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ABSTRACT

In order to directly relate research on children's thinking to curriculum development in the social studies, this study approximates the conditions and substances of daily classroom life and examines the levels of abstraction in children's thinking about complex social problems. The subjects include 210 boys and girls in equal numbers in grades one through seven. The students interpret four magazine photographs depicting scenes of war, poverty, old age, and destruction. The results indicate that there is a direct relationship between levels of abstraction inferred from children's explanations of social problems and the age levels of the children. These levels of abstraction and age correspond to Piaget's stages of cognitive development. There is no significant effect of sex on the level of abstraction, however, the abstraction levels differ according to the pictures. Results of this research imply a logic of curriculum development in both content and sequence which is not sufficiently applied at this time. (Author/DE)

THE DEVELOPMENT OF LEVELS OF ABSTRACTION IN CHILDREN'S THINKING ABOUT COMPLEX SOCIAL PROBLEMS

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Need for the Study

In the decade of the sixties, social studies curriculum reflected the major impact of the "structure of the disciplines" movement. Although this movement sharpened the intellectual parameters of the social sciences, bringing into focus valid constructs and attendant methodology, it often served to obscure an equally important component in curriculum development, i.e., the nature of the learner as well as the nature of the processes of learning. In fact, the emphasis on the structure of academic disciplines emanated from university scholars and harkened back to such traditional derivations for curriculum as "what do the wise men in society deem proper for the young to know?"

While this work in curriculum reform was in progress, research on the nature of the learner at particular stages of his development was also bursting forth, primarily in the work of Piaget, and extended and supported by researchers throughout the world. Little in those years came forth on the development of thinking about complex human problems. Experimentation was located in substantive areas in which control of variables could be tighter, and laboratory methods employed. Such research as there was dealt with isolated and particularized concepts related to human problems, e.g., the development of economic concepts explored by Sutton and Danziger, religious concepts, by Elkind, country and nationality, flag, and identity, by Jahoda, and Weinstein, justice, by Durkin, kinship, by Danziger, homeland, by Piaget and Weil.

In recent years work has been gathering momentum in the area of political concepts and attendant awareness (Easten, Hess and Torney, Greenstein, Connell, Coles, Adelson) and, of course, Kohlberg's impressive body of work on moral development is being extended and critiqued by such researchers as Selman, Rest, Turiel, and Kurtines and Grief. There seemed to this investigagor, in order to directly relate research on children's thinking to curriculum development in social studies, a need for study approximating both the conditions and substance of daily classroom life.

The Problem

With these concerns in mind, the author undertook an exploratory study which addressed itself to the following questions: Are there

discrete levels of abstraction which can be inferred from children's explanations of social problems? If so, can they be measured? How? Do they vary as a function of age? What are characteristics of these levels of abstraction? How do they change from one level to the next? Do they vary as a function of sex? Of task? How might these levels of abstraction correspond to those established by Piaget?

Definitions

In this study levels of abstraction is defined as follows: A qualitative change in organizational characteristics moving from simple to complex; and social problems refers specifically to conditions of poverty, war, old age, and destruction of land and people by natural or man-made means. These complex problems of human existence have been and remain central concerns of governments and are continually examined by public agencies and institutions as well as by the mass media.

Hypotheses

The hypotheses which generated this research are:

1. There is a direct relationship between the levels of abstraction inferred from children's explanations of social problems and the age levels of the children making the explanations.

2. These relationships will correspond to the levels postulated by Piaget in his work on Math and Science.

Research Procedures

The study was conducted in six public elementary and junior high schools in two suburbs of New York City. The subjects included 210 boys and girls in equal numbers in grades one through seven spanning the ages of $6\frac{1}{2}$ - $13\frac{1}{2}$. The age span was intended to cover the major stages of cognitive development as postulated by Piaget. The children were middle class, Caucasian, and in the normal I.Q. range (90-115).

The instrument for the study consisted of four magazine photographs depicting scenes of (A) war, (B) poverty, (C) old age, and (D) destruction. The pictures had to be clear enough to elicit responses from the six year olds and yet challenging enough to capture the interest of the thirteen year olds. In addition they had to be as neutral as possible in relation to such emotionally charged factors as violence, sex, and race.

During a pre-pilot and then a formal pilot study, four photographs, (scenes of war, poverty, old age, destruction) were shown by this investigator to each child individually in a small room other than the classroom. Responses were taped, transcribed, and scored by the investigator.

The interview began with simple introductions.

I'm interested in the things children tell about pictures. I'm going to show you a group of pictures and I'd like you to tell me about what's happening in each picture. There are no right or wrong ideas. Each child tells something different. What can you tell me about these pictures? Here's the first one...

Follow-up questions:
When something is unclear: what do you mean by that?
When something is undeveloped: can you tell me more? Or what else can you tell me? Or you said...(mention the specific word or phrase that was spoken); Can you tell me more about that?

At the end: Anything else?
At the end of the interview: Thank you very much.

Picture 1 shows a mother sitting on a chair with a baby on her lap and a boy of eleven or twelve standing nearby. They are in the kitchen area of a broken-down shack. Boards are missing in the wall, a few dishes and rags lie on bare shelves, a black pot stands on an old and greasy stove. A cat, dog, and a chicken are in the room. The woman looks worn out. The boy, in ragged clothes, looks unhealthy; his head is shaven and his stomach seems swollen. They are all barefooted.

Picture 2 shows three soldiers sitting in a wooded area. One, wearing his helmet, reads from a small book. Another is holding the third in his arms and seems to be comforting him.

Picture 3 shows four old men, probably in their eighties, two perhaps in their sixties, whittling, on benches outside of a stately looking building, white-columned and landscaped. They are talking together in what seems to be a pleasant fashion. Their light clothing suggests either warm weather or climate.

Picture 4 shows a city destroyed - shells of buildings, rubble. A boy walking down stairs into the city with a knapsack on his back is the only person in the picture.

The Problem of Measurement

The first problem, that of measurement, was dealt with in the pilot study, in which measurable indicators of abstraction levels were developed. The pilot study had been conducted to develop and refine coding and scoring procedures. In order to describe, classify, and order children's explanations of social problems into levels of abstraction, it was first necessary to establish the characteristics of those levels. The problem, then, was to translate theoretical dimensions into operational definitions for the purposes of measurement. In order to do this, the data was examined for evidences of similarities and differences. From these responses the following indicators of three distinct levels were found to be meaningful.

1. Disconnected. The picture is described by the subject as a set of disparate items. No context or theme is presented. No relationships are made to social problems.

Transitional (1)

2. Connected. The items or attributes in the picture are placed by the subject within the context of a social situation, i.e., they are organized into a categorial reference, which may or may not be seen as a problem. The situation is taken as absolute, i.e., not related to any other situation or subsumed under a universal category.

Transitional (2)

3. Thematic. The items or attributes in the picture are organized into a social context or situation which is related to a universal problem or theme. Multi-causality may be introduced by articulating various causes and/or consequences. Hypothetical statements may be used.

Each of the responses was examined as a whole and assigned a score ranging from the numeral one through five, numerals two and four indicating transitional responses between clearly defined levels of abstraction.

The pilot study served to establish reliability. A sample of sixty out of 240 responses, twenty from each of the three age groups, was randomly selected and scored by the investigator and by two independent judges. Responses were coded to mask age or sex of child. The co-efficient of interscorer reliability as determined by the Product Moment correlation was .75.

Construct validity was established on the basis of the pilot study. Essentially, this answers the question of whether the dependent variable, level of abstraction, was capable of measurement.

Treatment of the Data

1) After each of the 840 responses was scored, frequency distributions and percentages were obtained for the five levels of abstraction on four tasks for each of the seven age groups.

A three way analysis of variance and trend analysis was then done for the factors of age, sex and task. The main effects of the analysis examined whether there are differences among age groups regardless of sex or task, between sexes regardless of age or task, or among tasks regardless of age or sex.

As a test of the hypothesis the shape of the age group curve was examined by means of a trend analysis to investigate whether there is a significant monotonic relationship between age level and level of abstraction.

The subsidiary questions of sex and task were also examined. The sex by age group interaction examined difference between the mean scores of the age groups as a function of the sex of the subjects.

The task by sex by age interaction examined the possibility that there were differences among mean scores of age group as a function of task and sex of the subjects.

2) The data were examined for homogeneity of responses for each subject and analyzed for the nature of the levels of abstraction in each subject's four responses.

3) The data were further analyzed for correspondence to the relationships postulated by Piaget between age and level of abstraction.

Findings

Effects of Age on Level of Abstraction

The first hypothesis states that there is a direct relationship between the levels of abstraction inferred from children's explanantions of social problems and the age levels of the children. Table 1 indicates that the relationship between age level and the level of abstraction attained on the experimental task yielded a significant F of 60.81 ($p < .01$). A further analysis of this relationship yielded a significant linear trend ($F = 178.00$; $p < .01$). It should be noted that the strength of this linear relationship between age and level of abstraction is indexed by the epsilon[1] (E) of .64. The first hypothesis is therefore supported.

It might also be noted that there is no significant quadratic trend, suggesting that no asymptote is reached within the span of age levels investigated.

The direct relationship between age and level of abstraction is depicted graphically in Figure 1. In addition, Table 2 presents the means and standard deviations for each of the seven age groups on each of the four tasks, and over age groups and tasks.

It will be noted in Table 2 that the range in the levels of abstraction inferred from children's explanations of social problems is

[1] Epsilon is an estimate of the strength of the relationship between a dependent and an independent variable. Its magnitude may be interpreted in a similar way to the product moment r. However, it does not presume a linear relationship. The procedure for this is established in J. Cohen, "Some Statistical Issues in Psychological Research," in B.B. Wolman (ed.), Handbook of Clinical Psychology, p. 105.

TABLE 1

ANALYSIS OF VARIANCE OF INTERACTION BETWEEN AGE, SEX, AND TASK FOR 210 CHILDREN, AGES 6 YEARS 5 MONTHS TO 13 YEARS 4 MONTHS

Source of Variation	Sum of Squares	d.f.	Mean Square	F	
Age (A)	389.295	6	64.882	60.81**	.80
Linear Trend	380.000	2	190.000	178.00**	.64
Quadratic Trend	2.186	2	1.430	1.34	
Sex (S)	.429	1	.429	1.00	
A×S	11.357	6	1.892	1.77	
Subjects Within	209.140	196	1.067		
A×S (E_1)					
Tasks (T)	3131.404	3	10.467	33.02**	.37
T×A	14.767	18	.820	2.16**	
T×A×S	5.816	18	.323	.02	
Task: Subjects Within	186.352	588	.317		
A×S (E_2)					

** $p < .01$

TABLE 2

MEANS AND STANDARD DEVIATIONS OF LEVEL OF ABSTRACTION SCORES ON RESPONSES TO FOUR TASKS FOR SEVEN AGE GROUPS

Task		Age Groups 6.5 7.4	7.5 8.4	8.5 9.4	9.5 10.4	10.5 11.4	11.5 12.4	12.5 13.4	Over Age Groups
A	M	1.50	1.60	2.17	2.90	2.87	3.63	3.53	2.60
	SD	.68	.86	.91	.96	.43	.89	.78	1.13
B	M	2.00	2.47	2.53	3.20	3.27	3.53	3.60	2.94
	SD	.64	.73	.63	.48	.45	.73	.77	.85
C	M	1.63	1.57	2.33	2.53	2.90	3.30	3.42	2.53
	SD	.61	.68	.71	.73	.66	.84	.57	.97
D	M	1.83	2.27	2.57	3.17	3.30	3.60	3.93	2.95
	SD	.70	.78	.77	.53	.53	.81	.74	.99
Over Tasks	M	1.74	1.97	2.40	2.95	3.08	3.52	3.62	
	SD	.68	.85	.77	.74	.56	.82	.73	

between the mean score of 1.74 at ages six years and five months to seven years and four months, and to a mean score of 3.62 at ages twelve years and five months to thirteen years and four months. This is presented graphically in Figure 1.

Reference to Tables 3 and 4 indicates lower and upper age limits for each of the levels of abstraction and affords a more detailed view of what Jahoda calls the "effective range of responses" for each age group.

The age limit on the lower and upper ends for each of the five levels of abstraction are as follows:

1.	Disconnected:	6.5 - 7.4 (39%) lower
		9.5 - 10.4 (5%) upper
2.	Transitional (1) :	6.5 - 7.4 (48%) lower
		12.5 - 13.4 (3%) upper
3.	Connected :	6.5 - 7.4 (13%) lower
		no upper limit discernable.
4.	Transitional (2) :	8.5 - 9.4 (4%) lower
		no upper limit
5.	Thematic :	11.5 - 12.4 (11.5%) lower
		no upper limit

It seems clear that the age limits on the lower end for connected and transitional (1) thinking are not accurate and are bounded only by the ages of the sample population used in this study.

Effects of Sex on Level of Abstraction

It will be noted in Table 1 that there was no significant effect of sex on the level of abstraction attained on children's responses to pictures of social problems.

Effects of Task on Level of Abstraction

A comparison of the average levels of abstraction of the responses elicited by the four tasks used in the study yielded an F of 33.02,

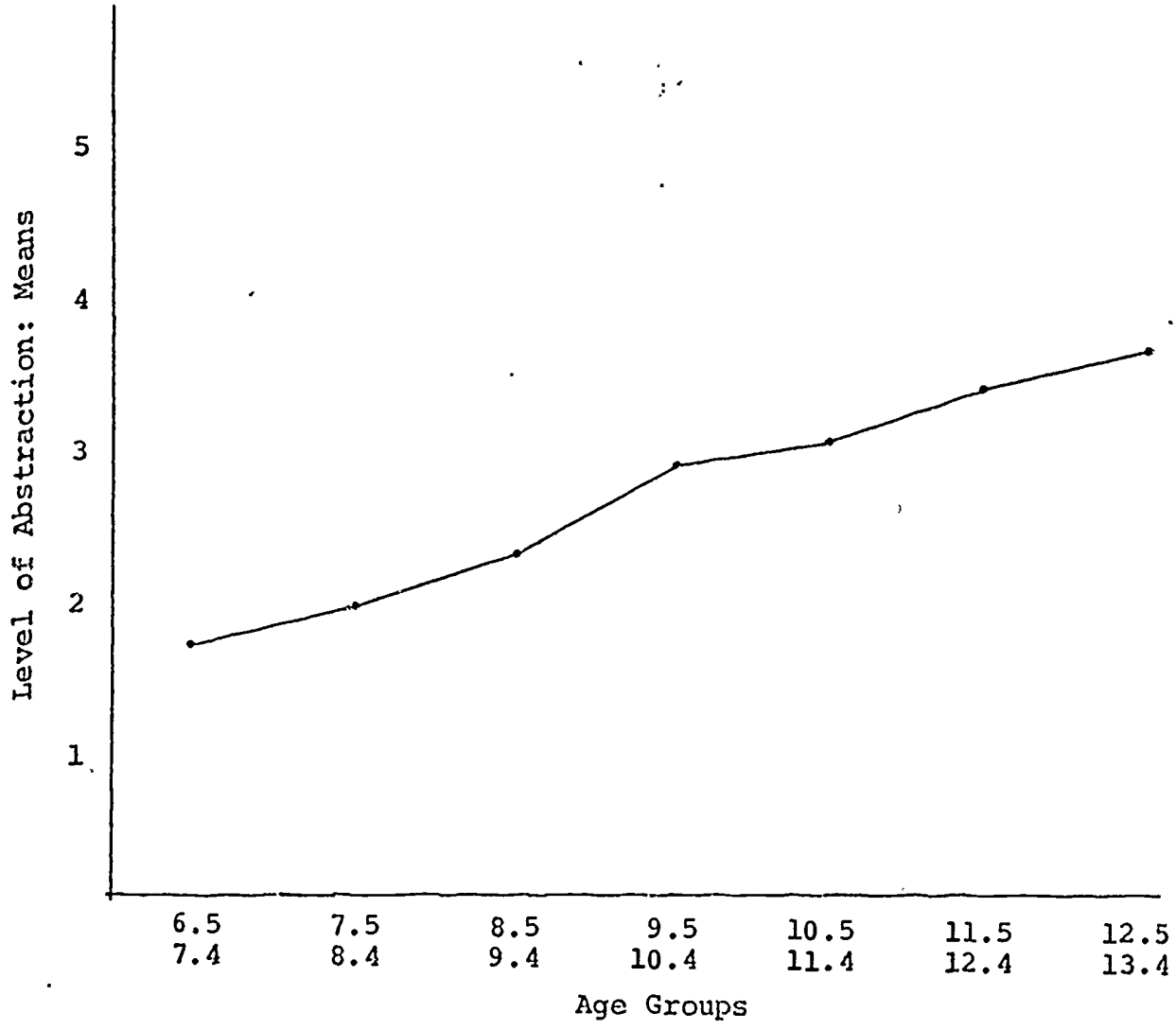

FIGURE 1

TREND OF THE RELATIONSHIP BETWEEN AGE AND LEVEL OF ABSTRACTION INFERRED FROM 210 CHILDREN'S RESPONSES TO FOUR EXPERIMENTAL TASKS

significant beyond the .01 level. This result suggests that, for whatever reasons, children's responses to different pictures of social problems reveal different levels of abstraction. Inspection of Table 2 indicates that the levels of abstraction associated with Tasks (pictures) 1 and 3 differ little from each other, and that those associated with Tasks 2 and 4 are almost identical, although Tasks 1 and 3 elicited responses of markedly lower levels of abstraction than those elicited by Tasks 2 and 4.

Effects of Task by Age on Level of Abstraction

The analysis of variance yielded an age by task interaction which proved to be significant ($F = 2.16$; $p < .01$ level). Apparently, this would indicate that the age groups responded differentially to the different social problems presumably depicted by the four pictures.

TABLE 3

FREQUENCY DISTRIBUTION OF RESPONSES FOR EACH OF THE FIVE LEVELS OF ABSTRACTION OVER FOUR TAKS FOR SEVEN AGE GROUPS

Age	Level of Abstraction				
	1	2	3	4	5
6.5 - 7.4	47	57	16	0	0
7.5 - 8.4	45	33	42	0	0
8.5 - 9.4	17	40	58	5	0
9.5 - 10.4	6	17	72	21	1
10.5 - 11.4	0	14	79	27	0
11.5 - 12.4	0	12	50	44	14
12.5 - 13.4	0	4	51	51	14
Total	115	177	368	148	29

Characteristics of the Levels of Abstraction.

It is clear from the analysis of the data presented in Table 1 that the nature of the specific task has a significant effect on the level

TABLE 4

PERCENTAGE OF RESPONSES FOR EACH OF THE FIVE LEVELS OF ABSTRACTION OVER FOUR TASKS FOR SEVEN AGE GROUPS

Age	Level of Abstraction				
	1	2	3	4	5
6.5 - 7.4	39	48	13	0	0
7.5 - 8.4	37.5	27.5	35	0	0
8.5 - 9.4	14	33	48	4	0
9.5 - 10.4	5	14.5	60	17.5	0
10.5 - 11.4	0	11.5	66.5	22.5	0
11.5 - 12.4	0	10	41.5	36.5	11
12.5 - 13.4	0	3	42.5	42.5	11
Total	14	21	44	18	3

of abstraction attained in children's explanations of social problems. Taking another vantage point, however, enables the data to be viewed somewhat differently. Examining the data for homogeneity of responses, shifts the emphasis from the task to the nature of the thinking process within each child. It becomes clear that within an individual different levels of abstraction, generally within a narrow range (of two adjacent levels) are possible simultaneously. Table 7 presents the distribution of homogeneity scores for each of the seven age groups.

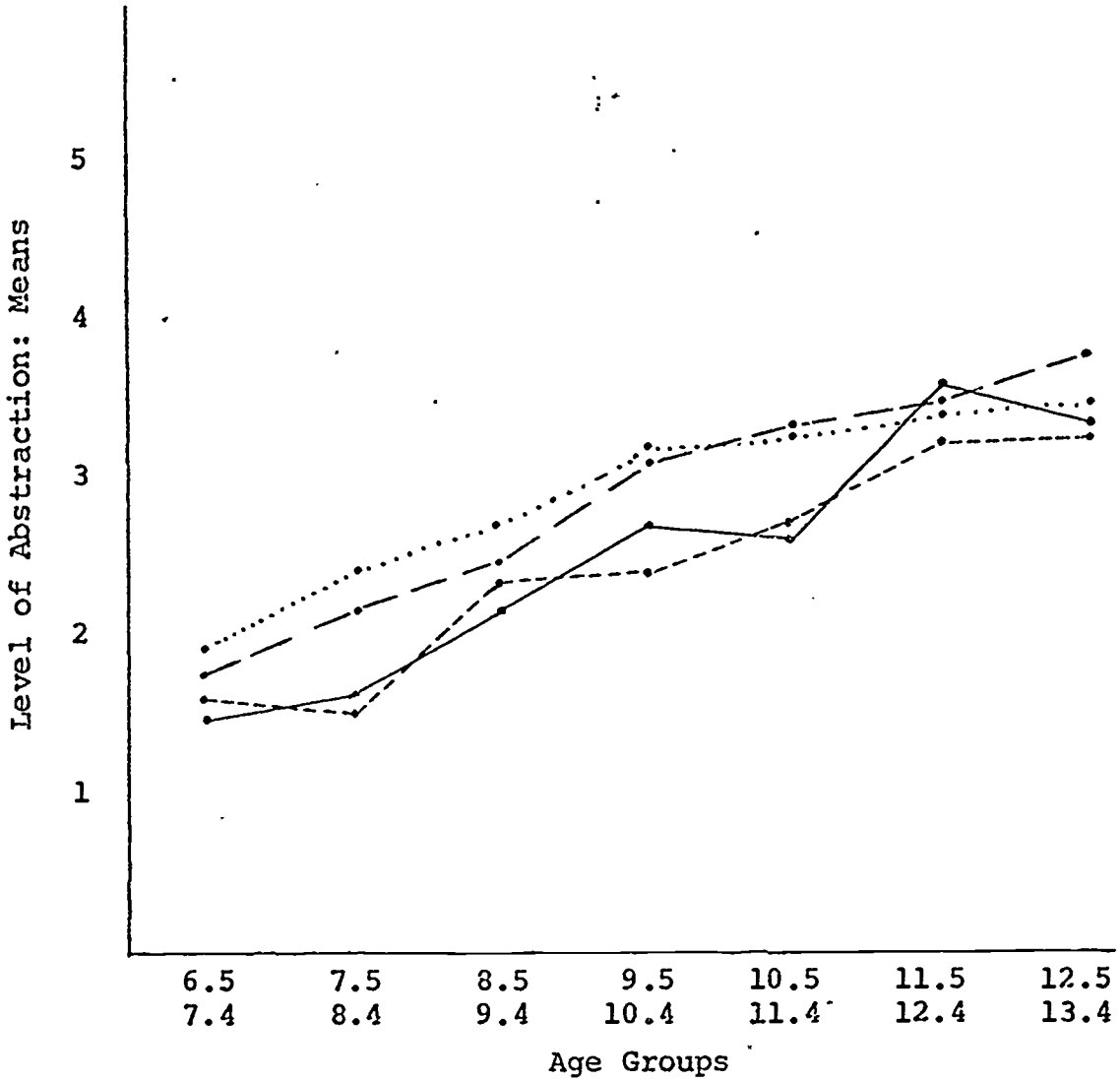

FIGURE 2

TRENDS OF RELATIONSHIPS BETWEEN AGE AND LEVEL OF ABSTRACTION FOR EACH OF FOUR EXPERIMENTAL TASKS

Task A _____

Task P ___ ____ ____

Task C ----------

Task D ....

FREQUENCY DISTRIBUTION OF HOMOGENEITY SCORES FOR SEVEN AGE GROUPS (210 CHILDREN) ON FOUR TASKS

Score*	6.5 7.4	7.5 8.4	8.5 9.4	9.5 10.4	10.5 11.4	11.5 12.4	12.5 13.4	Total	Percentage
A	5	1	8	6	5	2	4	31	15
B	12	12	14	11	17	17	9	92	44
C	7	11	2	8	4	6	13	51	24
D	6	6	6	4	4	5	4	35	17

*A = all four responses on the same level of abstraction
B = all but one response on the same level of abstraction
C = two responses on one level, two on another
D = more than two levels of abstraction in the four responses

Comparisons between the mean score for levels of abstraction inferred from children's responses to pictures and questions about social problems achieved by the seven age groups (over tasks) yielded significant differences between the ages of 8.5 to 9.4 and 9.5 to 10.4 ($t = 2.411$; $p < .010$), and the ages of 10.5 to 11.4 and 11.5 to 12.4 ($t = 2.095$; $p < .025$). What these findings suggest is that developmental shifts occur at these points. Tables 3 and 4 clarify these shifts.

Validity of Piaget's Stages

The second hypothesis states that the relationship between the levels of abstraction inferred from children's explanations of social problems and the chronological age of the children corresponds to the stages of cognitive development postulated by Jean Piaget.

This hypothesis is supported. There are five distinct levels of abstraction found in the responses to the tasks in this study. They occur in invariant sequence from the simplest to the most complex. Reference to Tables 3 and 4 indicates the absence of any responses on the Transitional (2), or Thematic (No. 5) levels before the ages of 8.5 to 9.4.

On the other end the simplest kind of thinking disappears after the ages of 9.5 to 10.4. By the ages of 12.5 to 13.4 there are only a few transitional (1) responses occuring. The highest incidence of connected responses occurs between the ages of 9.5 and 11.4.

Piaget postulates that before the ages of approximately seven to eight, children are pre-logical or intuitive in their thinking. Although the mean scores (see Table 2) indicate that connected thinking is not attained before the age of 9.5, Table 4 indicates that more than half of the children have attained the level of connected thinking by the age of 8.5 and 9.4.

Piaget states that the onset of formal thinking occurs between the ages of twelve and fourteen. This is confirmed by the findings in this study. Because the mean scores in Table 4 might be somewhat misleading, reference to the percentages of responses on each level for specific age groups may be helpful. By the ages of 11.5 to 13.4, approximately half of the children have attained the level of beginning thematic thinking.

Discussion

Measurement

The measurement of levels of abstraction in this study was based on children's explanations of complex social issues. Using this type of content rather than singular units such as kinship terms or patriotic symbols encounters particular problems.

The first problem was in distinguishing one level of abstraction from its adjacent level. This occurred when a response was weak or unclear. This might be solved by following up the initial open-ended question with systematic probing or by increasing the number of scoring levels.*

The second problem concerned the relationship of thought and language. In picture 2 on war, the words "army," "soldier," and "war" are words which children learn at early ages through T.V. and toys. It is hard to know what understanding children have of the terms they use. Does being in the army mean anything more than wearing an army uniform and carrying a gun? Does it mean killing the "bad guys?" Does any notion of the

* This is a common problem in studies using holistic data. See Kurtines and Grief, 1974.

discipline, the regimentation, the obedience to authority, the single-mindedness of goals, the need to kill, really enter the child's mind in the primary years of childhood?

This issue of the difference between thought and language is a major one in the area of child development and needs further study.

Age

The range of mean abstraction scores for children from approximately six and a half to thirteen and a half years of age seemed somewhat narrow in comparison to findings in studies on cognitive development in natural science and mathematics. This narrowness of range in scores, taken together with the age limits for levels of abstraction indicates that the span of ages of the sample population was not sufficiently wide to adequately measure the full range of children's thinking.

The rate of attainment of both the connected and the thematic levels of abstraction in this study was slower than it has been found to be in the content areas of science and mathematics. (Sigel, pp. 214-24). A comparison between these substantive areas in rate of accession to stages in cognitive development needs further investigation. Is this a function of formal education? Is the teaching of social science poor in comparison to the teaching of natural science and mathematics?* Or are the possible differences in abstraction levels related to the inherent differences in complexity of the material?

Sex

There were no significant differences in findings regarding the effect of sex on children's responses to the tasks. This accords with results of other research studies on cognitive development in the social sciences. (Kagan, pp. 156-60).

Task

In this study the specific task had a significant influence on the level of abstraction. This confirms findings from other studies as well as from Piaget's own work.

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* It has been the observation of the writer as well as that of many others who supervise student-teachers in large city and suburban public elementary schools that social studies seems most neglected in the curriculum, and that even when there is evidence of some program in this area, it is often limited to reading a textbook, doing simple map work, and doing projects which have more crafts value than social science value.

The similarity in scores between pictures 1 (poverty) and 3 (old age) and pictures 2 (war) and 4 (destruction) points to questions about the relationship between the nature of the stimulus and the response. In this study the stimuli were very much the same in form, all pictures, and similar in content, global social scenes. But even within these similarities a sharp difference emerged which can be a helpful way in which to view such stimuli.

The pictures of poverty and old age, both rich in explicit detail, leaving little to the imagination, elicited responses which were weighted to the simpler forms of thinking. The pictures of war and destruction, nebulous in detail, but quite clear in terms of a global situation, seemed to nurture the thinking process in the direction of abstraction. Both types of stimuli are important. The growing child needs information on which to act; he also needs open-ended situations which challenge and stimulate his potential for creative and abstract thinking.

A further question about the specific content of the pictures in relation to children's interests and needs is necessary. Do the higher levels of thinking which emerge in response to the pictures of war and destruction reflect children's aggressive needs? It is true that young children become familiar with these matters via the popular culture, e.g., toys, comic books, and television. Whether the popular culture stimulates these interests and nurtures these tendencies, or merely responds to needs and interests is a long-standing controversy.

Characteristics of Levels of Abstraction: Shift

Two points of significant change or shift from one level of abstraction to another were revealed in the analysis of the data. The first occurred between the ages of 8.5 and 10.4. During this time, between 3rd and 4th grades, there is a distinct change in the quality of children's thinking. They move from compiling data, from observing and dealing with phenomena on the basis of single attributes, from making simple connections between two factors, from centering on details instead of a context, to classifying on the basis of multiple attributes, to ordering attributes hierarchically, to holding central properties invariant, from Disconnected to Connected thinking.

The second point of shift occurred between the ages of 10.5 and 12.4, when thinking moves from Connected thinking, i.e. providing a context and seeing a coherence in the details, to moving into the hypothetical - deductive mode, Thematic thinking.

Werner discusses the phenomenon of saltatory change during the course of development. (Harris, ed., pp. 133-37). If there is to be qualitative change, then there must be points at which a discontinuity occurs - when one system of organization is displaced by another. It may be seen from the analysis of the examples presented, that the organization of criteria by which we deal with a problem is completely different from one level of abstraction to the next.

Further, there are points at which the occurrence of change can be clearly identified. The phenomenon of saltatory change needs further study to see how often and under what conditions this happens and at which points in development the changes occur. Rest, in his review of Kohlbergian research, discusses the phenomena of shift - as does Selman, in his work on perspective rating.

Characteristics of Levels of Abstraction: Homogeneity

Analysis of the data for homogeneity of response allowed a closer examination of individual performance and variation both within and between subjects. It is clear that an individual has the capacity to deal with tasks on more than one level of thinking depending upon the familiarity of the task and very likely, the emotional involvement with it. Only 15 per cent of the subjects gave all four responses on the same level of abstraction. Over three-quarters of the subjects gave overlapping responses, although on adjacent levels. Whether this overlap was in part a function of the problem of measurement, or completely a function of the difference in the nature of the task, should be investigated further.

Relationship Between Findings and Piaget's Stages

This study revealed a direct relationship between age and level of abstraction in children's explanations of social problems. The relationship follows an invariant sequence proceeding from a view of a social situation in terms of its separate parts, to one of a relationship between the parts and finally to a view of the particular situation as an exemplar of a universal problem. Each stage in the sequence subsumes the previous stage to its simpler components. Transitional (1) and (2) represent the preparatory periods which culminate in connected and thematic thinking. Finally, the capacity to think abstractly varies according to the nature of the task involved.

These findings correspond fully to the properties which Piaget postulates in his theory of stages in cognitive development. (Flavell, pp. 19-24).

Directions for Further Research

There are three directions for further research which are suggested by this study.

The first pursues the relationships between stages of cognitive development in the social sciences and such organismic and experiential variables as I.Q., social class, ethnic and racial background, and life experience, i.e., exposure to television or films on army life, old age, and poverty.

There is evidence that children of high intelligence have a significantly faster rate of accession to stages than children of normal intelligence. (Elitcher.) Social class has also been found to effect the nature of the content of children's responses to questions about poverty. (Russell, Coles.)

The findings in this study indicate that further research needs to include an extension of the age range upwards two or three years and downwards one or two years in order to determine more precisely the age limits for each of the levels of abstraction.

The second direction explores the comparison of cognitive development in the social sciences with cognitive development in the physical sciences. Will children be in similar stages in both areas of knowledge? If not, how will they differ? Will the spurts which occurred in thinking about social problems show up at the same points for natural science problems?

The third direction for research investigates methodology. The question of how to elicit responses which represent children's ability to think centers around the nature of the instrument and the way in which it is used. A limitation of this study was in the interviewer's lack of systematic probing once an initial response had been elicited. A comparison of responses to an initial open-ended question with responses to more systematic probing would clarify the relationship between task and level of abstraction. Similarly, this relationship would be further clarified by comparing responses to two groups of pictures on the same subjects, one open (in the nature of the pictures of war and destruction), one closed (in the nature of the pictures of poverty and old age). A final study might use a series of pictures on each concept in different ways: randomly, from easy to hard, from hard to easy, to explore such questions as: When do ideas "set?" Is there a maximal point of understanding? Is there a difference in the level of cognition as the input of stimuli increases?

Implications

The practical implications of this study concern the relationship between cognitive development and social studies curriculum. The fullness and maturity of children's thinking depends upon two factors. The first is the biological structure of the organism. The second is the nature of the stimuli, i.e., either arranged by design or taken randomly from life experience. Although educators have little or no control over a child's human and physical environment outside of school, much can be done within the school program to nurture cognitive growth.

The relationship between age and level of abstraction found in this study implies a logic of curriculum development in the social studies, both in content and in sequence, which is not being sufficiently attended to at this time.

Children between the ages of six and eight years still need to learn to identify the objects and processes in their world. They need to learn to begin to classify on the basis of salient attributes. They need to go out of the classroom to learn about the world firsthand. They need a full range of sensory and manipulative experiences. The richest opportunities for learning would center in and around the immediate world of the child, e.g., his neighborhood, town, city, surrounding areas. In the processes and products of his world, he can build rich storehouses of data on which to operate and to serve as a base for future reference and comparisons.

In the middle years of childhood, from eight to ten years of age, children need to practice and consolidate the ability to classify on the basis of many attributes, to see a situation from various perspectives. They need to deal with one situation at a time and should not range too far afield in time and space simultaneously. The opportunity for "doing" should be in the service of logical thinking as well as in extending the affective life of the child.

During these years studies of their own communities through time are profitable. By visiting historic sites, the possibilities for imaginative identification are rich. Studies of other cultures, simpler in form, such as an American Indian group, the ancient Aztecs, the Bedouins of the Middle East, can be equally compelling.

In the preadolescent and early adolescent years (ages eleven through fourteen), children's learning can and should rely on books, pictures, museum trips, as well as other secondary sources. These are the years when children move beyond the immediate to consider and deal with the complexities of time and space, of cause and consequence, of the particular and its relation to the universal.

Finally, there needs to be some mention of the implications of this study for the education of teachers. This study supports the research of stage theory, principally Piaget's and extends it into the realm of everyday experience in clearly defined terms. Teachers must learn to evaluate the process as well as the content of children's thinking, a task which is possible even in daily classroom life. This means that teachers must do much more talking with instead of to children, more listening and analyzing what children say and do. Teachers must learn to structure learning so that opportunities are as rich as possible for children to operate on their world, to use their abilities to think broadly and deeply. Teachers must learn to evaluate ready-made materials and curriculum guides in the light of the particular children they are teaching. Further, it is to be hoped that more teachers of young children will develop strong interests and involvements in the urgent social issues of our time. For if there is a major lesson to be learned from Piaget's contributions to our understanding of the genesis and development of thought, it is that without an active engagement in the external world, the ability to think abstractly never comes to its fullest fruition.

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