that not all heavy things sink and not all things that float are light. But the average eight year old is not developmentally ready to understand a more accurate description of why things do or do not float. To the extent that it is possible, concept learning should involve the child in predictions about what is likely to happen and actual observations to see what in fact does happen.

Here's an example.

A teacher is working with a group of seven year olds on a science project involving concepts of time, measurement, shadows, and the movement of the sun. Early in the morning, the children stand in the sunlight and have partners trace the outlines of their shadows on large pieces of paper. At noon they trace their shadows again on the same pieces of paper, and notice that the shadows cast by the noon sun are smaller. They discuss why that is the case. The teacher asks the children to guess about what will happen if they trace their shadows later in the afternoon. The children discuss their ideas before doing a third tracing later in the day.

Activity 14: Anticipating Outcomes

Discuss the above example in terms of how it helps children to use concepts to anticipate outcomes. Make up your own example of teaching activity, ideally with different concepts and for children of an age you are familiar with.

4. Sharing Concepts.

Concepts are the content of what is shared by people. And concepts are learned by incorporating the views of others and noting areas of agreement and disagreement.

Here's an example.

A pre-school teacher is interested in helping children develop their concepts of fairness and what they think it means to be fair in work and play with other children. The teacher makes up a number of imaginary situations that are typical of classroom problems concerning fairness. A small group of children discusses the situations in terms of what they think is unfair. Here's an example of one of the imaginary situations:

Suzie and Linda used all the blocks to build a city in the block play area. They asked if they could keep the city till the next day and the teacher said they could. The next day other children wanted to play with the blocks. Suzie and Linda said they couldn't because it would ruin their city. What should Suzie and Linda and the other children do?

Activity 15: Sharing Concepts

Discuss how the concept of fairness is extended through sharing. Make up an example of your own using a different concept for children of any age you are familiar with.

5. Representing concepts in a variety of ways.

Concepts are represented understandings. The more a child represents his/her concepts in different ways the richer those concepts become.

Here's an example.

Some third graders are interested in studying electricity. The teacher asks them to think about ways they might share what they know about electricity with other classmates. The children brainstorm about ways to represent their knowledge. They come up with ideas such as: an electrical project with a notebook on how they made it; a play about a character called "Mr. Electricity"; a collection of pictures of things that run on electricity; a collection of books that could be put into the reading center; a series of drawings showing where electricity for the house comes from and all the things that happen to it before it gets to the house. The teacher asks the children which project they want to do and they decide to do two of them. They divide up so that one half will work on one project and the other on the second.

Activity 16: Representing Concepts in a Variety of Ways

Discuss how the above example involves a variety of representations

of the concept of electricity, and how brainstorming on the various means of representation might itself expand the children's concepts of electricity.

Make up another example using a different concept as your focus for a group of children of an age you are familiar with.

6. Finding and discussing examples, attributes, and values.

Concepts develop by mental and physical representation of examples, and recognition of examples in the environment. In both representation and recognition, the learner must consider the attributes and values of the examples. To the extent that concepts are social, there must be agreement on the meaning given to the attributes and values of the examples.

All attempts to teach concepts should actively involve learners in selecting, recognizing, and inventing examples. This requires considering what things are and are not examples, which in turn requires a consideration of classes (similarities and differences). For example, a systematic conception of "cat" requires understanding the attributes and values that are true of all cat examples (animals, mammals, four legs, furry, claws, carnivorous, etc.)

On the other hand all the examples of a concept such as "brother" require a definition of both classes (all males who have a sibling by the same parent (s), and relations. Since brother is defined only in terms of another sibling, a relationship is involved just as a relationship is involved in the concept "shorter" which can only be defined in terms of something else. Relations, like classes, have attributes and values. In the case of brothers, the attribute is

"sex of sibling" and the value is "male."

Children should be taught concepts in a way that exposes them to a number of examples of concepts, and to active representations of the concepts. One of the ways in which a child can represent a concept is to point one out. An important suggestion for teaching concepts is that children select, experience, and construct examples of concepts, with discussions of the attributes and values of the examples when this seems natural or appropriate to the situation.

Here's an example.

A teacher has the following conversation with a four year old. "What's a job?" "THAT'S WHERE YOU GO TO WORK." "Do you know of any jobs?" "YES, MY DADDY GOES TO WORK." "What does he do?" "HE HELPS MAKE ROADS." "Do other people have jobs?" "YES FIREMEN DO, BECAUSE THEY PUT OUT FIRES." "What other kinds of jobs are there?" "POLICE-MEN AND DOCTORS ARE JOBS BECAUSE THEY HELP PEOPLE." "Does anybody help you?" "MY AUNT." "Does helping you mean she has a job?" "NO." "Why?" "BECAUSE SHE'S JUST NICE."

Activity 17: Finding and Discussing Examples, Attributes, and Values

Describe all the ways that the child in the above conversation gives examples of jobs or descriptions of what is true about his/her concept of jobs.

APPENDIX A

NOTES ON INVESTIGATING CHILDREN'S REASONING BY USE OF THE CLINICAL METHOD

The clinical method of interviewing is more successful with older children. In a clinical interview children below the age of four probably will yield very little useful information.

Make the exchange with the child pleasant for both of you: it is not a testing situation. Children like to share their thoughts with adults who seem interested and respectful. They will respond well to you if you don't turn them off with disapproval, mocking disbelief, not listening, or other forms of sophisticated dishonesty.

As far as you are able, treat the child as an equal. Keep in mind that children, much more than adults, tend to regard their views of the world as the only conceivable ones. By and large, children are not use to reflecting upon their own thoughts as subject to varying degrees of truth or accuracy. If you feel unbearably uncomfortable during the interview, or if the child is feeling anxious and uncomfortable, then it is best to discontinue the interview.

There is no need for you to be anxious with yourself or the child. It is alright to make mistakes, fail to ask the "right questions," fail to understand the child and so on. It takes a great deal of experience to become a good interviewer of children or adults. You will have to make mistakes in order to learn, and if you worry about the mistakes you might make, you'll probably worry the child as well.

The most frequent mistake beginning interviewers make is to talk too much. Try to keep your end of the conversation to a minimum. You are

trying to get to the child's thoughts. Don't turn the situation around. If you keep the child going with simple statements that indicate you are interested in his/her views and that you want to share in them, you'll be less likely to interrupt the child's line of thought.

Start with broad questions designed to open the topic. Let the child take the lead as much as possible; get a grasp of the words s/he uses and the direction of his/her thoughts before you influence them with your interaction. When the discussion is well under way, you can begin to explore the child's reasoning with probing questions, counter suggestions and so on.

If the child's responses suggest a generalized statement (e.g., "It floats because it is light") then pursue this line of thought by asking questions to find out whether this idea is firmly established in his/her mind (e.g., pick a light object such as a straight pin and ask the child if it floats. "Why?" or "Why not?").

Such questions as: "How do you know?" "If someone didn't believe you, how would you show him or her?" are good ways to get more information. Sometimes you can challenge the child's ideas. For example, if s/he suggests something, you can say that another little boy/girl told you that the opposite was true. "Do you think that child was right?"

Piaget has outlined five types of responses you can expect from children (The child's Conception of the World). You will need to develop an ear to determine which type of response you are getting.

1. Answers at random: The child is simply not interested in your question, or finds it too difficult to answer and thus gives any answer that comes to mind. This kind of answer tells you very little about the child's thought. If it

persists and you cannot move the child from this type of response, it is time to end the interview or switch to another topic.

2. Romancing: The child treats your question lightly and makes fun of it by inventing a fantasy-like answer. It is often hard to distinguish this type of response from the child's true convictions, since for younger children fantasy and reality are closely related. "Romancing" can be distinguished from random response by the fact that it is organized around a story-line of sorts. It is distinguishable from "convictions" (see below) by the fact that the child does not really believe the answer; if you think the child is romancing, your questions might be directed toward discovering whether s/he is simply making up a story. As with random answers, if the child persists in this type of response, change your line of questioning or discontinue the interview.

3. Suggested conviction: In this case, the child is uttering some answer that s/he has heard before, or one you may have suggested by the line of your questioning. Again, it is not a view which the child holds as his/her own, and counter suggestions often will reveal his/her lack of conviction.

4. Spontaneous conviction: The child has thought about the issue previously and has given you a response that s/he made up prior to the interview. This type of response often

yields quite revealing information about the child's reasoning and interests.

5. Liberated conviction: In this instance the child's responses are made up in the context of the interview; the problem has never occured to the child before. If they truly reflect his/her serious thoughts about the issue, the responses are quite revealing. Of the five types of responses, this is the ideal.

The general purpose of the clinical interview is to go beyond simply posing a question and regarding the child's answer as a real indication of his/her thought. In order to get more directly into the child's thinking, it is important to have a flexible plan of action: always try to keep in mind some idea which you want to test--often making up ideas to test as you go along--while at the same time trying to stay consistent with the direction of the child's thought.

Avoid suggesting the answers you are seeking. This is extremely difficult since it is quite easy to make such suggestions accidently. For example, if you ask a question such as "Did men make the ocean?" and the child says "Yes," and then you ask about rivers, the moon, stars, lakes, etc., it is quite likely that the child will respond "yes" to all the questions simply because you have suggested a pattern of response by the line of your question.

When a child gives an answer or response, consider it not in its absolute terms but as a general direction in his/her thinking. That way it will be easier to think of further questions to ask. For example, if, to the question "How did the sun come into being?" the child responds, "Man

made it," then take the position that the child sees some connection between acts of men and the existence of heavenly bodies. This will give you more flexibility than an interpretation that the child believes literally that the sun was made by a man.

If possible, record the interview. Your record will provide you with a much richer experience, both about learning how to interview and learning about child thought. The simplest means is to use a tape recorder. If this is not possible, you might try to take a few notes during the interview--at least enough to capture the general direction of the conversation so that you can fill in by memory later. The least effective means, but still better than nothing, is to write down what was said after the interview. Try to recall specific questions you asked and the general nature of the responses. As you recall some specifics, others will come back to mind. Of course, the sooner you try to write a record of the interview, the more accurate your record will be.

APPENDIX B

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The Growth of Intellegince in the Preschool Years. (31 minutes)

Conservation. (29 minutes)

Classification. (16 minutes)

Available through the University of California Extension Media Center, Berkeley, Ca., 94720

Far West Laboratory, Connections in Learning: Scenes from a Responsive Classroom.

-----,The Growing Mind: A Piagetian View of Young Children:

Part 1: The Development of Classification. (30 minutes)

Part 2: The Development of Order Relations: Seriation. (27 minutes)

Part 3: The Development of Quantitative Relations: Conservation. (32 minutes)

Part 4: The Development of Spatial Relations. (29 minutes)

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