THE QUARTERLY NEWSLETTER OF THE

LABORATORY OF COMPARATIVE HUMAN COGNITION

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Center for Human Information Processing
University of California, San Diego

THE QUARTERLY NEWSLETTER OF THE LABORATORY OF COMPARATIVE HUMAN COGNITION

Submission of Manuscripts: If your work has important implications for characterizing the way people use their minds and organize their lives, we would like to encourage you to submit a brief (6-15 pages) article for consideration. As a newsletter rather than a journal, this publication provides a forum for discussing issues that are difficult to discuss in typical journal outlets. It is a good place to try out new ideas or report new techniques; authors often get feedback from other subscribers. Please keep in mind when you are preparing a manuscript that our readership is unusually broad (anthropologists, psychologists, linguists, sociologists, educators, and public policy people are all among our subscribers) and avoid jargon that is familiar only to researchers in one field. Also try to keep references to a minimum; it is the ideas, not the scholarly pedigree, that concerns us.

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Editorial

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The Quarterly Newsletter of the Laboratory of Comparative Human Cognition has now been published for 15 years. The *Newsletter* has consistently functioned as a forum for research and theory within a broadly conceived framework of cultural-historical and mediational approaches to mind and activity. It has served as an outlet for novel ideas and research programs. From the very beginning, the *Newsletter* has also been international and multicultural in its contents.

We will continue along these lines. But we also plan to expand and transform the *Newsletter*. At the beginning of 1994, the *Newsletter* will be turned into a refereed journal, entitled, *Mind, Culture and Activity: An International Journal.*

This decision is based on several considerations: As a refereed journal, *Mind, Culture and Activity* will be more visible and easier to circulate internationally. Many researchers around the globe pursuing a cultural-historical and mediational agenda have expressed a need for such a journal. Our authors deserve the feedback provided by peer reviews and also full academic credit for the work they publish in this forum.

The transformation from newsletter to journal will not change the open and flexible character of this forum. Peer review will not make the journal narrower. We will continue to be committed to innovative and challenging ideas and research designs. We will also reserve a section in the journal for work-in-progress and discussion initiatives that are not subjected to peer review.

The journal will continue to appear four times a year. The format of the new journal will remain similar to the present one. Thus, the transformation will not affect our subscription prices.

We invite the readers to make suggestions concerning the contents and editorial policies of the new journal. Feel free to write to us - by regular mail, by electronic mail, or by telefax at the following address:

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In this issue, Farida Khan writes of the cognitive organization and work activity of carpet weavers in Kashmir, India. The paper exemplifies the viability of the research approach created by Sylvia Scribner in the City University of New York. Khan examines the weavers' use of a special script for representing the intricate pattern of the carpet. This mediational system reveals an ongoing constructive "effort after meaning" in the work activity.

Naoki Ueno and Norifumi Arimoto report on their work on learning physics among students. They develop a theoretical argument and present empirical evidence for understanding physics learning as expansion of the metacontext of discourse. To facilitate a transition from naive physics to Newtonian physics, "one has to expand the problem context to focus a student's attention on his or her own metacontext." This idea has far-reaching consequences for our theories of learning and for our notions of the relationship between everyday and scientific concepts.

Yasuko Minoura writes on the classical problem of culture and personality, using interview data from cases of Japanese children returning to their homeland from the United States. Minoura's starting point is D'Andrade's contention that cultural meaning systems have strong impact on the motivational and emotional functioning of the evolving personality. Hopefully, Minoura's article will evoke discussion and further papers aimed at reconceptualizing this theme.

Finally, Jonathan Tudge, Sarah Putnam and Judy Sidden examine preschoolers' activities in their sociocultural contexts. Children from two different communties - one predominantly professional, the other predominantly working class - were followed in their daily activities. The children from the two communities were found to be involved in rather strikingly different types of activities. This article addresses the important problem of possible methodologies for observing and recording ongoing activities. We will return to that problem in our upcoming October issue, devoted to methodologies of "shadowing" people in their activities and guest-edited by Steve Reder.

Yrjö Engeström
Olga Vasquez

Cognitive Organization and Work Activity: A Study of Carpet Weavers in Kashmir[1]

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Introduction

Cognitive activity in the everyday world occurs in a socio-cultural setting. It is "socially defined, interpreted and supported. People, usually in conjunction with each other, and always guided by social norms, set goals, negotiate appropriate means to reach the goals, and assist each other in implementing the means and resetting the goals as activities evolve" (Rogoff, 1984, p. 4). Most non-laboratory activities and real life situations are embedded in a socio-cultural context, wherein cognition does not remain an isolated mental activity. It is modified in the context of the external cues available to it. Such contexts require the subject to learn and flexibly apply multiple strategies in line with the goals of learning an activity (Scribner, 1984).

This study focuses on a work activity - carpet weaving, and traces how a socio-cultural tool is employed and contextually modified in the process of carrying out the activity. A repertoire of traditional patterns is reproduced by the weavers which requires accuracy and does not allow individual variations. Carpet patterns are written out in the form of a script and weavers are expected to use it to guide the weaving. The script is a set of instructions which can quite literally be followed in a manner very similar to a program or a routine that a computer might follow. Observations, however, reveal that in the process of weaving, the script is modified in interesting ways to: 1) render it more meaningful to the weaver, and 2) make the activity of weaving more efficient.

The Setting

This study was done with carpet weavers in Kashmir, India. The carpet industry in Kashmir dates from the 15th century and weaving is carried out in homes as well as factories. An upright loom is used for weaving and the technique is similar to that of all centers where carpets are woven. Weavers reproduce a repertoire of traditional patterns but play no part in changes or innovations that may be introduced. The patterns are highly intricate and minutely detailed and involve the use of several colors. A feature that is unique to the Kashmiri weaver, however, is the use of a "weaving script" - a written representation of the pattern specifying the number and color of knots for each row of weaving (Edwards, 1953).

Background

The research involved a period of ethnographic study of a carpet factory which provided background information of the cognitive requirements of the weaving process. Details of the learning and use of the script were obtained and the weaver's involvement with the script as a tool were observed and recorded.

The process of "writing" out a carpet pattern. Carpets for which scripts are not already available are "written" out in the following manner: a master artist first draws out the pattern to actual scale and fills in the color scheme. The next stage consists of graphically specifying each knot of the pattern (since the unit of weaving is a knot) to make it intelligible to the weaver. This graphic representation is then translated into a script by a specialized "script writer."

The script is a unique writing system using signs to represent numbers and colors, somewhat similar to a musical notation system, and does not in any way correspond to the local Kashmiri script. It uses scriptorial signs and can be classified as a slot list (Harris, 1986). It is essentially a color and number code specifying the number of knots to be woven in each color. Since weaving is done in rows, the script is written out in rows as well. The need to write out the entire script seldom arises as traditional patterns either consist of repetitive motifs or the upper half of the carpet mirrors the lower half and the left half mirrors the right half. The script is therefore written out for one basic unit and repeated for the rest of the weaving.

The carpets are of a very fine quality and a square inch of weaving can encompass as many as 400 knots. To make it easier for the weaver to handle the instructions, the writing is done on strips of paper, which are serially numbered in the order of continuation. Each strip contains less than 10 rows, which again are grouped into columns of 10 or more symbols to make visual distinctions easier. The weavers fix these strips of paper containing the script onto the loom at weaving level.

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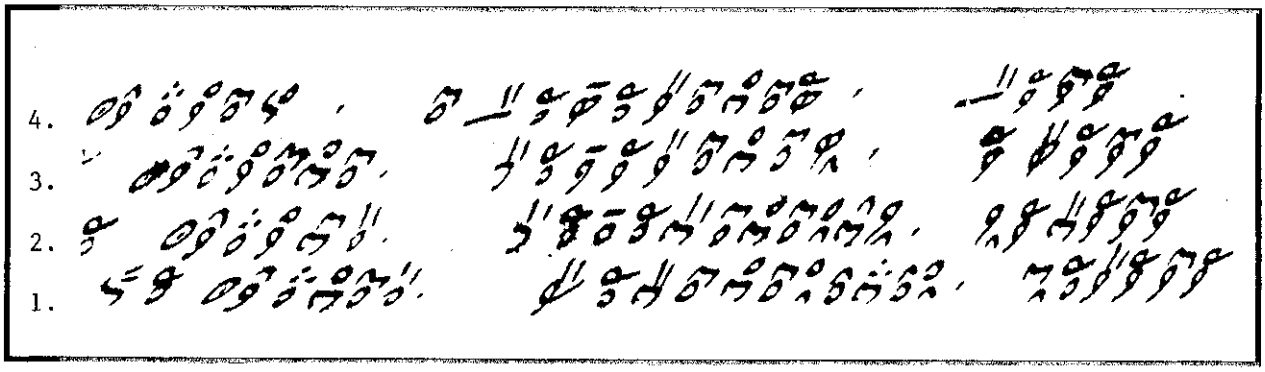


Figure 1. A sample of the script and the symbols it uses.

Reading the Script

The process of weaving places some constraints on the reading of the script: since weaving proceeds upwards, one row of weaving must be completed before the next row can begin. Within each row, however, the knots are independent of each other, and weaving can move back and forth, and need not follow a fixed order from one end to the center. The script is the only writing system that a majority of weavers are acquainted with, since most of them are illiterate. It is only in the last stages of apprenticeship that weavers learn to read the script.

Subjects and Procedure

Since the script is read out loud for all carpets where weaving involves more than one person, it was possible to tape-record the reading out of the script as the process of weaving was going on. Five workers were taped weaving five different carpets. Each of the five carpets was being woven by two weavers making the reading aloud necessary. Of the 10 weavers employed in the weaving of the taped scripts, two of the listeners were novices and could not read the script. The other eight were capable of reading the script and thus weaving a carpet independently.

Data Used

Data comprised of two rows of the script of each of the five carpets. Of these two rows the first was used to guide the interpretation on the basis of which the analysis of the second row was carried out. Each reading was done by one weaver only, whereas weaving of all the five carpets was done by two weavers. The reading was audiotaped during the weaving of the carpets. All five recordings were done in the factory, and all five carpets were abut halfway to completion when the recordings took place. (Most carpets take several months to complete.)

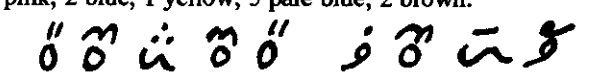
Unit of Analysis

A sample of the written script and its reading aloud in the process of weaving was used for the analysis. The reading proceeds in a rapid rhythmic manner with distinct pauses between sub-units, somewhat akin to a pause that a comma entails in the reading of text. The reading between each of these pauses was coded as an "utterance" and the analysis of the relationship between the reading and the weaving was done on the basis of these units. Each utterance usually includes reference to one background color and one outline color as every unit in a traditional pattern (be it a leaf, a flower, a petal or a stem) is outlined by a different color.

Analysis and Discussion

The script as written out and presented to the weaver is, for all practical purposes, a knot by knot specification of the colors to be woven exactly as a pattern for knitting or crocheting would be written out. The script is composed of two sets of symbols - one for color and the other for number, and no other specification is provided to the reader by the script itself. The visual representation is organized into rows and columns and the most likely and seemingly logical order of reading would be similar to the reading of any textual material, i.e., a consecutive reading from left to right or vice versa.

For example, this segment of the script should literally read as follows: 2 pink, 1 yellow, 5 red, 1 yellow, 1 pink, 2 blue, 1 yellow, 5 pale blue, 2 brown.



The weavers, however, do not follow this procedure. They repeatedly stress that the reading out of the script is a time consuming and effortful exercise. As each reader is also weaving, reading entails a division of attention between the reading and the weaving. The process is seen as necessary but cumbersome. This came up repeatedly in the interviews:

> Guhlam Hassan (weaver, 35 yrs.):
> "It's too much trouble, it couldn't be done. It's much easier to read what I need and then concentrate on the weaving...."

> Mohammed Yaseen (weaver, 50 years):
> "Read the whole row? No, no I can't do that, I don't need to do that - I can look at the carpet and weave."

It is for this reason that only one weaver "reads" when two or more people are involved in the weaving. The reading of the script takes on characteristics that transform the written instructions in important ways. These transformations and deviations enable the weavers to pick up the maximum amount of information while keeping the reading to a minimum which thus allows them to dispense with the written material and thereafter concentrate on the weaving alone.

On the basis of the analysis of the data (Tables 1 and 2) and the observations made in the factory and outside over a period of two months, some distinct patterns of organization were observed. A point that needs to be specified is that the script is composed of two kinds of symbols - symbols for a set of colors and symbols for numbers. There is absolutely nothing else that is written into the script as it is handed to the weaver. Within the weaving community, however, a lexicon has evolved which has become part of the reading tradition, and includes a set of terms which would be unintelligible to a non-weaver.

The major modifications and transformations that are seen to occur are as follows:

1. The script reading marks a distinction between the background and the outlines in the pattern, although no such distinction is present in the script itself. As stated earlier, the outline against a background forms an important part of the visual pattern, and every unit, no matter how minute, is marked by an outline. This distinction is characterized by the use of the terms "make" and "leave," which again are not present in the script, but have entered the reading practice. The weavers "make," i.e., weave the knots that form the outline but "leave" unwoven the knots that form the background. The number of knots is the only specification that accompanies the instruction "leave" whereas the knots to be "made" may be accompanied by any of the other specifications mentioned below. Out of a total number of 183 utterances the background color is

Table 1. Frequencies and Mean Percentages of Specifications "Leave" and "Make" for Background and Outlines

S. No.	Total no. of utterances	Background		Outlines	
		Specification "leave"	Specification "make"	Specification "leave"	Specification "make"
1	38	30	8	2	36
2	41	16	25	1	40
3	39	39	0	16	23
4	29	24	5	0	29
5	36	36	0	3	33
%age of means	100	79.23	20.77	12.02	87.98

Table 2. Frequencies and Percentages of Specifications of Color, Specification Other Than Color and a Combination of Color and Other for Background and Outline

S. No.	Background			Outline		
	Color	Other	Color & Other	Color	Other	Color & Other
1	8	0	0	4	18	14
2	23	1	1	27	3	10
3	0	0	0	6	16	1
4	5	0	0	11	5	11
5	0	0	0	6	15	12
Total	36	1	1	54	57	50
Mean %age	19.67	.55	.55	29.5	31.15	27.32

attributed the specification "leave" 145 times (79.2%) whereas the outline is given this specification only 22 times (12.%). 87.9% of outline colors mentioned are therefore woven in during the reading itself (Table 1). By using this strategy the weaver is weaving a minimum number of knots during the reading (since the outlines entail a far fewer number of knots than any background color), and filling in the larger number of knots once the script reading for a particular row is over. The color information for the unwoven knots is later picked up from the previous row.

2. A feature of the script which is not always used in the reading is the color specification. This becomes a serious omission from the literal representation. This omission is more typical of the background than of the outline. In the present data the color for background was specified in 20.2% and for outlines in 56.8% of the utterances (Table 2).

3. A number of qualifying terms categorized here as "specifications other than color" are used during the reading which do not figure in the written script at all. The mean percentage of such specifications for the outline is 58.47 and for the background is 1.09 (Table 2). Whereas the script uses a knot as a unit, these terms indicate that the weaver is thinking in larger units which are not confined to one row alone. This additional vocabulary includes descriptive forms and shapes like a flower, a petal, an animal or more general terms like the background, the edge or the border. Again it is the outline which gets these specifications as that is the focus of the weaving in the process of reading.

4. Shifts in weaving from one point of the row to another are made with the help of "focal points." Some of the examples recorded were: "the flower in the middle," "the edge where the colors are going up in a straight line," "the centerpoint of the pattern," etc. In such cases, the weaver is essentially forming a context within which the colors take on a meaning directly related to the visual pattern that he is in the process of constructing. In the data analyzed here there was at least one such shift in each of the five readings and as many as three in one of them.

5. A feature that all of the above observations support is that although in its written version each row is completely independent of any other row, the reading of the script is deeply embedded in the preceding rows of the weaving. Reading of each row has to be understood in the context of the previous one. Additions and omissions are made in the reading which hinge largely upon the visual representation of the pattern. It is therefore fairly obvious that the weaver is much more focused on the pattern being woven rather than the sequential order of the written instructions.

By making these modifications the weavers are actually transforming the strings of symbols into a representation that is meaningful to them, i.e., a visual pattern consisting of colors, lines and form, which is part of a larger whole - the carpet itself. To take an example,

Row 2
XXOOOOOXXOOWOOXXOOOOOXX

Row 1
OXXOOOOOXXOOOXXOOOOOXXO

where O represents blue, X represents red and W represents yellow, the script for row 2 will be written as follows: 2 red, 5 blue, 2 red, 2 blue, 1 yellow, 2 blue, 2 red, 5 blue, 2 red. The reading of this row by a weaver is likely to proceed as follows:

Make 2 red going outward, leave 4, 2 red moving outward, leave 2 blue, make 1 yellow, repeat for the other half. The directions are therefore read out in the context of row 1, specifications are added if it makes the instructions more meaningful, and omitted where the weavers can pick up the information from the woven portions of the carpet itself.

These strategies provide the weavers with the least amount of information required from the script to give the maximum amount of meaning to the weaving of that row, to enable them to work efficiently, to expend as little energy as possible on the reading and to minimize the burden of concentrating on both the script and the weaving. The reading does not remain a literal rendition of the instructions as they are written out. It gives a whole new organization to these instructions, drawing upon external cues available to the weaver. Here on the face of it is an activity to be carried out according to a relatively straightforward set of instructions. But in the process of being executed it becomes a highly organized system of mental and manual transactions in the interests of efficiency towards a desired end.

Discussion

Vygotsky (1978, p. 125) comparing signs to technical tools stated that "a sign (that is, a psychological tool) changes nothing in the object of a psychological operation. A sign is a means for psychologically influencing behavior - either the behavior of another one's own behavior; it is a means of internal activity, directed towards the mastery of humans themselves. A sign is inwardly directed." Examples of psychological tools include language, various systems for counting, writing and all sorts of conventional signs among others. By these standards the writing system used by the weavers would well qualify as a mediational system. The use of this mediational system for the execution of a skill can be seen as an instance of practical thinking as defined by Scribner (1984) who refers to it as "thinking that can be explicitly defined as embedded in larger purposive activities and that functions to carry out the goals of these activities" (p. 2).

Here we have an example of a setting with a straightforward goal - getting a row of knots woven, with a set of instructions which can be literally followed from one end of the row to the other. The actual process of weaving, however, reorganizes the system enabling efficient performance with the minimum of effort possible. The least effort strategy has been observed in other instances of practical thinking (Scribner, 1984). For the weaver, however, there seems to be a need to embed the symbols in a meaningful context within the relevant activity, an "effort after meaning" as it were in Bartlett's terminology, who states that "psychologically, a situation always involves the arrangement of cognitive material by some more or less specific active tendency, or group of tendencies and to define a situation in any given case we have to refer, not only to the arrangement of material, but also the particular activity or activities in operation" (Bartlett, 1967, p. 231).

Note

[1]This research was done under the supervision of Professor Sylvia Scribner, as part of a Ph.D. program in developmental psychology at the Graduate Center, CUNY.

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Learning Physics by Expanding the Metacontext of Phenomena

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Introduction

The last decade has produced much research on naive physics in both cognitive science and physics education. Although many researchers agree on the existence and robustness of naive physics, there has been considerable discussion about the nature of naive physics.

However, almost all previous formulations of the nature of naive physics focus only on the mental representations of naive students. Besides, "conceptual change" is conceived as an event that occurs only in the mind. As long as we focus exclusively on mental representational knowledge, it would be difficult to describe adequately where naive physics comes from and how conceptual change might come about.

It seems to us that naive physics can more accurately be considered as an interactive system between cognitive agents, real objects, and the physical environment rather than as systematic theories or knowledge in the mind. For instance, as we discussed previously (Ueno, Arimoto & Yoshioka, 1991), the fact that we reside in a field of gravity is particularly critical in order to specify where naive physics comes from. In addition, the fact that the ground where we stand is "static" contributes critically to our conceptualization of naive physics. In other words, it would be impossible for us to "invent" the same naive physics in an environment without gravity and without a "static" ground.

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Furthermore, theory or theory-like construction is always embedded in a specific kind of language game. One cannot talk about one's theory without referring to a language game in which one participates. In other words, "theory" is always socially rooted. For instance, we can regard medieval impetus theory as embedded in a specific language game of natural philosophy. On the other hand, in everyday discourse, we do not deliberately need to define the concept of force and motion. A specific language game requires us to articulate the concept of force and motion. In this sense, "preconceptions" can be regarded as a social invention rather than as an invention of the individual mind.

This is true in the case of learning. Learning is not only an event in mind but can also be usefully characterized as the change of an interactive system composed of cognizers and particular situations. If so, the robustness of naive physics comes not only from the nature of individual minds but also from the nature of a learning system that includes social organization and mediational means. For instance, the kind of metacontext implicitly shared in a language game leads participants to a specific way of thinking. If different types of language games do not share a metacontext, miscommunication between the language games continues. It seems to us that exactly the same situation often occurs in physics classrooms. Thus, a design of instruction should reorganize miscommunication between different types of language games. Expanding the metacontext of the phenomenon is required for students, teachers, and designers of instruction, from the side of participants in this reorganization.

In this paper, we describe the processes involved in learning Newtonian physics by expanding a metacontext of phenomena along with a proposal for mechanics instruction design. Before discussing learning, let us take a look at the difference between a metacontext of everyday discourse and that of a Newtonian's. This is because there has not been enough research on that critical difference between the metacontext of everyday discourse and Newtonian discourse while there has been much research on the nature of explanation in naive physics.

The Metacontext of Everyday and Newtonian Discourse

It seems to us that, in everyday discourse, there is a metacontext that is drastically different from that of Newtonian physics. This metacontext seems to be tacit and it can be noticed by contrasting it with that of Newtonian discourse rather than by merely observing what

people explicitly say. Let us present some examples. The first example concerns a way of talking about the velocity of an object.

(a) The speed of this car is 50 miles per hour
(b) What is your frame of reference for telling the velocity of that car? Is it the earth, the solar system or the galactic system?

In the above instance, (a) shows ordinary everyday discourse and (b) shows Newtonian discourse. In everyday discourse, the frame of reference for observation is not referred to explicitly. We never ask where our observational point of view is when we talk about the velocity of an object. Rather, "the static ground" as a frame of reference is tacitly considered as natural. Accordingly, a question such as sentence (b) will be regarded as very eccentric in everyday discourse. If you ask a question such as (b), the conversation will be a kind of "breaching experiment" used by ethnomethodologists. The "routine grounds" (Garfinkel, 1964) or "metacontext" (Bateson, 1979) which is socially shared in the conversation will be destroyed by a question like this. On the other hand, in Newtonian discourse, identifying a frame of reference for observation is extremely important.

The second example concerns force (Ueno, Arimoto & Fujita, 1990).

(1) Susie slaps Tom's face.
(2) Tom's face is slapped by Susie.

In sentence (1), Susie is an agent and the main character and Tom is a patient. On the other hand, in sentence (2), Tom is a patient and the main character. However, Susie is still an agent. We use sentence (1) or (2), according to the topic or focus taken at the moment. These two sentences are natural castings.

Now let us consider how these examples would be regarded from the perspective of Newtonian physics. It might be said as follows;

(1) Susie slaps Tom's face.
(3) Tom's face slaps the palm of Susie's hand.
(4) The force of Susie's slapping is the same as the force of Tom's slapping.

Sentences (3) and (4) are obviously pragmatic nonsense in natural language use. As shown above, in natural language use, an agent and a patient are usually fixed. Even when a sentence is transformed from the active voice to the passive voice, the relation between the agent and the patient is invariant.

Here again, the metacontext of everyday discourse seems to be different from that of the Newtonian discourse. The "fixation of casting" in everyday discourse seems to be dependent on the same metacontext as the previous example concerning velocity. This is because the casting of a moving object as an agent is possible as long as the static point of view is tacitly presupposed.

On the other hand, in Newtonian physics, one cannot fix the casting because it is not presupposed that there is a static observational point of view. A moving object is not necessarily moving. Likewise, a static object is not necessarily static. The velocity of an object is dependent on the inertial system in relation to the observer's position. Thus, the collision between a moving object and a static object can be considered simply as the interaction between two objects.

However, in everyday discourse, we share the feeling that the description in sentence (3) is simply nonsense. Thus, the second example also shows that the "routine ground" or "metacontext" is socially shared in everyday discourse. As shown in the above examples, in everyday discourse, the "fact" that the ground is static is not only tacitly presupposed but also socially shared, while people in our communities know that the earth is rotating and revolving.

Mach (1883) pointed out that the formula "$f = ma$" in the Second Law of Newtonian physics is simply a rephrasing of the Third Law of motion since the Third Law can also be described as "má = ma." The formula "má = ma" means that two objects with the mass of m and m that interact with each other are both agents and patients simultaneously.

The metacontext of everyday discourse is similar to that of Aristotle and medieval impetus theory while this metacontext is entirely different from that of Newtonian physics. However, it does not mean that a language game of everyday discourse is the same as that of medieval natural philosophies. In the next section, we will compare a language game of everyday discourse with that of natural philosophies.

Situated Actions and Theory

In everyday life, we rarely define the terms motion and force on purpose. We deliberately do not explain what

kind of force acts on an object either. For example, when you toss a coin in the air, you will pay attention simply to the course of the coin in order to check whether the course of the coin is controlled according to your prediction. This is because it is commonly known that a coin thrown up will fall down.

Of course, perceptual information of motion patterns of objects is a very critical resource needed to control objects and one's situated actions (Gibson, 1979; Suchman, 1987). As we showed in the experiment of motion perception (Ueno, Arimoto, & Yoshioka, 1991), regarding motion in the vertical direction, the motion following gravity such as free falling was perceived as "letting," that is a natural non-causal event. On the other hand, the motion against gravity such as decelerated falling and falling at constant velocity was perceived as "causing," that is motion involving an agent and a patient. With respect to motion in the horizontal direction, the motion against the stationary state of the ground such as motion at constant velocity and accelerated motion was perceived as "causing," namely motion involving an agent and a patient. In short, motion that deviated from free falling and the stationary state was perceived as "causing." According to information regarding these motion patterns, we can easily control objects and our own actions.

In everyday life, we also often communicate with each other about motion and force. However, it seems in almost all cases, we communicate with each other not to explain phenomena but in order to coordinate our situated actions collaboratively. For example, we often say "Push it harder" or "Keep pulling." However, we seldom articulate the meaning of force and motion in everyday discourse.

As pointed out in the previous section, the metacontext in everyday discourse is similar to that of impetus theory. However, situated actions and communication for coordination of situated actions themselves are not impetus theory. This is because the function of description and explanation concerning motion and force in everyday discourse is definitely different from that of medieval natural philosophies. In other words, what one describes as motion and force is different in the discourse of natural philosophy and in everyday discourse. As a result, what is described with respect to motion and force is different. How phenomena are explained is also different.

"Theory" does not exist in an individual mind that resides in vacuum. Rather, it is embedded in a specific language game in a specific community. One cannot discuss whether a description and an explanation about motion and force are theory-like knowledge without referring to a type of language game in which one participates.

If so, we must notice the type of language game in which "theory" is invented. It seems to us that Nakamura's lesson (Nakamura, 1974) regarding the concept of force is particularly relevant to our argument. He gave a series of problems (as shown in Figure 1) to high school students in a physics class. After discussion, many students still believed that the "force" moving the train was greater than the force of the friction of the rail track and the air friction while the train moved. They argued further that the train would stop when the force moving the train was greater than the force of the friction of the rail track and the air friction while the train moved. They argued that the train would stop when he force moving the train was equal to

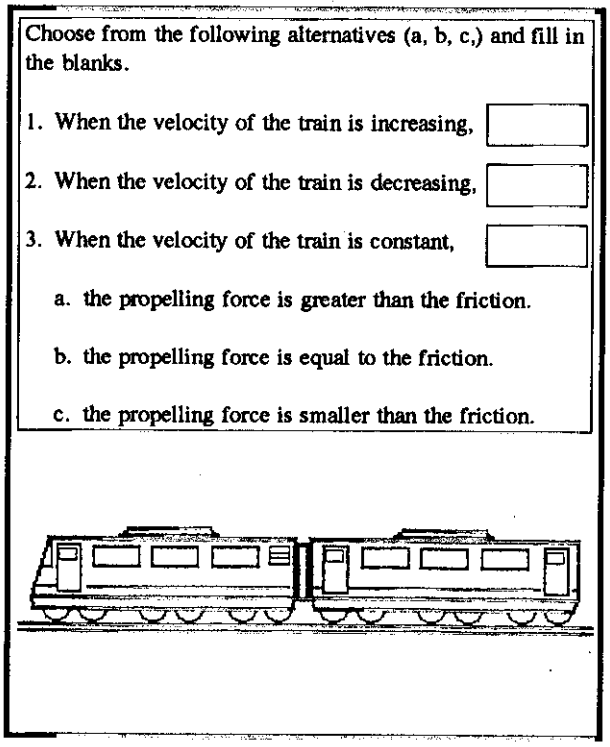

Figure 1. Nakamura's problem

the friction of the rail track and the air friction. As the discussion proceeded, their arguments became more elaborate and consistent within their theoretical framework than before. For example, they thought that there was "extra" force even after the engine of the train had stopped. Then this "extra'" force decreased due to the friction. The concept of "extra force" the students referred to is very similar to the Medieval concept of impetus.

Let us notice that the students' elaborate and consistent explanations resulted from participation in a specific language game in which one tries to interpret force acting on a train. In this situation, something like "impetus theory" was socially formed in discussions with the teacher. Nakamura's lesson can be regarded as a simulation of the language game in medieval natural philosophy although that was not the teacher's intention.

This is also true in the case of the coin problem regarding the force acting on a coin thrown upward. As previously pointed out, we deliberately do not explain force acting on a coin thrown upward in everyday discourse. The situation in which we must explain force acting on an object for interpreting a phenomenon is very specific.

We must also point out that the metacontext of Nakamura's train problem and the coin problem appears to be limited to the motion on the ground. In other words, it looks as if the static point of view on the ground is tacitly presupposed. In this sense, both problems seem to share the same metacontext with Aristotelian theory and impetus theory as long as a teacher or an experimenter does not try to explain the metacontext of Newtonian physics.

On the other hand, in the Newtonian language game, one must clarify what one's frame of reference is, when one tries to describe motion and force. In Newtonian physics, a frame of reference is ordinarily one of an inertial system. However, in some cases, a frame of reference can be located in an accelerated system. If one's frame of reference is in an accelerated system, the definition of force is different from that of force in an inertial system. Thus, strictly speaking, the problem in Newtonian physics must include information concerning a type of system.

Thus, we can regard naive physics or preconceptions as something generated by participating in a specific language game of a specific community. This language game has the same metacontext as everyday discourse. However, an inquiry system is different from that of everyday communications.

Learning as Expansive Recontextualization

It seems to us that, in learning Newtonian physics, falsification or equilibration type learning cannot produce conceptual change. This is because students cannot know the metacontext of Newtonian physics by falsification of their predictions. For example, even after students can correctly predict the result of an experiment of free falling, e.g., objects of different mass falling down at the same time, conceptual change does not result. Students tend to regard the phenomena of free falling only as a specific case even after the observation of the experiment. Actually, they merely regard the phenomenon of free falling as irrelevant to "weight."

That is true in the case of the concept of inertia. Even after students observe the experiment of relativity of motion, they never change their view of motion and force (Ueno, Arimoto, & Fujita, 1990). For example, as shown in Figures 2a and 2b, many novice university students answered that the motion observed from the ground is the real motion, and on the other hand, they answered that the motion observed from another system as the ship of constant velocity is only an appearance. This result indicates that the ground is implicitly considered to be the given framework in this discourse. Further, they, also implicitly, presuppose that the ground is static. It is because the motion observed from the ground is considered the "reality" and the motion observed from the ship is considered as merely an "appearance." Generally, the force-vector described by subjects varied according to the observational point of view. For example, as shown in Figure 2b, in the case of the iron ball falling down from the top of a ship mast, the forces described as acting on the iron ball were gravity and "the forward force" when the point of view was on the ground. On the other hand, gravity was the only force described when the point of view was on the ship. However, if asked which force-vector described in the two cases is the real force or whether both are real forces, almost all subjects answered that the forces described on the motion observed from the ground are the real force. The result is consistent with the "reality-appearance distinction" between the motions observed from the ground and from the ship.

Thus, instruction without clarifying the metacontext of Newtonian physics does not produce conceptual change. The interpretation of students is still very local even after they are able to correctly predict phenomena of motion and force. In other words, the results of experiments are interpreted within their tacit metacontext. In order to produce conceptual change, students must recontextualize phenomena under the different metacontext. In other words, learning Newtonian physics definitely requires expansive recontextualization.

The process of learning Newtonian physics is apparently different from problem solving within a given context. Rather, one has to expand the problem context to focus a student's attention on his or her own metacontext.

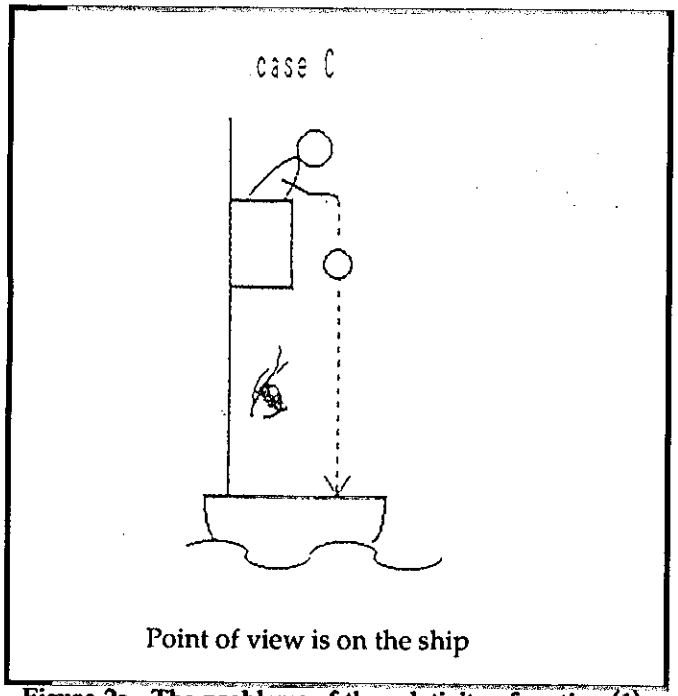

Figure 2a. The problems of the relativity of motion (1)

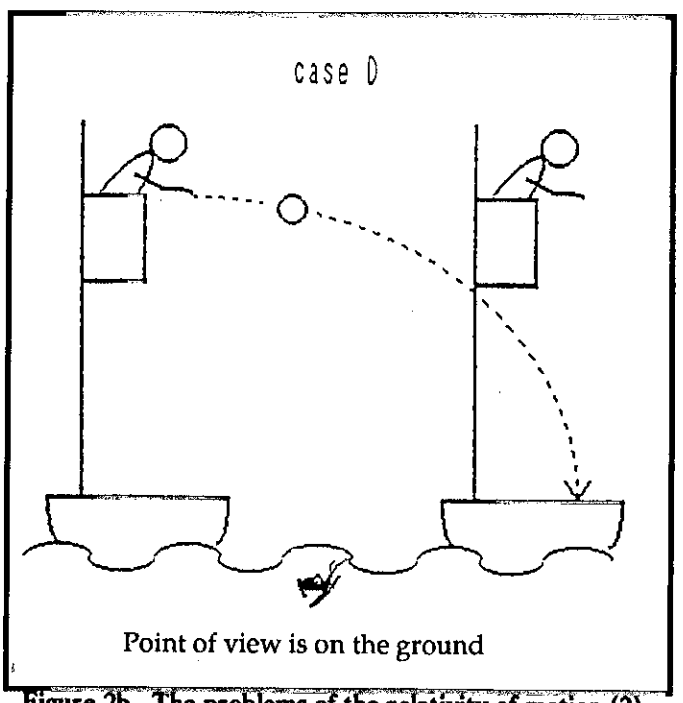

Figure 2b. The problems of the relativity of motion (2)

This perspective is related to Engeström's view of "Learning by Expanding" (Engeström, 1987). According to Engeström, learning should be considered not only as the acquisition of new skills and problem solving within a given context but also as the expansion of the given context.

Thus, design of instruction for mechanics should support the expansive recontextualization of students. Concretely, at the beginning, astronomy will produce an appropriate context in order to recontextualize phenomena of motion and force on the ground. For example, the experiment of relativity of motion should be shown in the context of the argument between heliocentricism and geocentricism as shown by Galilei. Second, the same phenomena should be shown under the context of the argument concerning spatial models. Finally, the concept of force and motion should be reinterpreted under this metacontext. We developed a design of instruction as outlined above (Ueno, Arimoto, & Fujita, 1990). Let us discuss the details of this design.

Designing the Conversation

In order to construct the learning session of dynamics, we enhance the social nature of the scientific knowledge. As it is mentioned above, no scientific theories in history have occurred within an individual mind without social interaction. There is always a certain scientific community and some tools to interact with where a theory was invented and shared. It is only the rhetoric of our science story that a scientist invented a theory by himself, in the social vacuum. In this sense, we carefully prepared the metacontext other than everyday's where a given and thus invisible force such as gravity turns out to be the topic of the talk. Instead of the traditional types of physics instruction, we intentionally redesigned the conversation of Newtonian physics. In this social state of learning, we call it a "stage," subjects were forced to redefine their concept of movement totally differently from that of everyday concepts. We gave them a chance to see various movements from the Newtonian point of view, that is not from static ground, but located high above in space. This socially shared metacontext is the very point that we want to emphasize, and is not referred to in previous studies in terms of physics instruction design (Pea, 1991).

The design of this conversation involved two elements. The first one was groups of questions about the relativity of motion and force. The second one involved a number of experiments on both a VCR and a personal computer. We used these questions and experiments as devices to construct a stage, the conversational ground of Newtonian theory. We made these questions not to infuse

knowledge in the ordinary sense of the traditional educational situation but to reconstruct the tacit presupposition of the conversation. To give an answer to each of these questions, subjects had to redefine their concept of movement. They were asked to clarify whether there was a fixed observational point or not, and whether motion implies force or not in this simulated Newtonian conversation.

Experiments on the VCR and the computer simulations of various movements also function to arrange the social setting of the conversation. As seen in any classroom practices or in previous studies, only experiments or simulations themselves will not sufficiently produce conceptual changes. If there is no conversational ground of the subject matter, any good experiment or simulation will just be a strange trick, or at best a way to make people believe in a scientific notion. We put emphasis on the social nature of the scientific experiment or simulation, which, in an ordinary sense, is believed to be the way to reveal the fact or the hidden nature of an object to ensure the theory. A part of this belief is true, but what is most important is to see a science as one of the social activities within a certain community. In the social sense, an experiment or a simulation is a device to maintain the conversational ground of the community. They are media for re-representing an object to fit into the activity of the scientific community. The visibility, the exactness, and the reproducibility of the scientific experiment are required to share the scientific fact among the community, and to enable scientists to "draw things together" (Latour, 1990). The experiment and the simulation are socially shared representations in this community, and ways to display the metacontext of an activity socially.

It is taken for granted that there is a certain point of view behind any visual representations like photographs or pictures. Beyond them, we feel the existence of the author's intention, purpose, and idea. None of them are just the optical representation of the real object, but have its activity background. Not only a news photo of the war, but also photos on a restaurant menu or an I.D. card have it. By seeing and using these representations, we share the same relationship that a representation-maker and his or her community have with the object concerned.

However, this "personality of the representation," is seldom told, especially in scientific representations like pictures on a science textbook or computer graphics usually shown on TV. We will emphasize that there is still a representation-maker and his or her community behind any scientific representations. They are displaying certain relationships between the scientific community and the object, not a truth of nature.

We designed and used the computer simulation of various movements in this sense. 3D POINT OF VIEW LOGO, the LOGO language which allows the turtle's point of view to be freely located and moved within a three-dimensional space, was used to build this simulation. With this computer simulation with multiple points of view, subjects were engaged in seeing a number of movements such as bombing from an airplane, playing catch, a floating balloon, etc. from different points of view. These points of view differ not only in terms of their graphic representations on the screen. The views we implemented in these simulations are the socially shared representations of the movement of both Newtonian and everyday physics. For example, the point of view moving horizontally with the object gives us a representation of Newtonian physics, because only a vertical movement caused by gravity can be observed in this view setting.

The Introduction of the Relativity of Motion in the Context of Astronomy

In the first session, referred to as Instruction A, the relativity of motion was introduced in a context where one can recognize the motion of the earth. Examples of questions included in the instructions are shown in sections 8, 9, and 10. As shown in Figures 1, 3.1 and Figure 3.2, an object dropped from an airplane is observed from two points of view; that is, from the ground and from a point of view where one can observe that the earth is moving. In this situation, for example, the free falling of an object dropped from the hovering airplane as seen by someone on the ground is perceived as a parabolic motion by one who can observe the earth moving at uniform velocity within some horizontal range. On the other hand, a motion of an object dropped from an airplane flying at uniform velocity to the ground is also perceived simply as free falling from a point of view where one can observe that the airplane is static and that the earth is moving at uniform velocity. An alternative prediction of the motion of the object dropped from the airplane, that is a bug version, is shown in Figure 4.1. In this alternative, the object dropped from the airplane with uniform velocity falls straight down immediately after it is dropped. However, when the object is observed from the point of view from which the airplane looks static, it falls down in a backward direction in this bug version as shown in Figure 4.2.

In Instruction A, the situations described above were presented by computer graphics developed by 3D POINT OF VIEW LOGO. Students could search for various views by changing the point of view.

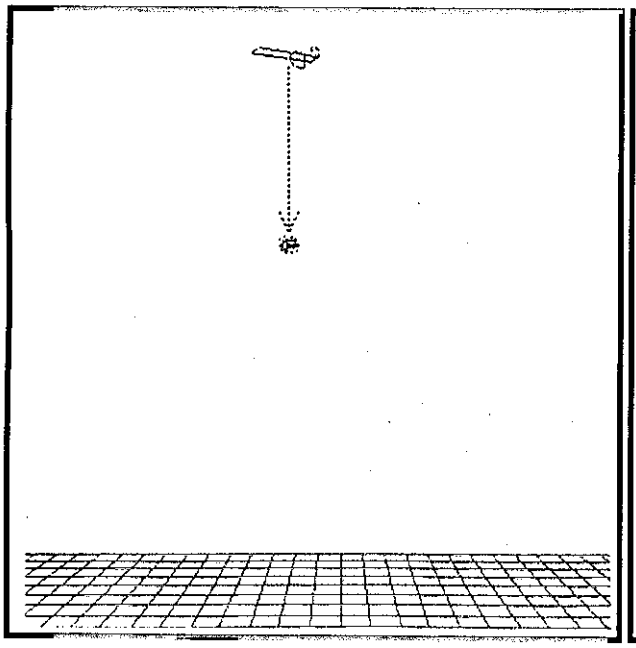

Figure 3.1. A ball dropped from the hovering plane (ground view)

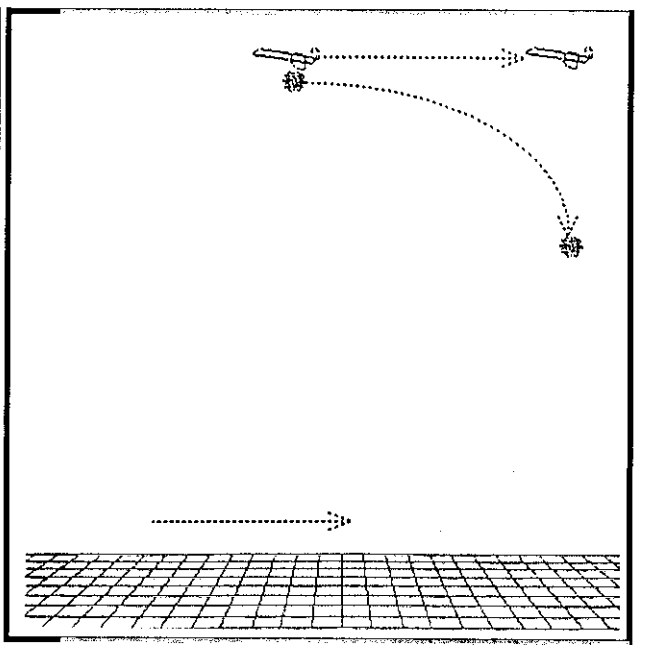

Figure 3.2. A ball dropped from the hovering plane (satellite view)

The problems of relativity of motion were presented in exactly the same context as that of Galilei's. This is a new problem context for students in order to reconsider motions and force on the ground. One cannot expect that the students will change their conceptualization concerning force and motion immediately after the presentation of this problem context. However, one can at least expect that this new problem context will expand the problem context of motion and force. This problem context was expanded further in the second session of instruction.

Problems Concerning Models of Space

Let us show the example of design instruction which the second session referred to as Instruction B. The following problems concern systems of a stationary state and a uniform linear motion. (Asterisk indicates the correct answer from the perspective of Newtonian physics.) In the first and second problem it is asked whether we can distinguish a system of a stationary state from a system of a uniform linear motion.

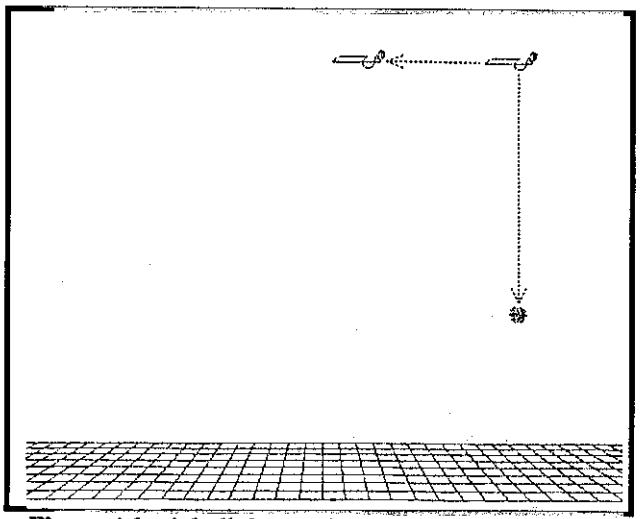

Figure 4.1. A ball dropped from the flying plane (ground view)

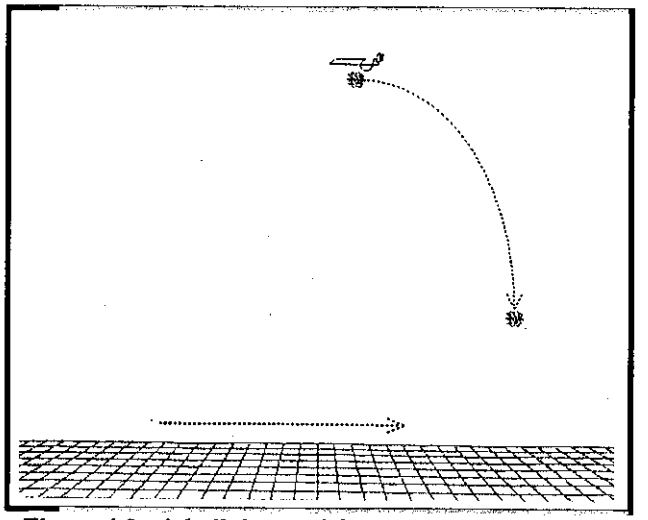

Figure 4.2. A ball dropped from the flying plane (satellite view)

(1) Imagine you are riding on a linear motor car running on the ground with a uniform linear motion. If you cannot see outside the car, can you see whether you are moving or not?

* No.

(2) Two linear motor cars pass each other on the ground. One is static and the other is moving with a uniform linear motion. If the passengers cannot see anything but the other car through the windows, can they see which car is moving and which car is static?

* No.

According to the results of our learning experiment (Ueno, Arimoto, & Fujita, 1990), all students could make a correct prediction for the above problems. However, many students hesitated to answer the following problems.

(3) The problem is similar to the above No. 2 except that the space shuttles replace linear motor cars. It is asked whether there is the third space shuttle from which one can decide which shuttle is moving or not.

* No.

(4) Can you find a point of view from which you can distinguish a uniform velocity motion from a stationary state?

* No.

Some said that there is no point of view at which one can distinguish a uniform velocity motion from a stationary state. Some said that there must be an absolute static point of view somewhere in the space. In problems (3) and (4), the phenomena were recontextualized. In other words, these questions were asking about a model of space. Let us take a look at some protocols regarding problem (4).

T1: This is the problem on the earth?

E: No. This is the problem about anywhere in the space.

T2: If this is the problem on the earth, if one regards the earth as a stationary state, there is a point of view (from which one can distinguish a stationary state from a uniform linear motion).

E: The earth is rotating and revolving.

T1: If one thinks like that, there is no point of view (from which one can distinguish a stationary state from a uniform linear motion).

T2: I vote for the opinion that there is no point of view (from which one can distinguish a stationary state from a uniform linear motion).

In this protocol, T1 directly asked for the problem context. He answered that there is no point of view from which one can distinguish a state from a uniform linear motion as long as one does not regard the earth as static.

In fact, the students had already known the results of some of these experiments, since, in the previous session referred to as Instruction A, students had observed the same experiments in the context of the argument between heliocentricism and geocentricism. This time, the same experiments were shown in the context of inquiry of the model of space. The same experiments of the relativity of motion were interpreted in the different way in this session. After observing these experiments, some students went back to the experimenter's question, "A stationary state for what?" Then they concluded that one cannot judge whether the moving object is really moving, because one cannot judge whether one is really static.

One of the other students still held to the static observational point of view even after observing the experiments of the relativity of motion, although, on one hand, she also understood the model of the relative space. She said that the static point must be somewhere in the universe even though one cannot discover the static point in the space around the earth. It seems to us that this kind of explanation is also plausible from the perspective of Newton himself. This is because, as pointed out previously, Newton's model of relative space coexisted with the model of the absolute space.

The Meaning of Motion in the Different Metacontext

Further, we also asked questions such as shown in the following. The problems were asking about "appearance and reality" of motion observed from various points of view.

(7) The problem is the same as No. 8 below except that a person drops an iron ball on the top of the tower and an observer sees the ball falling in the shuttle outside the

earth from which the earth looks like it is moving with uniform velocity.

(8) Imagine that a passenger in a linear motor car running with uniform velocity on the ground drops an iron ball. He sees the ball falling straight down. On the other hand, an observer on the ground sees the ball falling with a parabolic path. Which motion is real?

a. The path observed from the ground is real. The path observed by the passenger is only an appearance.
b. The path observed by the passenger is real. The path observed from the ground is only an appearance.
c. One cannot say which path of motion is real or apparent.
d. Other explanations.

As pointed out previously, if the same questions are independently asked without clarifying a metacontext, students tend to think that the motions observed from the ground are real and the motions observed from the ship are merely an appearance. For example, only 20-30% of the students selected choice "c" in the series of problems listed above. Instead of that, many students selected a choice such as "a." This is because the students tacitly regarded these questions as motions limited to the ground.

However, this time, the same questions were asked in a more global context. In this learning experiment, over 60-70% of the students selected choice "c"; that is, one cannot say which path of motion is real or apparent. First of all, in the previous session referred to as Instruction A, the students were provided the problems of the relativity of motion in the context of the arguments concerning heliocentricism and geocentricism. Thus, all students already knew that the metacontext of the discourse was not confined to the motions on the ground. Second, at the beginning of this session referred to as Instruction B, they were also asked whether one can find a point of view from which one can distinguish a uniform velocity motion from a stationary state.

In the series of problems above, the student T1's protocol seems to be typical.

T1: This problem is something wrong.

E: Why?

T1: Because, in the theory of mechanics, an observational point of view is located on the static ground.

E: Actually no.

T1: Where is our observational point of view? Can I locate it in the universe? If so, the answer is choice "c." One cannot say which path of motion is real or apparent.

T1: What is the meaning of "real?" If you regard the earth as a stationary state, the answer will be different from choice "c." If you regard the earth as moving, the answer is different. Which perspective should I select?

In this protocol, the student T1 clearly showed that he regarded mechanics as a theory based on the static ground. However, he also said that one cannot distinguish reality from appearance if one's observational point of view is in the universe.

In short, a series of questions as shown in the above were asked in the metacontext different from that of everyday discourse and medieval natural philosophies. We introduced a new metacontext for interpreting the phenomena. In this context, certainly, students' answers were different from answers under the metacontext of everyday discourse or medieval natural philosophy.

Force and Motion Under the Global Metacontext

Now it is time to reconceptualize the concepts of force and motion based on the expanded metacontext as shown above.

In the case of accelerated motion, an object is given constant force. Further, the force acting on the object does not change regardless of the points of view. An accelerated motion is also observed as an accelerated motion from any inertial systems.

On the other hand, in the case of an object in a stationary state on the ground, the object can be regarded as moving at constant velocity from the other inertial system. In addition to that, as shown in Figure 5, a small cart fixed in a big cart with springs does not move as long as the big cart is static on the ground.

This is also true in the case of an object moving at constant velocity on the ground. The object can be regarded as a stationary state from the other inertial system. In addition to that, as shown in Figure 6, a small cart fixed in a big cart with springs does not move when the big cart is moving at constant velocity on the ground. It is precisely

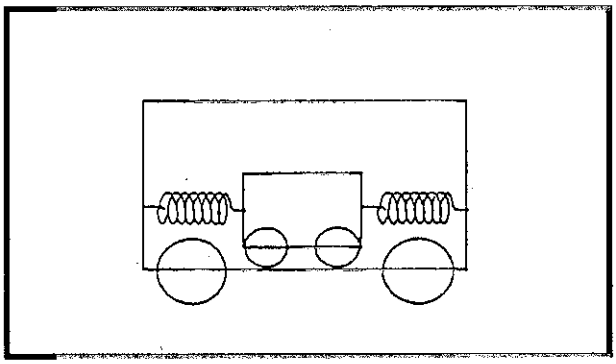

Figure 5. The cart at a stationary state

in the same way that a small cart fixed to a big cart with springs does not move while the big cart maintains a stationary state on the ground. Further, the same degree of force as that of friction is sufficient to maintain constant velocity. In short, in the expanded metacontext, a uniform linear motion on the ground can be considered to be the same as a stationary state on the ground. On the other hand, a uniform linear motion and a stationary state are very contrastive to an accelerated motion.

That was the outline of reconceptualization of force and motion we expected in this subsession. Let us now show the detail of instruction. Regarding accelerating motion and force, the same problem was asked in the two different observational points of view. First of all, the point of view was on the ground. Second, the point of view was in the shuttle "moving" at uniform velocity.

(1) Suppose the cart is given constant force on the floor with no friction as shown in the figure below. How does the cart move?

a. The cart runs with uniform velocity.
b. The cart accelerates at first, but soon it runs with uniform velocity.
*c. The cart keeps accelerating while it is pulled.
d. Others.

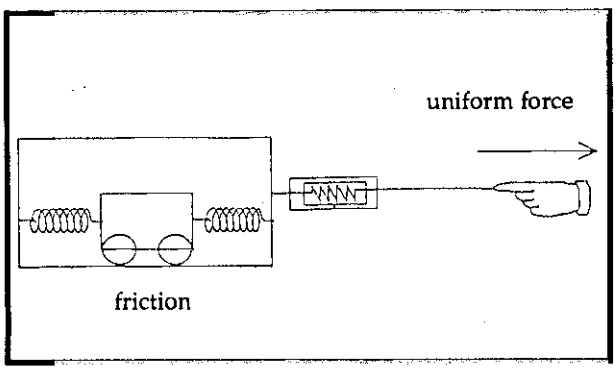

Figure 6. The cart pulled by uniform force

Experiment: A cart is given constant force under the condition where there is little friction between the cart and the floor.

(3) Suppose a cart accelerates on the ground. How does the cart appear to an observer in a space shuttle moving with constant velocity (or being static)? The ground appears to be moving with constant velocity from the shuttle.

a. It appears to be static.
b. It appears to be moving at uniform velocity.
*c. It appears to be accelerating.
d. Others.

In the above problems, the fact that an accelerated motion is observed as an accelerated motion from any inertial systems was shown. At the same time, the question is asked whether force acting on the cart changes after one changes the observational point of view.

On the other hand, with respect to a stationary state and a uniform linear motion, the following problems were given.

(1) The problem is asking whether the horizontal force is acting on the static cart on the ground or not.

(3) The problem is asking the same question as No. 1 above except that an observational point of view is in a space shuttle with a stationary state or a uniform linear motion.

(5) As drawn in the figure below, what kind of horizontal force is acting on the cart running with constant velocity on the no friction floor?

a. Constant force.
b. Force that is getting stronger.
*c. No force.
d. Others.

(7) The problem is the same as No. 2 above except that the question is whether the horizontal force acting on the cart changes according to the observer in the static shuttle or in the shuttle running with uniform velocity.

Experiment: Subjects observe that a big cart (fixed to a small cart with springs) is pulled by another spring. The spring that pulls the big cart maintains the cart at a constant velocity. It also means that the degree of force of pulling is the same as the degree of friction. The small cart fixed to the big cart does not move while the big cart maintains the constant velocity (see Figure 6).

In the above set of problems, it was shown that the constant velocity on the ground is the same as a stationary state from the other point of view. The point is that these experiments on force and constant velocity were also shown in the global metacontext. For example, the cart moving at constant velocity on the ground can be regarded as a stationary state from the observational point of view such as a shuttle outside the earth. On the other hand, the stationary state of the art on the ground can be regarded as moving at constant velocity from the observational point of view of a shuttle. Under this metacontext, the questions concerning force and constant velocity were asked.

As the results of the post test showed, the reconceptualization of force and motion we expected seems to be attained (Ueno, Arimoto, & Fujita, 1990).

It is extremely important to clarify the difference between the metacontext of everyday discourse and that of Newtonian physics. Learning physics is not to abandon the metacontext of everyday but to clarify the contrast between the metacontext of the two kinds of discourse. Further, according to our view, conceptual change should be regarded as processes involved in expansive recontextualization rather than merely the transition from one conceptual structure to another.

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Culture and Personality Reconsidered: Theory Building from Cases of Japanese Children Returning from the United States

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Introduction

One constructs one's intra-psychological sphere (the cultural part of one's personality) by incorporating a variety of cultural meaning systems into one's mind. In this sense culture shapes an individual's motivational characteristics and beliefs about the way things are over the course of personality development (see Figure 1). Questions that arise, then, include:

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(1) How are cultural meaning systems external to the individual incorporated into his or her intra-psychological sphere as a schema?

(2) How are certain cognitive schemas involved in motivational and/or affective functioning?

In order to understand how cultural meaning systems are incorporated, I have examined cases of Japanese children growing up in the United States. Modes of interpersonal behavior vary from culture to culture with most fullfledged members of a society having knowledge about how to relate to whom in what situation. This means that most interpersonal behavior is more or less laden with cultural meanings. Great differences between Japan and the United States are observed in the cultural meaning system in this domain (Minoura, 1980). Therefore, examining which cultural meaning system for interpersonal behavior Japanese children incorporate if they are raised in American communities by Japanese parents and are attending local American schools has special significance.

What I have found is that the majority of Japanese children who came to the United States at a certain age, learn a certain amount of English, have friends among Americans, and stay for enough time, can successfully incorporate American meaning systems and act accordingly while they live in the States. Some of them internalize American meaning systems about interpersonal relationships so deeply that, upon their return to Japan, they are no longer comfortable with Japanese ways. Because of that, some tend to have frictions with others. Still some others are confronted with the task of psychological reorganization of their meaning systems (Minoura, 1984; 1988). Many Japanese children returned from the United States have reported that they felt as if "part of their flesh was carved out" when the formerly acquired American meaning system was negated. This means that cultural meaning systems related to interpersonal relationships became a significant part of the self (personality) in all my informants. What we have observed here is that "at least some culturally distinctive dispositions are experienced by most persons as salient parts of themselves to which they are emotionally attached, and they are not easily given up" (LeVine, 1973, p. 23). Some part of personality is affected more by innate dispositions than a cultural environment in which they grow up. This is why I divide personality into the cultural part and the non-cultural part (Figure 1).

How do returnees manage the incongruities between the perceived meaning systems of Japanese society in general and their own cultural schemas brought back from the United States? By examining such cases, I hope to gain insights for a new theoretical formulation concerning culture and personality. Before presenting the cases, I would like to outline my theoretical framework.

Theoretical Framework

It is hypothesized that during the sensitive period a part of cultural meaning systems is incorporated into one's mind by getting linked to the human biological system, and that it becomes ready to manifest itself in behavior accompanying affect (Minoura, 1992). D'Andrade has proposed a comprehensive discussion on what meaning systems *do* for individuals. According to him, "meanings in general, and cultural meaning systems in particular, do at least four different things. Meanings represent the world, create cultural entities, direct one to do certain things, and evoke certain feelings" (D'Andrade, 1984, p. 96). D'Andrade's four functions are postulated as potentials of a cultural meaning system, which are to be activated as psychological functionings under certain conditions. At least three out of four, that is representational, directive and evocative functions have the corresponding levels of what an individual may experience when being exposed to a particular cultural meaning system.

How do these potentials on the part of cultural systems manifest themselves as psychological functionings such as cognition, affect, or behavior? Figure 1 outlines how something originating from the "outside" becomes incorporated into the "inside" of the individual and comes to have affective and/or motivational significance for behavior. External events which normally contain cultural meaning systems rouse cognitive schema and certain physiological states which are appraised automatically by an already existing frame of reference derived from each individual's cognitive-motivational-affective system. Through the cognitive appraisal the personal significance of cognitive schema is evaluated, producing motivation and affect. Affect is generated in relation to degree of acceptance or rejection of a particular schema, while motivation is in relation to commitment to action tendency. The box surrounded by dotted lines in Figure 1 is a part of one's personality system activated by an encounter with an external event. An activated part of the cognitive-motivational-affective system is to a more stable part of personality as a current file of a computer system is to a permanent file.

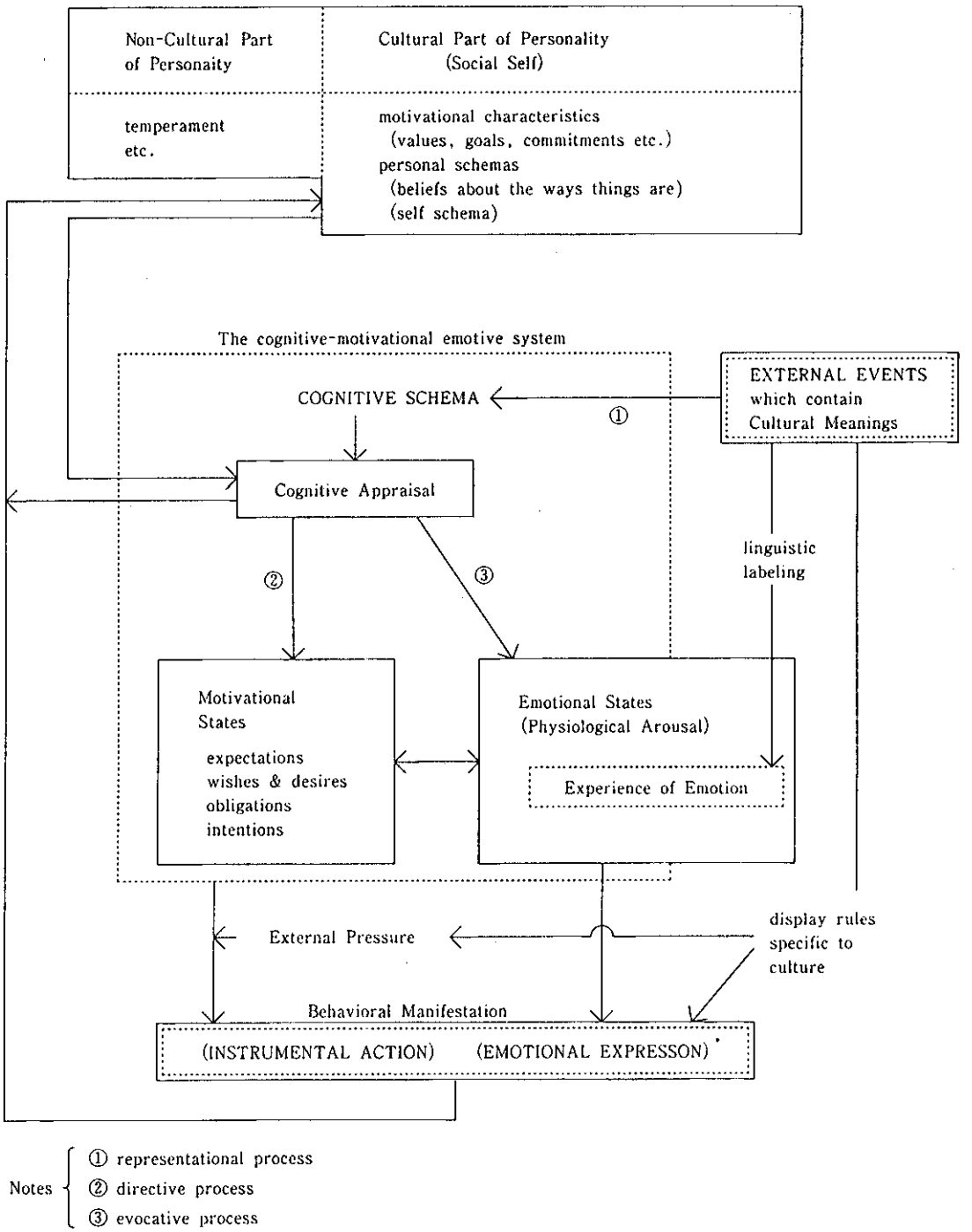

Figure 1. Relationships between personality and cultural meaning systems

The coaction of cognitive appraisal and arousal generates states that produce an experience that is in the common language called emotional experience (Mandler, 1984; Shachter, 1964; Smith & Lazalus, 1990). In other words, when physiological arousal is given a linguistic label, a psychological experience called "emotion" is recognized. However, some cultures expect their members to inhibit displays of certain emotional experiences and others encourage open displays of them and still others may give them a particular form of expression. This is why emotional experience is distinguished from emotional expression in Figure 1. Children learn both explicitly and implicitly what kinds of emotional expression are acceptable in their culture.

Motivational processes relate to goal states of the individual in his or her attempt to produce desired changes in his or her environment. There are four types of motivational state: expectations, wishes (or attitudes toward an act), obligations and intentions (Kuhl, 1986). When motivation is experienced subjectively as a desire or wish, it is "followed by a feeling of satisfaction if the desire is fulfilled or a sense of frustration if it is not" (D'Andrade, 1992). Thus the arrow between *motivational state* and *experience of emotion and mood* is bidirectional in Figure 1.

The very basis of the cultural part of personality, which provides a frame of reference for cognitive appraisal, is constructed during ages 9 to 14.5 (Minoura, 1992). I have called this the sensitive period during which cultural schema of interpersonal relationships acquire motivational force and/or affective potency. The cultural part of personality, however, is reorganized constantly, negotiating its status with varied cultural inputs. Many factors appear to influence both the reorganization period and the sensitive period during which the cultural part of personality is laid down. Central to both periods is the interiorization that links cultural meaning systems to the cognitive-motivational-affective systems (Figure 1). How do these linkages between culture and personality system emerge at the interface of two cultures ? Let us examine the cases.

Rie's Case

Rie came to the United States at the age of 7 years and 10 months and went back to Japan at the age of 11 years and 3 months. I interviewed Rie and her family four times during their three-year-and-three-month-stay in the States from October, 1976, to January, 1980.

At the fourth interview, her mother disclosed her worries about her daughter's Americanized behavior. The mother's talk indicated how much Rie had incorporated an American way of self-presentation. Her mother said,

"I know it is important to be self-assertive in this country, but I don't want her to be too self-assertive. I was shocked by her essay which was included in an essay-collection sent to parents by her classroom teacher at the Japanese Saturday School. My child wrote, 'In my previous school, I was the best student in math. The magnet school I am now attending collects the best students in math from many schools. I am one of those. I feel it great.' I was so shocked what she wrote. If she had been raised in Japan, she would not have written such a thing in a essay. Compared with her elder brothers, she has been really amid American friends and picked up what her American friends do!! In turn, she is failing to acquire the Japanese way of expressing herself, skills of indirect communication of alluding what she wants, or of blurring yes or no, but still getting across what she wants to say. These are regarded as bad Japanese habits, but you need them if you live in Japan. No matter how much I make efforts I can not inculcate those in her. Parents can't do that. There are something which she is able to understand only through the experiences of dealing with people outside her family. Because of my daughter's rapid Americanization, I was quite relieved by the decision of my husband's transfer to Japan next month."

Rie went back to the place where her family used to live and enrolled in the 5th grade. Friends whom she had left when she went to the United States were still there, attending the same school. Rie was remembered by her old friends despite her absence. My fifth interview with her and her mother took place at the end of her sixth grade (one year and two months after her return from the States). She expressed her feelings of disgust towards ways her Japanese friends behaved and her wish to go back to the States. Her classroom teacher hinted to her mother that Rie tended to have frictions with other girls because of the way she expressed herself. The mother realized that Rie acted just as she did in America and that she was taken as a tough girl.

When Rie was in the 10th grade, she heard about a study abroad program at the United World College (UWC) and decided to enter a stiff competition for the most prestigious scholarship open to high school students. She left Japan for UWC near Albuquerque at the age of 16 years and 9 months and lived in a dormitory for two years with students from more than 50 countries. She came back

to Japan in 1987, after her graduation from UWC. My seventh interview with her was made one month after her return to Japan.

"I applied for a scholarship to UWC with the intention of going back to America, not studying abroad. I felt my American experience had been denied almost constantly. When I could not get along well with my friends, I had to change myself. I spent my ninth grade, saying to myself not to act assertively."

"When I entered senior high school, it became my natural way of behavior to refrain myself. In the beginning I regarded myself as 'different,' trying not to negate my American experience. Looking back from now, I became 'Japanese' by the time of my entrance to senior high school. I found myself becoming comfortable with drifting down in the stream with others instead of trying to go up my own way against others."

When I asked, "Did you change your style of relating to people upon entering UWC ?" she said, "For first one or two months I felt somehow awkward. However, without any determination, my old American way came back naturally. I felt as if some strings had been untied."

Jiro's Case

Jiro first entered the United States at age six as a result of his father's overseas assignment and went through the American educational system from kindergarten to the eighth grade. Jiro went back again to the United States at the age of 16 years and 9 months, and enrolled in the eleventh grade. At the second interview with him (at age 17), looking back over his three years' stay in Japan, he said, "Coming back to Japan did not mean that I became a Japanese. I don't have any "Japan" to begin with. I had to make a Japanese out of myself. Around the time I entered senior high school, I determined to become a bilingual who can understand both Japan and the United States and be a bridge between the two, although I harbored my wish to go back to America in my heart. I convinced myself that I had to learn more about Japan by living here, in order to be accepted as a Japanese. If I go to a Japanese university, I will understand Japanese more and know how I can make my career, although it does not mean that I want to be part of Japanese society."

Jiro came back to Japan as an American, so to speak, and met considerable difficulties socially and academically just like Rie. The most uncomfortable among all he faced is that the Japanese do not say explicitly what they think. He could not handle the Japanese style of indirect communication. Jiro says:

"Japanese friends say something which is not intelligible to me. They can understand each other, but I can't. In the beginning I asked back when I can't understand and friends were willing to explain. This has changed over a year. Recently I stopped asking back, since I felt friends were no longer welcome to my request for clarification. I wouldn't say everything American is good, but to me America is a comfortable country to live."

After three years in Japan, however, problems with the Japanese language are no longer a serious academic handicap and Jiro is able to incorporate Japanese patterns both at the cognitive and behavioral level, as indicated by what he says:

"In Japan you will not be acceptable unless you keep up with others. In the U.S. there is a lot of diversity. It is all right if you are happy with it. Things don't go that way in Japan. When I returned to the United States I felt relieved. I thought that now I could assert myself without worrying about conforming to others. But on the other hand, it was difficult. Here you have to make decisions yourself. Looking back, it was easy in Japan since others tell you what you should do and you just do that, although I hated it when I was in Japanese school. Here in the U.S. you should be alert and support yourself, or you will drop out. It was in my second stay in the U.S. that I understood these differences between Americans and Japanese well. Being taken care of in the Japanese way isn't so bad as I used to think. After all you enjoy more of a feeling of security."

Upon being asked, "Are you American or Japanese?", Jiro says: "I'm a Japanese without any question. I don't have any ambivalence towards being a Japanese. I came to accept this fact after my return to the U.S. It is when I went back again to the U.S. that I identified myself as a Japanese and determined to foster a 'Japanese mind.' During my first stay I had never considered myself as a foreigner. I looked like a Japanese, but it did not bother me. I can be regarded as a *nisei* (Japanese-American). However, this time I am able to present myself as a Japanese with pride. In social studies I did not act as one of we-Americans, but tried to take a position of you-Americans. My friends acknowledge my position."

Cognition, Affect and Cultural Meanings

Psychological research has traditionally treated emotion as a primitive gut reaction, conceiving of emotion

as a within-person variable. However, in order to fully comprehend how emotions and motivations are generated, we need to give much more attention to the world of meanings in which each individual resides. Cultural meaning systems are part and parcel of people's emotional lives and they are structurally embedded within action and interaction, language and metaphor in social settings. These settings provide a person with experience of cultural meanings in action.

People living in a culture other than their own offer an invaluable opportunity to examine relationships between emotions, motivations and cultural meanings because dissociation of emotion from the context where action is taking place is an essential feature of an intercultural experience (see Minoura, 1992 for more details). By utilizing two such cases, I would like to examine how their emotions and motivations are experienced in relation to cultural meaning systems to which they are committed.

The incorporation of cultural meaning systems appears to take place at three levels - cognitive, motivational and affective. First I discuss what happens at the cognitive and affective level. Feldman (1987) argues that every cognitive activity contains two components: one ontic, the other epistemic. "The something thought about must first be represented in some form in the mind of the person who is to think about it" (Feldman, 1987, p. 145). This is termed *Cognitive Schema* (Figure 1). The individual operates epistemically on this cognitive schema, the processes of which are termed *Cognitive Appraisal* in this paper. Through these two mental processes the individual construes a reality and comes to know about the world. Whenever the relevant triggering situational features are present in the external environment, the cognitive-motivational-affective system of the individual's personality becomes activated and thus forms a cognitive schema of an external situation, invoking the appraisal processes. It should be noted that the individual who is exposed to certain cultural meanings does not necessarily form a cognitive schema of everything offered. What is thought about depends upon personality factors and stimulus conditions. This is how cultural meaning systems activate their representational function at the intra-individual level.

Appraisals of cognitive schema (epistemic aspect) are made from the framework of the individual's social self (cultural part of personality). The activated self then would presumably guide the cognitive appraisal and convert some cognitive schema to motivation and/or physiological arousal. These processes are often made automatically without awareness and can occur in very rapid fashion. Mere formation of the cognitive representation (cognitive schema) of a cultural meaning does not necessarily mean that it will lead to emotion or behavior. Some cognitive schemas remain at the cognitive level, while cognitive appraisal sometimes triggers affect and motivations. This corresponds to what D'Andrade calls the directive and evocative functions of cultural meaning systems, respectively. In other words, the appraisal is the core processes of "generating meaning" at the intra-individual level.

Rie and Jiro have developed the cultural part of their personality (Figure 1), incorporating American cultural meaning systems. Upon their return to a Japanese school, they were exposed to Japanese cultural meaning systems through interaction with their classmates, which activated their cognitive-motivational-affective system. Cognitive schema thus generated are appraised from their framework of American meaning systems, resulting in an emotional experience. Rie evaluates her classmates' behavior as "not right" and harbors a feeling of disgust toward them. Rie's cognitive appraisal is made from the demands of her sense of self, which does not allow her to accommodate herself to the demands of her Japanese school. It should be noted that Rie's American way of thinking, a part of her self, evoked negative cognitive appraisal as well as feelings of disgust towards Japanese friends.

Jiro came back to Japan as an American, culturally speaking. He could not handle the Japanese style of indirect communication and sometimes made direct comments on what his friends said, which occasionally evoked negative reactions from his peers who were raised exclusively in Japan. Jiro's parents put him in a school which has a special program for children returning from overseas, while Rie came back to her old school which had never had a returnee from overseas. Because of differing situational features of their respective schools, Rie appeared to be exposed more often to wider discrepancy between her own world of meanings and that of her teachers and peers than did Jiro. Rie's perception of Japanese school became very negative, whereas Jiro's reaction was mildly negative which still allowed him to incorporate Japanese cultural meanings.

Mandler's formulation about relationships between schema and emotional experience may shed light on the mechanism for how a cultural meaning system acquires such affective function. Mandler argues that a part of cognitive appraisal "consists of those that determine the appropriateness or inappropriateness of actions in re-

sponse to the demands of the environment and the self" (Mandler, 1984, p. 118). In other words, perceived incongruities generate certain affect. According to Mandler's theory, both Rie and Jiro cognitively appraise their arousal of the autonomic nervous system (ANS) triggered by incongruities between their schema constructed while in the U.S. and the actual reality they encountered in Japan. Schema incongruity appeared to be greater with Rie than with Jiro.

About schema incongruity, Mandler speculates:

> What are the consequences of schema incongruity, of an interruption of expectations and predictions? . . . we assume that the intensity of the emotion is a function of the degree of ANS arousal and that the latter depends to a large degree on how interrupting the elicited event is, then emotional intensity depends on how much of a discrepancy (or incongruity) exists between what is encountered and what was expected (Mandler, 1984, p. 203).

Mandler appears to explain differences in emotional reaction observed between Rie and Jiro.

The expression of certain emotions is socialized differentially across cultures. Part of a child's developmental task is to learn emotional expressions appropriate to her or his culture. From Rie's case we can infer that display rules of emotions specific to culture appeared to be acquired at least partly by the latter half of the fifth grade. For example, Rie's schema about "appropriate" ways to reveal her negative feelings toward someone who makes a loud noise is acquired while she is in the States. It is different from "appropriate" ways for her Japanese friends to attain the same goal - alluding indirectly to what they want. In response to my questions about differences in meaning of *ki-o-tsukau* between the United States and Japan, she said:

"Totally different. In Japan *ki-o-tsukau* means that you try not to make yourself too clear or try not to be assertive too much. In United States *ki-o-tsukau* means to exert your common sense for not disturbing others, for example, "avoid making loud noise" or "try not to raise volume when listening to music". When I asked others to exercise this common sense, I was told that my way of saying such a request was too direct and I was impudent. This was soon after I came back to Japan. I was shocked, since it was not my intention. I was regarded as arrogant."

In this episode, negative affect aroused by a loud noise is probably the same to both Rie and her peers, but the way to express this negative feeling is different: Rie's expression is direct, which contrasts to the indirect communication of her Japanese friends. Rie violates a Japanese display rule of negative feelings, and consequently her act invites very negative reactions from her peers. They attributed Rie's behavior to her personality, without understanding that Rie's behavior was shaped while she had been raised in the United States.

Affect, Motivation and Behavior

It goes without saying that our behavior, our reactions to our world, are colored by our affect. In this section I would like to discuss relationships between affect, motivation and behavior. A comparison of Rie's case with Jiro's illustrates how differences in emotional experience become important sources of differences in behavioral profile.

Upon Rie's return to Japan, she experienced a great deal of incongruity in interpersonal relationships between the actual and the expected (her schema). Cultural schemas she brought back were not shared with her Japanese peers and teachers. They did not behave as she had expected. Without having a schema that informed her about Japan-U.S. differences, she acted according to American schema and consequently had numerous conflicts. She said:

"I had resisted for the first three years, however finally I was obliged 'to let it be.' By giving up my way, I can avoid friction and maintain smooth relationships with friends. I remember very well when I determined to change my attitude toward teachers. It was just before I got into the ninth grade. It became clear to me that it did not improve my situation at all to do what I thought right or to do what I wanted to do. I determined to act as being humble, saying to myself not to act assertively. Troubles at school had made me really wearied by that time. I had to guide myself with a very conscious effort. Otherwise, I couldn't change my way of behavior."

Rie's case showed us how cognitive processes are affected by the emotional and motivational states of the individual, that is, her awareness of teachers' wish in the above episode. It also shows how accumulation of negative affect motivates her to avoid further conflict by changing her behavior. However, her initial reaction to pressure to conform to the Japanese way was: "The way I behaved is the right way, why do I have to change it ?" It should be noted that there are close interactions among cognition, motivation and affect despite the functional differences among the three.

What she thinks it should be and what her classmates consider appropriate are far apart. As such schematic incongruities between Rie and her classmates about what was appropriate proved to be real, discomfort and stress increased on Rie's part. Finally, they amounted to a point which made her very weary, feeling unable to continue her American way. Many uncomfortable incidents followed one after another. Just before she became a ninth grader, in order to avoid further troubles, she determined to do what she perceived others wanted her to do. For example, she related to teachers as she thought they wanted to be treated. No troubles since then. This indicates that Rie became able to practice *awaseru* (go along with others, suppressing one's opinion, just like many other Japanese).

These kinds of countless incidents lead Rie's classmates to attribute her assertive behavior to her personality. Consequently, Rie was regarded as an aggressive girl who was difficult to get along with. However, Rie interpreted this situation differently. She felt as if part of her self was denied when her way was criticized or was placed under strong pressures for modification. Although she was not a newcomer, her friends who had been socialized in Japan appeared to be aliens to her culturally, so to speak. She had incorporated American meaning systems as a part of her "self" to the degree where they had acquired existential meanings for her. Thus, the incongruities between her expected schema and the actual life she encountered daily in Japan triggered a strong affect.

In the beginning Jiro faced difficulties similar to Rie, but he internalized Japanese meaning systems of maternalistic protection prevailing in his school to the extent that he felt being taken care of was not so bad. He did it at the expense of autonomy and self-assertion, which Rie held to firmly. However, Rie was obliged to give up her American way of behavior in order to resolve her strong negative affect. In other words, Rie had to conform to an external standard of Japanese meaning systems which still existed outside her. In Jiro's case, Japanese meaning systems existed inside and thus they were able to influence his emotion and motivation.

Rie had incorporated American cultural meaning systems for self-presentation to a degree where the interruption of them gave rise to an emotional arousal. While she lived in the States, there were few discrepancies between the actual and the expected. As Mandler (1984, p. 201) points out, embedded meanings are void of passion or fire; they remain with "cold positive value" in a setting in which they are taken for granted. Evocative potentials of a cultural schema surface in the form of negative affect only when execution of a schema is interrupted or disapproved of by the actual happenings of daily life. This explains why Rie reacted negatively to her Japanese classmates. Rie had to change her behavior in order to avoid further emotional suffering, accommodating herself to the demands of the environment. She was forced to switch her goal from defending her sense of self to getting rid of friction with people in her school. At this point the American cultural schema ceased to exert a directive force on her.

Jiro's school has the special program for returnees to which he enrolls. He can have teachers who understand difficulties of those who return from overseas and friends who share overseas experiences. There are some scripts available to explain the behavior of returnees. Unlike in Rie's case, this appears to mitigate Jiro's difficulties and to prevent him and his friends from developing negative feelings towards each other.

In Jiro's case, the restructuring processes from American to Japanese meaning systems are gradual, compared to Rie. While Jiro lived in Japan from the age of 13 years 6 months to 16 years 9 months, he determined to become a bridge between Japan and the United States. This appears to facilitate restructuring into the Japanese meaning system acquiring directive force. Jiro has been successful in his incorporation of a Japanese meaning system as indicated in his behavior during his second stay in the United States.

The cultural part of Jiro's personality during his second stay in the United States may be characterized by two sets of personal systems, American and Japanese meaning systems. Therefore, various incidents Jiro encounters in his American high schools are appraised cognitively not only from an American framework but also from a Japanese one. Both affect his emotional and behavioral reactions. At the affective level he is more comfortable with American ways, but his conscious choice to be a Japanese appears to affect more the processes of cognitive appraisal and consequently to motivate him to take a position of "you are American, but I am Japanese" in his social studies class. This is in sharp contrast with Rie.

Rie came back to Japan at the age of 11 years and 3 months, two years younger than Jiro. No one around Rie knew about cultural differences. If someone had told her and her teachers that this was a common experience for young persons coming back from the United States, they might have reacted differently. She had only a slight

motivation to adopt Japanese ways of behavior, but enormous external pressure made her restructure her goal and feel obliged to adopt them. The way Japanese cultural schemata acquire directive force with Rie is quite different from Jiro. Since Japanese meaning systems had not yet firmly internalized into her personality systems, Rie dropped them with relative ease and resumed American practices one month after her arrival at UWC. This is sharp contrast with Jiro who became able to evaluate facts and things from multiple points of views.

In sum, culture in terms of cultural meaning systems is directly related to the personality system at least in four ways: as activator for cognitive schemata; as provider of linguistic labels to physiological arousal so that members of each culture have developed a unique system to express emotion; as creator of motivational state of obligation and of pressure to enact it; and as provider of display rules specific to culture for motivational state and emotional experience. Cultural meaning systems, which are internalized as motivational characteristics and/or personal schemas offer a framework for cognitive appraisal to process incoming cognitive schemata. In this sense they indirectly participate in culture and personality interactions.

Note

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Preschoolers' Activities in Socio-Cultural Context

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The central question addressed in this study is: How do children grow up to be competent members of their cultural communities? From Vygotskian and ecological perspectives it is in the course of everyday routine activities that children gain cultural knowledge—ways of behaving and thinking considered important in their cultural community. Competent members of the community en-

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gage in activities viewed as important, and make those activities more or less available for children to participate in. For example, in industrialized societies much of the work that is critically important for economic self-sufficiency occurs away from the home, and children are rarely able to participate in it. Specialized institutions (various types of child-care centers and schools) are set up both to help children learn the skills they will need in order to become economically self-sufficient and to allow the parents to work in places to which children are not encouraged to come. On the other hand, work also occurs in and around the home, and children are in some instances encouraged to participate (helping to set the table, for example), and in others are not (lighting the fire). Children, simultaneously, strive to get involved in the activities that are going on around them. They seek opportunities to participate in on-going activities, to start new activities, and recruit others to participate with them. The availability (and lack of availability) of activities and the extent to which children are involved are thus mutually determined by culturally and historically related factors, the values and beliefs of more competent members of the culture (who arrange different types of activities for their young, and encourage them in different ways and to different extents to participate in them), and by the children's own active attempts to participate in and start activities (Rogoff, 1990; Tudge, Putnam, & Valsiner, 1991; Tudge & Winterhoff, 1993; Tulviste, 1991; Valsiner, 1987; Whiting & Edwards, 1988).

Theoretical Framework

The research is set within Vygotsky's theory (1978, 1987), which holds that children's development can best be understood by considering simultaneously the child's active involvement in activities, interactions with others who are more competent at those activities, and the broader socio-cultural context that provides the meaning to the activities. Vygotsky believed that while children are actively striving to make sense of their world they are helped in that process by others who are more competent and who actively seek to facilitate the children becoming increasingly competent themselves. The definition of "competence" necessarily depends on historically derived cultural values, beliefs, and assumptions. From a Vygotskian perspective, therefore, it is not the case that cultures "socialize" or "enculturate" in any simplistic unidirectional fashion; nor is it the case that children themselves create their own understanding of the world simply from their own activity in it. Instead, the process is one of "co-construction" in which, in the course of action and inter-action, children with the help of socializing agents jointly come to construct and reconstruct their world.

This is so, Vygotsky reasoned, because the process of coming to make sense of the world occurs in the course of social interactions that in turn derive their meaning from culturally organized settings and practices. Cultural institutions, technologies, symbol systems and the like help to channel the nature and focus of the interpersonal interactions, which in turn assist in the shaping of children's development. At the same time, however, culture "is the product of social life and human social activity" (Vygotsky, 1981, p. 164 [authors' emphasis]). Thus, unlike other psychological theories that attempt to "explain" psychological factors from characteristics of the individual plus extraneous and secondary social influences, Vygotsky's unit of analysis goes beyond the individual (Cole, 1985; Wertsch, 1991). The unit of analysis used in this research is thus the individual in social activity, a unit that encompasses the individual, the activity, and the social world at both the immediate interpersonal and distal cultural-historical levels.

The aim of this project was, therefore, to examine children in their everyday activities in a number of differing cultural communities, of which two will be examined in this paper. "Cultural community" was defined broadly, so as to encompass groups that differ not only in terms of such attributes as extent of industrialization, the use of schooling as the primary means of preparing children for self-sufficiency, and so on (differences that exist typically at the cross-societal level), but within societies, in terms of social class and racial group.

Much of the cross-cultural work in developmental psychology either implicitly or explicitly involves a comparison group—a group against which to set the practices of the culture being studied. Cross-cultural psychologists and cultural anthropologists no longer believe that a North American or Western set of cultural practices constitutes the model which other groups should strive to attain (Laboratory of Comparative Human Cognition, 1986); nonetheless, many scholars take a single United States sample as the comparison group of interest against which to discuss the cultural practices of one or more groups at a simpler level of technological complexity (examples include Bakeman, Adamson, Konner, & Barr, 1990; Bloch, 1989; Dixon, LeVine, Richman, & Brazelton, 1984; Munroe, Munroe, & Michelson, 1983; Ochs & Schieffelin, 1984; Rogoff, Mosier, Mistry, & Göncü, 1989; Sigman, Neumann, Carter, D'Souza, & Bwibo, 1988; Whiting & Edwards, 1988). Bornstein stated

quite explicitly, in his introduction to the edited volume entitled, *Cultural approaches to parenting:* "Not unexpectedly, the modal comparison is with U.S. samples" (1991, p. 7). That North American scholars (and their readers) should use North American samples as points of comparison is hardly surprising, but the resulting confounding of schooled, technologically complex society and the United States of America may artificially instantiate one culture's practices (or, more exactly, one subculture's practices, given the tendency to study middle class white samples) as the exemplar of technologically complex societies' practices in general.

From a cultural perspective this tendency is problematic for two reasons. First, to view just one society, even implicitly, as the exemplar for a group of societies at a similar level of technology, is to ignore tremendous cultural variability in approaches to child rearing within technologically similar societies. Second, even within any single society there is likely to be variation in child rearing practices as a function of within-society cultural differences. Whiting and Edwards (1988) nevertheless made no reference to the fact that the pattern of mother-child interactions found in their single exemplar of a community from a technologically complex society (Orchard Town, in New England) could be specific to a social class grouping (middle class), racial or ethnic group (white and of European descent), or to a particular historical period (one in which mothers were expected and encouraged to stay at home). A number of studies provide reason to doubt the uniformity of child rearing practices, at least in the United States (Ellis & Gauvain, 1992; Heath, 1983, 1988; Kohn, 1977, 1979; Ogbu, 1979, 1981, 1988; Schacter, 1979; Tharp, 1989).

Kohn (1977, 1979) argued that working class and middle class parent-child interactions can best be understood by examining the different beliefs about competence held by these groups. Kohn argued, for example, that factors such as the degree of self-direction parents have in the work-place and the degree of complexity of their work are reflected in the ways in which they deal with their children, the goals that they have for their children, and the extent to which they encourage self-direction in their children. In Kohn's view, "occupational experience helps structure parents' views not only of the occupational world but of social reality in general" (Kohn, 1979, p. 61). This is one of the ways in which children of different social class groupings are encouraged to learn patterns that enable them most easily to stay within their parents' social class, and with more difficulty move out of it. Social class groups, as with other cultural groups (such as racial and ethnic groups) are thus continually re-created.

The specific objective of this paper was to explore variation in the types of activities available to young children in two different cultural communities that vary by the types of workplace experiences described by Kohn, focusing particularly on those activities in which children engage, who is responsible for the children engaging in these activities, their partners, and the respective roles taken by the children and their partners.

Participants

In this paper we focus on the activities, partners, and settings of 20 preschoolers who ranged in age from 28 to 45 months ($\underline{M}$ = 36.65 months, SD = 1.31). The children were drawn from two cultural communities (both white, one named "Holden" in which parents tend to work in professional occupations and one named "Summit" in which parents tend to work in the non-professional sphere) in a southeastern city in the United States. The Holden group of children consisted of six females ($\underline{M}$ = 38.33 months, SD = 6.62) and five males ($\underline{M}$ = 34.4 months, SD = 7.64), and the Summit group consisted of five females ($\underline{M}$ = 35.0, SD = 3.74) and four males ($\underline{M}$ = 39.0, SD = 4.56).

Participants were located in the following manner. "Community" was defined as an area of town bounded on all sides by relatively clear boundaries (major roads, railway line, etc.), with no major roads cutting through the area, relatively small in size (1 1/2-2 square miles), and judged to be fairly homogeneous in terms of types of housing and racial background. A list was then generated from the birth records of all children born in that area between two and four years earlier. Letters were sent to all families who appeared to still be living in the area (information derived from the telephone book and/or city records), and followed up by a screening call. In order to participate, the family still had to be living in the area, and had to fit education and occupation criteria. For the Holden community, at least one parent had to have a minimum of a college degree, and have an occupation judged to be middle class according to Hollingshead criteria; for the Summit community neither custodial parent could have a degree (one non-residential, divorced, father had a degree).

Of the 28 families contacted in Holden, 10 declined to participate, seven were willing to participate but did not meet our requirements, and 11 participated. The minimum median family income (families responded to an income range rather than a precise amount) for this group was $70,000 (ranging from $40,000 to more than $85,000),

and the median Hollingshead ranking was 8 (administrators, lesser professionals), range 7-9 (excluding the six mothers who worked at home). The mothers' median educational attainment was a bachelor's degree (ranging from some college to graduate degrees), and their average years of full-time education after age 14 was 8.1 (SD = 1.23). The fathers' median (and minimum) educational attainment was also a bachelor's degree, but two had doctoral degrees, and their average length of full-time education after age 14 was 8.9 (SD = 1.7).

Of the 18 families contacted in Summit, four declined to participate, five were willing to participate but did not meet our requirements, and 9 participated. The minimum median family income for this group was $25,000 (ranging from $10,000 to $40,000), and the median Hollingshead ranking was 4 (skilled manual workers), range 2-5 (all mothers but one worked outside the home). The mothers' median and maximum educational attainment was some college and all had finished high school. On average, these mothers completed 4.9 years of full- time education after age 14 (SD = 1.54). The fathers' median educational attainment was completion of high school, and ranged from less than high school to some college and their average years of education after age 14 was 4.6 (SD = 1.62).

Methodology

Families were asked to keep their daily routines unchanged as much as possible during the observation period. Each child was observed, wherever he/she was, for 20 hours over the course of a week to capture the equivalent of an entire waking day. Observations were continuous in 2- and 4-hour blocks, but activities, partners, respective roles, etc. were only coded during 30-second "windows" every 5 1/2 minutes, using modified "spot observations" (Ellis, Rogoff, & Cromer, 1981; Whiting & Edwards, 1988). Activities were coded as being "available to" the child if they occurred within his/her ear- or eye-shot. Children were coded as being "involved in" the activities if they were physically participating or were watching closely.

The activities in which we were interested were lessons (4 categories), work (5 categories), play (10 categories), conversation (3 categories), and "other" (6 categories, including sleeping, eating, etc.). (For full details of the coding scheme, please refer to Tudge, Sidden, & Putnam, 1990). In brief, however, lessons were defined as involving the deliberate attempt to impart or receive information in four areas: academic (spelling, counting, learning shapes and colors, etc.); interpersonal (teaching etiquette or "proper" behavior); skill/nature (how things work, why things happen); and religious lessons. Work was defined as "activities that either have economic importance or contribute to the maintenance of life" (Tudge, et al., 1990) and was broken down into work involving no technology, technology modified for a child's use, or "adult" technology. Play (including exploration and entertainment) was defined as activities that were being engaged in for fun or for their own sake, with no apparent curriculum (which would constitute a lesson) or sense that the activity had economic importance (work). Thus a child looking at a book or being read to would be coded as engaging in "play with an academic object" whereas the child asking what a particular word was, or being asked to name the colors would be coded as being involved in an academic lesson. Conversation was defined as talk that was not related to the on-going activity and had a sustained or focused topic. Talking that accompanied play, work, or a lesson was not coded as conversation. During any 30-second window, more than one activity could occur and could be coded. In this report we focus solely on variations by socio-economic status (SES) and gender in lessons and work. (Examples of lessons and work are provided in Appendix 1. It should be noted that we coded activities without necessarily trying to understand the meaning that the activity had for the children. A child may have seen helping an adult wash dishes as play, whereas we would code the child as being involved in work. However, when the focus of involvement changed, the coding would also change. Thus, if the child appeared to be more focused on producing more soap suds as opposed to cleaning dishes, the codes would reflect a change in focus from work to play.)

Results

Activities coded. A total of 3,584 observations were taken of these 20 preschoolers, 1,967 of the Holden group (11 children) and 1,617 of the Summit group (nine children). Because we coded all activities that occurred in the child's immediate vicinity (irrespective of the child's involvement) and because during the 30-second period a child could change activities, a total of 5,799 activities were coded, 2,676 for the Summit group and 3,123 for the Holden group. However, some of the observations took place while the children were sleeping (98 for the Summit group, 212 for the Holden group), and the activities taking place at those times (a total of 304, not including sleep as an activity) were clearly not available to the children. This left 5,185 activities that were potentially available to the children, 2,453 for the Summit group (47% of the total)

and 2,732 (53%) for the Holden group. Because both groups featured one more girl than boy, the proportion of observations on girls was somewhat higher in both communities (55:45).

Activities—availability and involvement. Many activities occurred within easy ear- and eye-shot of the children, and were, therefore, potentially available to them, even if the children did not get involved in them. As can be seen in Figure 1, in both the Holden and Summit groups, play (including exploration and entertainment) was the most common activity occurring around these children, and lessons the least common activity. These data also reveal that conversation and lessons were more likely to be going on around the Holden children, work and play more likely to be going on around the Summit children.

Focusing solely on activities in which children were involved, play was also the activity in which children in both groups were most likely to be involved, but lessons, work, and conversation were approximately equal in terms of involvement (see Figure 2).

Lessons. Lessons were available 279 times and the child was involved in 232 of them, either as an active participant or careful observer. As is seen in Figure 3, the Holden children engaged overall in more lessons than their Summit counterparts, particularly with regard to academic lessons (lessons about reading, numbers, colors, etc.) and skill/nature lessons (learning skills, such as tying shoes, or learning about the workings of nature). The other types of lessons were more evenly distributed. (It is also interesting to note that the Holden children were far more likely to play with academic objects—looking at books, or playing games with explicitly academic purposes.)

The Summit boys and girls were involved in lessons in the proportions expected, given the greater proportion of observations of girls. In the Holden group, however, boys were proportionally and actually more likely to be involved in lessons than girls. As Figure 4 shows, the predominant type of lesson in which the Summit children were involved was interpersonal (58% of their lessons), whereas the Holden children's lessons were more evenly divided. In both groups, however, boys were more likely to be involved in academic lessons than girls, whereas the opposite was true of interpersonal lessons.

As displayed in Figure 5, people other than the child were most likely to initiate the lessons—but the Holden children were far more likely to initiate (that is, to ask how something is done, how to spell a word, and so on) than those from the Summit community. More striking, however, was the fact that, irrespective of who initiated the lesson, the Holden children were far more likely to involve themselves in it (asking why something happened, how something works) than the Summit children (see Figure 6). The Summit children were more likely to be involved because someone else had ensured that they would—providing information unasked, or telling the child how to behave. In both communities, the mother was the person most commonly participating in lessons with the child (Putnam, Tudge, & Sidden, 1993).

Work. We were also interested in the different types of work that children engaged in, particularly in terms of the extent to which technology was involved. Some work (putting away clothes) need involve no technology, other work (sweeping with a broom, "helping" mend the family car) uses technology. In addition, some technological devices are modified explicitly for a child—a small broom for the child to use while the adult uses a large one.

As is clear from Figure 7, Holden children were more likely to be involved in work that used no technology, whereas Summit children were somewhat more likely to be involved in work with adult technology.

Summit girls and boys were involved in work proportionally about as often as expected (given the fact that girls were more often observed), and the types of work in which they were involved were almost identical. Holden children clearly differed by gender, however, with boys involved proportionally more than girls. If a Holden child was involved in work with some technology, moreover, that child was highly likely to be a boy.

As was clear from Figure 1, work often was going on when children did not get involved. However, although in both communities someone other than the child was most likely to initiate it, when children were involved the Holden children were more likely than their Summit counterparts to have initiated it (see Figure 8). So although someone other than the child was most likely to initiate the work in which the children were involved, to a great extent it was the children who involved themselves in the work once it was underway (see Figure 9). In both groups this was true for more than 3/4 of the observations of children engaged in work—in 81% of the cases for the Holden group, and 79% for the Summit group. Summit girls and Holden boys were most likely to get themselves involved in the work.

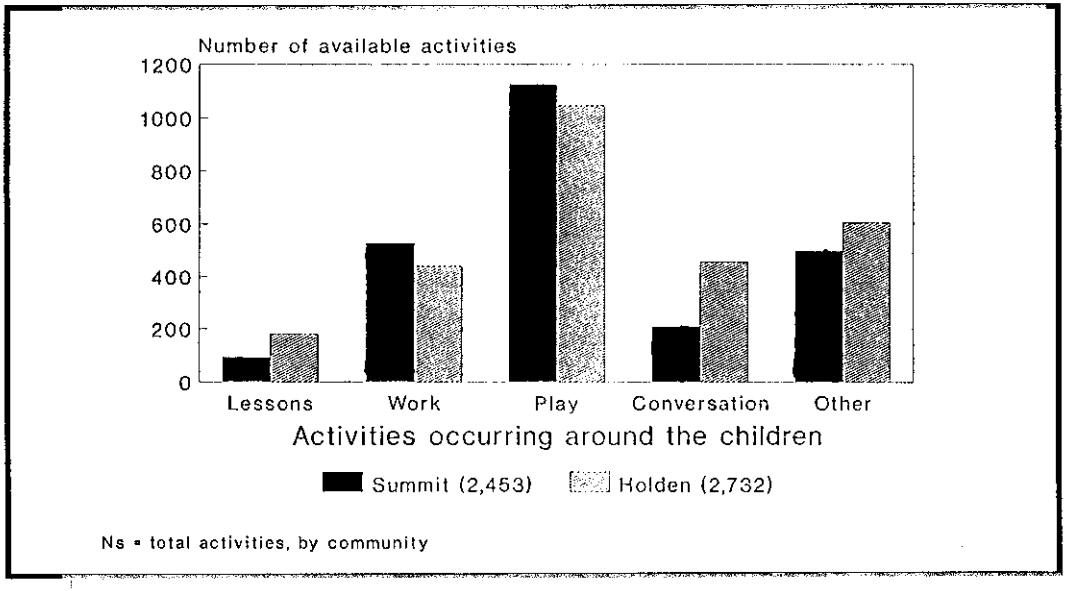

Figure 1. Availability of activities: By community

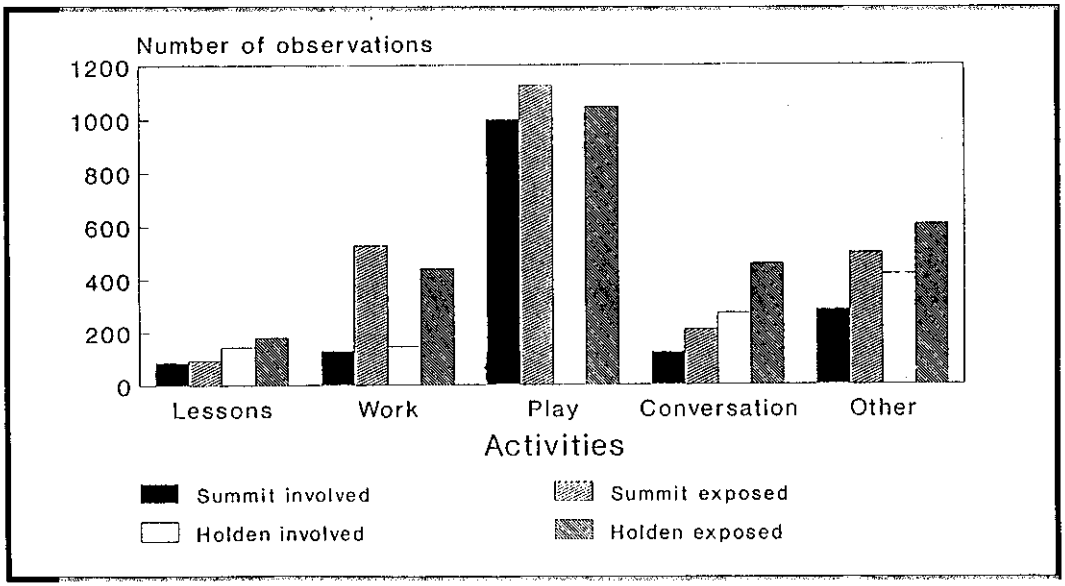

Figure 2. Activities: By exposure, involvement, & community

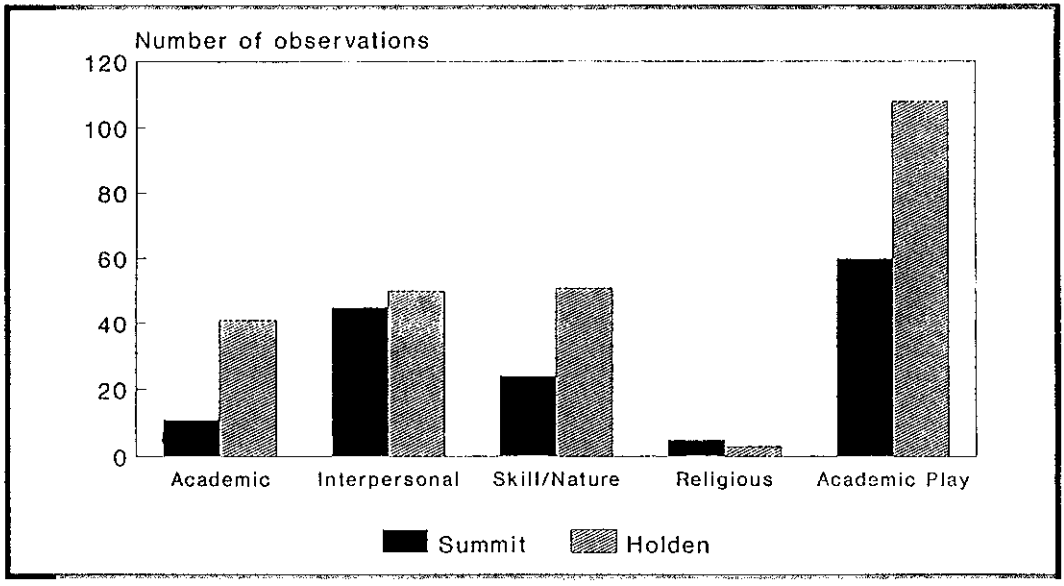

Figure 3. Lessons and academic play: By community

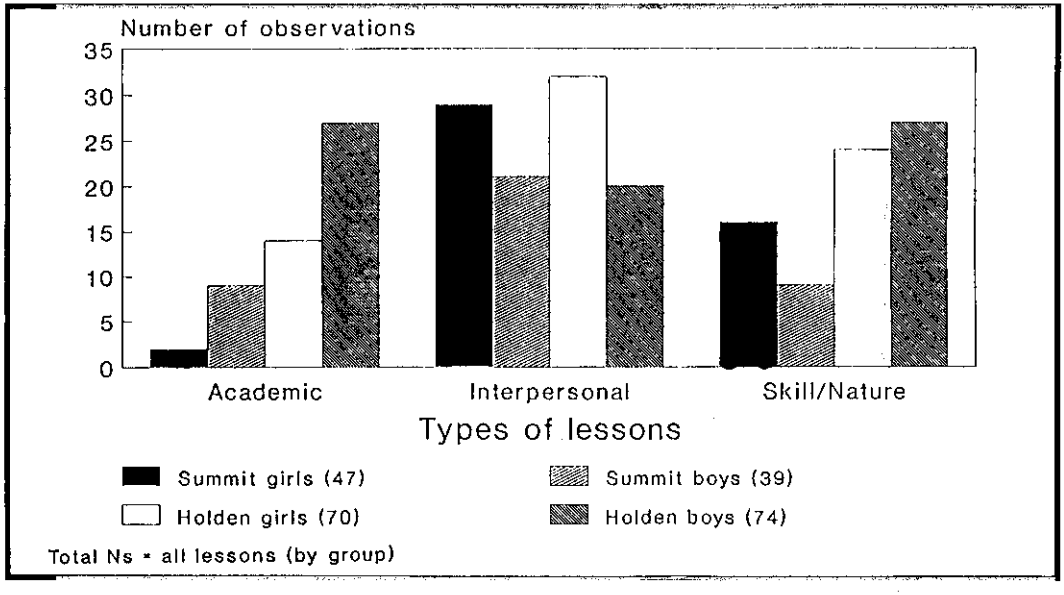

Figure 4. Lessons: By community and gender

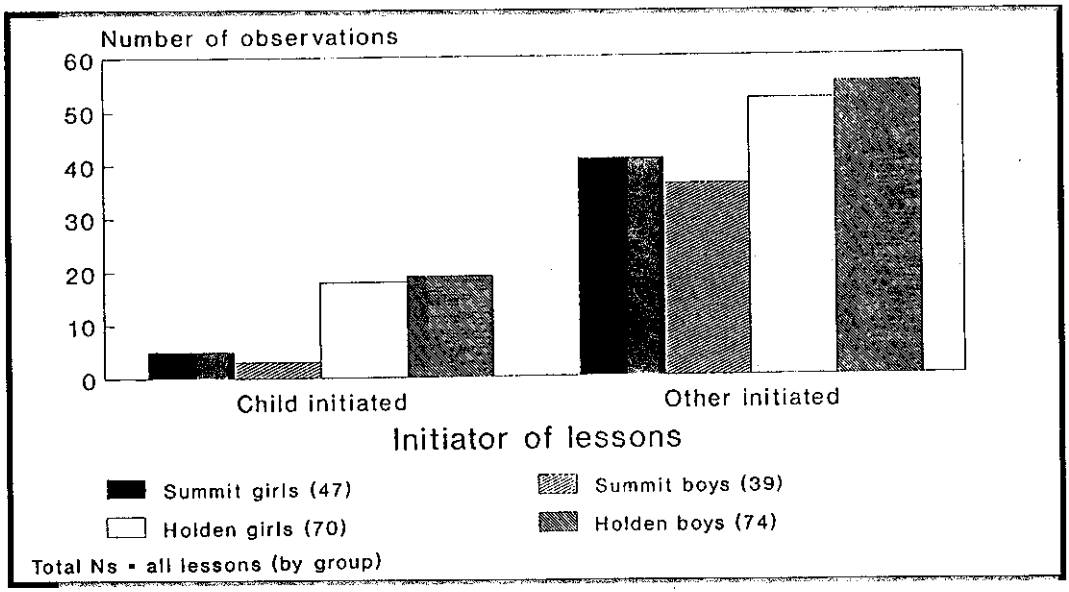

Figure 5. Who initiated the lessons? By community and gender

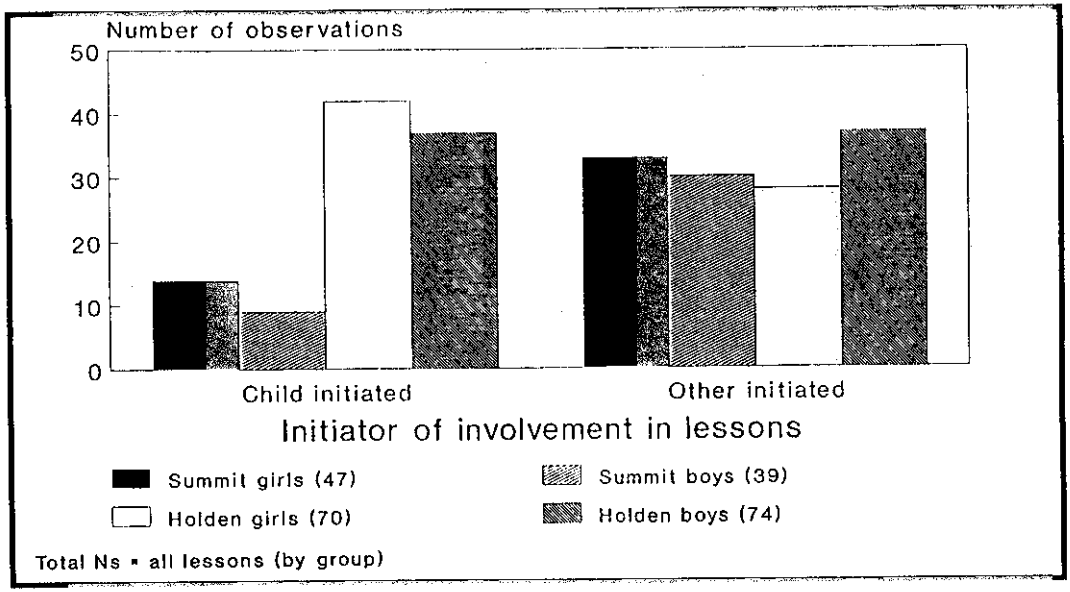

Figure 6. Who initiated involvement? By community and gender

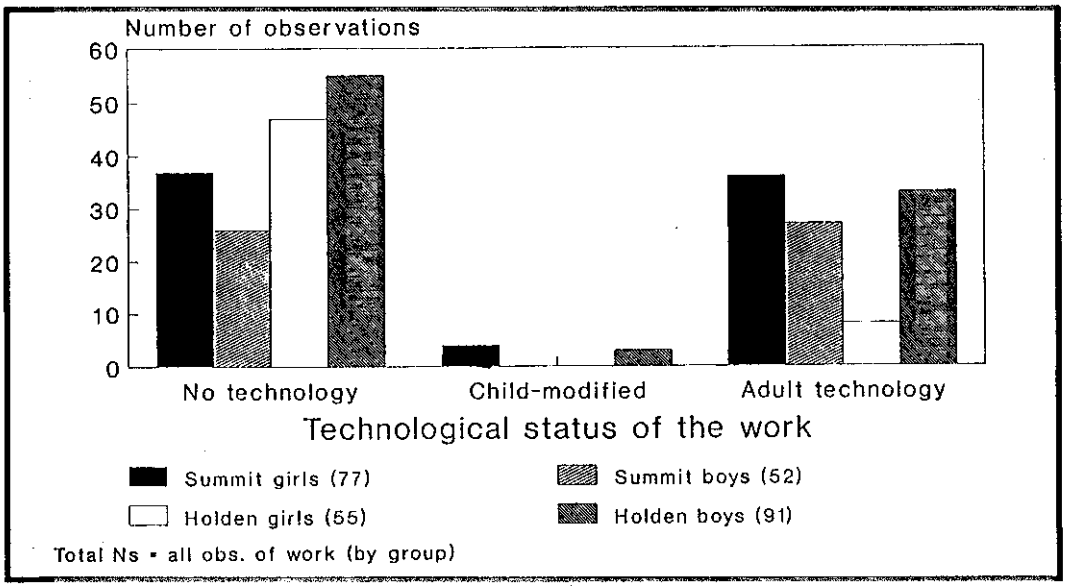

Figure 7. Involvement in work: By community

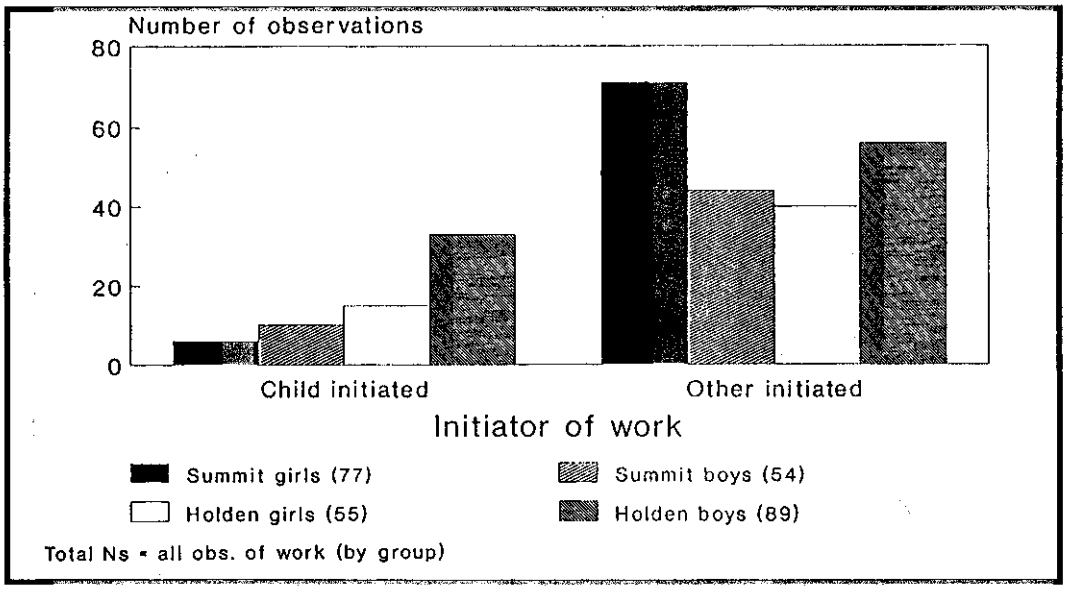

Figure 8. Who initiated the work? By community and gender

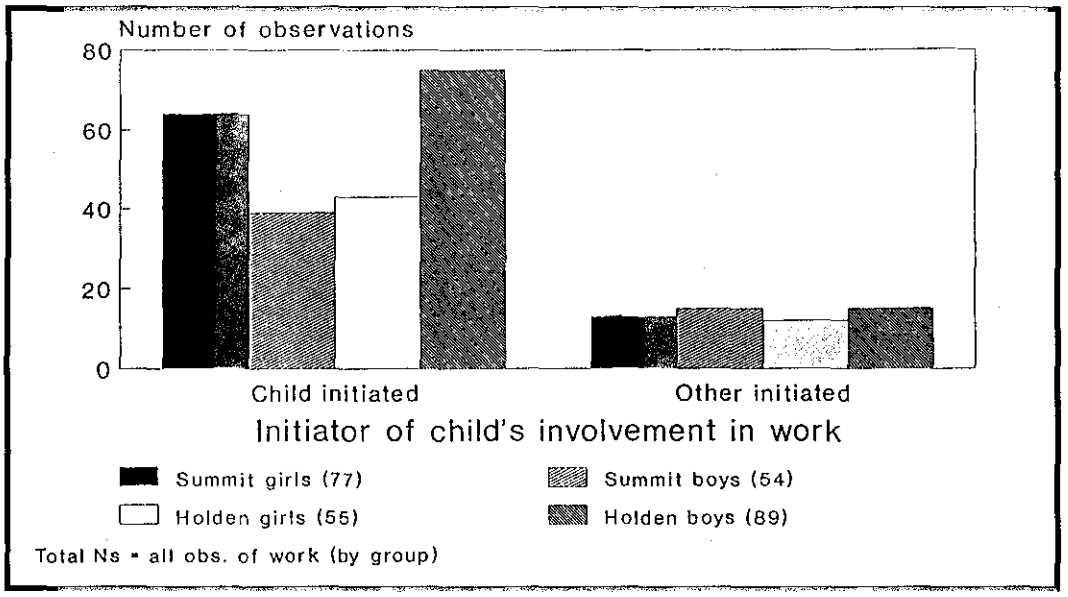

Figure 9. Who initiated involvement? By community and gender.

Discussion

As Bronfenbrenner (1979; Bronfenbrenner & Crouter, 1983) and others have argued, it is important when dealing with social and cultural variations both within and across societies to move away from "social address" models to "person-process-context" models. A social address model is one which simply seeks to demonstrate that two social groups (for example, racial or socio- economic) differ along some dimension. A model emphasizing process is one that seeks to explore the mechanisms which might account for those differences, focusing on what it is that members of two or more groups do or believe that might account for different developmental outcomes. Processes of development, as they occur in different cultural, historical, and social contexts, lie at the heart of Vygotskian theory.

From a Vygotskian perspective, children learn to make sense of their world in the course of the activities in which they engage, particularly with more competent social partners. Cross-cultural scholars have highlighted the fact that the activities in which adults engage and the activities in which they encourage their young to engage differ markedly in different cultural communities. The data presented here indicate that the social worlds inhabited and types of activities engaged in differ quite markedly in two groups from the same society and from the same city. Within-society differences related to factors of income, occupation, and education are unlikely to prove as drastic as those found in cross-cultural studies; nevertheless, they are likely to be significant in the lives of the children who experience them.

Kohn (1977, 1979) has argued that parents from different social classes try to inculcate somewhat different characteristics in their children, and that these differences both stem from and serve to re-create the social class system. He argued that parents whose occupations require a good deal of initiative and self-direction are likely to value self-direction, self-control, and initiative in their children. By contrast, parents whose occupations involve more close supervision by others are likely to value conformity to external authority, obedience, and good behavior on the part of their children. Although Kohn's position has been supported by a wealth of self-report and questionnaire data from parents, there is surprisingly little data on parental behavior (Luster, Rhoades, & Haas, 1989).

These data indicate that children from the two communities were involved in rather strikingly different types of activities. Those from the Holden community were twice as likely to be exposed to lessons and conversation than their Summit counterparts. Similarly, they were much more involved in these activities. The differences between the two groups were most striking in terms of academic lessons, skill/nature lessons (learning about how things work and the workings of the natural world), and academic play, with the Holden children more in-

volved than the Summit children. By contrast, the greatest proportion of the lessons in which the Summit group was involved were interpersonal lessons—that is, lessons dealing with good behavior toward other people. (It is worth noting that across the two communities girls were more likely than boys to be involved in interpersonal lessons.)

Yet more striking is the fact that the children from the Holden community were far more likely than those from the Summit community both to initiate lessons and initiate their own involvement in these lessons. That is, they were more likely to ensure that a lesson occurred, by asking a question, asking for help, and so on, rather than being drawn into a lesson by someone else. These data, which clearly suggest that these children are accustomed to some degree of self-direction before they are four years of age, appear to support Kohn's thesis that professional parents set goals for their children of independence, self-control, and control over their environments. The fact that interpersonal lessons were more important for girls than boys, and more important for Summit boys than for their Holden counterparts, also supports Kohn's thesis that parents in non-professional occupations may place a higher value on obedience and manners.

As Vygotskian scholars have argued, different cultural communities do indeed arrange different types of activities for their young, and encourage them in different ways and to different extents to participate in them. It is in the course of these everyday routine activities that children come to make sense of their socio-cultural worlds, and learn ways of thinking and behaving that are considered appropriate in their communities.

Note

[1]Extended version of a poster presented at the 1st Conference for Socio-Cultural Research, Madrid, 18 September 1992. Preparation of this paper was facilitated by the award to the first author of a National Academy of Education Spencer Fellowship, by a research grant to the first author from the Human Environmental Sciences Foundation, University of North Carolina at Greensboro, and by the award of a Carolina Consortium on Human Development Predoctoral Fellowship to the second author. The authors would like to express their great appreciation to the children and families who gave so generously of their time, and to Cathe Lawrence and Soeun Lee for their painstaking data entry and checking. We would also like to thank the two anonymous reviewers for their helpful comments. The coding scheme used in this research was developed by the authors in collaboration with Barbara Rogoff (formerly, University of Utah, currently University of California, Santa Cruz) and Gilda Morelli (Boston College), whose role in this activity we gratefully acknowledge.

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Appendix 1

The following transcripts provide a sense of the richness of the cultural surround which is muted by reliance solely on codes, and clarify how the activity codes were defined. Numbers in parentheses indicate the duration of the action. Examples are from the Holden community.

Skill/Nature Lesson

The participant (P) is a 28-month-old male. He is in the den with his mother, infant sister, and a family dog (a dachsund).
5:13 p.m. M is seating three-month old baby sister, propped up by cushions, in the corner of the couch. She is telling participant that he needs to wash his hands before supper.

M: (0:08:10) Let's go wash your hands, Boos.

P: Uh-uh.

M: You've got to have clean hands to eat. Plus the fact that you don't need to be handling baby all over

P: Want that. (He points to the dog.)

M: with school hands. [Not a lesson; no curriculum.]

P: Want that, Momma.

M: What is what? (She looks in the direction he is pointing.)

P: I want that.

M: Picture?

P: Want that.

M: What, tha... what they have? Oh, they have bones. But don't try and take them, sweetie. Don't ever try and take the dogs' bones. They

P: Want these. Want these..

M: I know. That's Sabrina's [the dachsund]. She might bite. [Lesson; curriculum clear: It is in the nature of the dog to bite you if you try to take her bone.] Okay? Let's go wash your hands. (0:08:53) .....

(0:10:30) (P sees dog with bone and goes over to the dog, bending down and reaching to pick up the bone.)

M: Uh-huh-un-un-un. (P steps back away from the dog and backs toward M.) Come here. (M places her hands on his back.) Oh! You scare me to death. (M puts her hands on his shoulder and arm, turning him toward her and leaning over so he can see her face.) No! Never touch the puppy with her bone.

P: Noooo. Ohhhh. (He pulls away from her, holding his shoulder.)

M: (M shakes her index finger at him.) Do you hear me? She will bite you. [Lesson; curriculum clear.] (0:10:44)

Interpersonal Lesson: ["Say please" or "Say thank you" do not require curricula.]

5:25 p.m. Same participant as above. He is with his grandmother in a bedroom. They have been playing a game in which he slaps her open palm. She then makes a fist. He tries to pry her hand open with both his hands. When unsuccessful, he whines.

GM: (0:20:46) Say please. [Lesson: You should say "please" when you want someone to do something.]

P: Please. (She opens her hand. He slaps her open palm gleefully.)

GM: Magic.

P: (He slaps her palm.) Eeeees. (0:20:56)

Academic Lesson

Participant is a 45-month-old female. She is in the home of an aunt, who is having a birthday party. The house is full of adults and children of all ages. Participant's older sister is keeping three younger children occupied in an out-of-the-way place.

5:09 p.m. P, her 15-year-old sister (Z), and two cousins (a male and a female) are sitting on the stairs, drawing on paper P's older sister is holding on her lap. (0:04:32)

Z: (To P.) Write your name.

Boy: Look at my car.

Z: Wow. That's very good, Amos.

Boy: (To P.) You didn't write your name.
(P hesitates, looking at Z.)

Z: Okay, I'll write. (To boy.) Can you write your name?

P: I can write my name. I..I can do it. I want to give you a L.

Z: I'll show you. This is a K. This is an A. Then a T, and this is a Y. And you both have an A. A for Ann and A for Amos. [Lesson: How to write your name and identify letters.] (0:05:13)

Work (and child-initiated skill/nature lesson)

Participant is a 41-month-old female. She is in the kitchen at home with her mother, making banana muffins. 5:03 p.m. She is standing on a chair so that she can reach the bowl on the counter. Mother has part of her attention on the TV and is putting ingredients into the bowl for P to mix with a spoon.

M: (0:06:41) (M is spraying non-stick coating on muffin tins. P watches her briefly, then turns back to stirring the bananas.) Mash 'em up, hon.

P: I am. [Child engaged in work.]
(M comes over to counter and looks into the bowl.)

P: I need a little spoon.

M: Huh-uh, you need a big spoon. (M takes the spoon out of P's hand.) Let me have it just for a second. (M stirs briskly as P watches closely.) [Child observing work.]

P: I.. I'll crack the egg.

M: No, you're not allowed to crack the egg. I'll crack the egg, and you can mix.

P: Okay. I want a muffin.

M: You want a muffin? (M uses flat back of spoon to press lumps against the side of the bowl.)

P: Why you do that?

M: I'm mashing it up so it will go in the muffins. [Both work and child-initiated lesson available.] (0:7:38)

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