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DEVELOPMENTAL EDUCATION AND TEACHER TRAINING

by

Pairin Nateharn Sujjavanich

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
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of the Requirements for the Degree
Doctor of Education

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1977

Approved by

Dissertation Adviser

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

Dissertation Adviser David E Pugel

Committee Members

October 6, 1977
Date of Acceptance by Committee

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SUJJAVANICH, PAIRIN NATEHARN. Developmental Education and Teacher Training. (1977)
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This study was designed to investigate the relationship of cognitive development and moral development; the differences and similarities between prospective elementary teachers and prospective secondary teachers in stages of cognitive development and moral development; as well as the relations between levels of cognitive and moral development and chronological age, experiences in mathematics, experiences in science, grade point average, and SAT scores.

Forty-three prospective elementary teachers and 32 prospective secondary teachers were administered Piagetian cognitive and Kohlbergian moral dilemma tests in order to determine their levels of cognitive development and moral development, respectively. The Piagetian type test consisted of a proportional test and quantification of probabilities test. The data obtained were analyzed, by computer, using the t-statistic and Pearson-Product-Moment correlation coefficients.

It was found that there was no significant correlation between prospective teachers' scores on cognitive development and moral development. There was no significant difference between levels of moral reasoning in prospective elementary teachers and prospective secondary teachers, while a mean score for cognitive development of prospective secondary

teachers (3.40) was higher significantly than that of prospective elementary teachers (2.96).

Within the group of prospective teachers examined, stages of cognitive development were not significantly related to number of high-school mathematics and science courses taken. The correlation between stages of cognitive development and number of college mathematics courses taken was .29; that between stages of cognitive development and number of college science courses taken was .24. Both were significant at the .05 level.

Stages of cognitive development and levels of moral reasoning in prospective teachers were not significantly related to chronological age and grade point average. The correlations between stages of cognitive development and SAT-Composite, SAT-Math, and SAT-Verbal scores were .60, .58, and .49, respectively. The correlation between levels of moral reasoning and SAT-Composite scores was .33. All were significant at the .05 level.

It was concluded that a majority of prospective teachers involved in this study were at the lower level of formal operational and/or between Stage 3 and Stage 4 of Kohlberg's moral reasoning. There was evidence of a relationship between the prospective teachers' cognitive and moral development and their abilities in the SAT.

Implications for applying developmental theory to teacher training are discussed. It is suggested that there

are possibilities for screening, diagnostic, and research applications.

The following suggestions for further research evolved from the study: 1. That a study be initiated to determine the effect of teachers' cognitive functioning on students' cognitive functioning. 2. That a follow-up study on these same groups be initiated after they had experienced a longer period of time in teaching. 3. That a method of this study be used with samples from different populations. 4. That mathematics course content and activities be analyzed to determine which types of reasoning are demanded.

Last, but certainly not least, to my husband, Surapon Sujjavanich, without whose understanding, encouragement, and devotion my task would have been more difficult.

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CHAPTER I

INTRODUCTION AND BACKGROUND

Introduction

This dissertation is concerned with gathering and analyzing data on the cognitive and moral development of preservice teacher education students.

The developmental approach to education has become one of the most important and powerful set of ideas in current time. The concept of development can be defined as, "a change toward greater differentiation, integration, and adaptation" (Kohlberg & Mayer, 1972, p. 483). "The developmental behavior change is irreversible, general over a field of responses, sequential, and hierarchical" (p. 486).

The foremost theorist of its approach can be said to be Jean Piaget. Piaget's theory is regarded today as the most comprehensive account of cognitive progression from birth through adolescence. Piaget has identified four qualitatively different stages in his developmental theory; namely, sensorimotor, preoperational, concrete operational, and formal operational. Development during the early months and years of life is described as sensorimotor. During this period, both physical maturation and social interaction with the environment provide the foundation upon which later intellectual development is built. From two years of age

until approximately seven years, Piaget describes cognition as preoperational, which is characterized by egocentrism and lack of ability to decenter or take another person's point of view. From the age of 7 to 11 years, the child's operational structures take form. Because operations are internalized and reversible actions, thought becomes decentered and the child can now consider the needs of others. He becomes much more flexible in his behavior during this period which Piaget calls concrete operations. By late adolescence, a final stage of formal operations is achieved and hypothetico-deductive reasoning and logical thinking reach their peak of development. According to Piaget's theory, not until one attains the final stage, formal operations, is he capable of understanding and assimilating many of the abstract concepts. This means that if the assimilation of some concepts requires formal thought and the student does not firmly possess such thought, learning will be difficult and incomplete. Therefore, instruction and content should be suited to the learner's level of cognitive development.

Development, for purposes of this study, is both cognitive and moral reasoning. Kohlberg has described three distinct levels in the development of moral reasoning with two stages in each level according to an age-developmental scheme which was demonstrated both longitudinally (Kohlberg, 1964; Kramer, 1968) and with

cross-sectional age groups (Kohlberg, 1969; Turiel, 1969). In the first or preconventional level, there is an orientation toward the physical consequences of an act (e.g., rewarded acts are good and punished acts are bad) and toward deference to superior power. In the second or conventional level, there is an orientation toward pleasing others and maintaining social order (e.g., obeying the rules set forth by the family or school). In the third or postconventional level, the orientation is toward autonomous moral principles which are independent of other people or groups. There are two stages in each level of moral reasoning. As characterized by Kohlberg (1976), 1) stages are "structured wholes," or organized system of thought; 2) stages form an invariant sequence; and 3) stages are "hierarchical integrations" (p. 178).

Kohlberg (1969) has suggested that the developmental changes which take place in moral reasoning occur as a result of internal changes in the child's cognitive structure. He contends that cognitive stages, such as those observed in moral reasoning, do not result from environmental influences alone. The following exemplifies his reasoning:

> In contrast, if structural stages do define general ontogenetic sequences, then an interactional type of theory of developmental process must be used to explain ontogeny. If the child goes through qualitatively different stages of thought, his basic modes of organizing experience cannot be the direct

> result of adult teaching, or they would be copies of adult thought from the start. If the child's cognitive responses differed from the adult's only in revealing less information and less complication of structure, it would be possible to view them as incomplete learning of the external structure of the world, whether that structure is defined in terms of the adult culture or in terms of the laws of the physical world. If the child's responses indicate a different structure or organization than the adult's rather than a less complete one, and if the structure is similar in all children, it is extremely difficult to view the child's mental structure as a direct learning of the external structure (p. 354).

Kohlberg seems to be assuming that the "external structure" remains the same for children of all ages. He implies that adults try to teach children of all ages the same things and in the same ways. However, at least with respect to moral reasoning, teachers probably do not teach children of different ages the same things. It seems unlikely, for example, that teachers would explore their own moral reasoning with a six-year-old child. It seems more likely that, with respect to moral situations, teachers treat students of different ages very differently and, thereby, imply different types of moral reasoning to students of different ages. If one can assume that the teachers' levels of moral reasoning reflect the way in which they ordinarily teach their students, then it seems to indicate that the development of moral reasoning in teachers themselves could, at least partly, have some effect on the stages of moral development in their students. Consequently, environmental factors, such as teachers' stages of moral reasoning, should

no longer be quickly dismissed as possible correlates of the development of moral reasoning in students. Thus, teachers' stages of moral reasoning should be considered as possible causes of developmental changes in the student's thinking.

It is the position of this writer that it would be valuable to look at the question of preparing professional teaching personnel from a developmental perspective. As Shearron and Hensel (1973) point out, "Developmental activities have also not been translated into teacher education programs" (p. 112). They go on to say that the preparation of teachers who are cognitively oriented is a proposition that should not be rejected by teacher educators.

Possibly, if we systematically and continually feed research on development into teacher education, we are more likely to turn out teachers who will be more effective in promoting development in students, thereby helping to narrow the gap between developmental theory and teacher education. Thus, one possibility that can narrow the gap between developmental theory and teacher education programs is a research paradigm that can provide useful data and insights.

Need for the Study

Several recent studies have raised many unanswered questions related to the cognitive and moral development of college students or adults in general.

Piaget (1972) has acknowledged that considerable variation can exist between and within populations of

countries which point to the variance evident in children's cognitive development. He suggested that development of formal structures varies from individual to individual and even from subject area to subject area. Higgens-Trenk and Gaite (1971) also raised the serious question of whether it can be assumed that formal operational levels are attained soon after pubescence.

There is contradictory evidence regarding level of cognitive development in adults. McKinnon and Renner (1971), Dulit (1972), Schwebel (1973), and Kolodiy (1975) have indicated that a majority of college students or adults have not achieved the level of formal operations; that is, the capacity for abstract, logical thought. Treating these students as abstract verbal learners is failing to suit instruction and content to each learner's cognitive level. On the other hand, Renner and Stafford (1972) reported that a large percentage of adults in their sample appeared to be at the formal operational level. Lack of agreement in the results from these studies indicated a need for further research in this area.

Juraschek (1974) found that the 52% of prospective elementary teachers who were classified as concrete operational was significantly different from the proportions of both secondary-school mathematics student teachers (6%) and the honor calculus students (0%). Only 5% of prospective elementary-school teachers were at upper level of formal

operations, while 47% of the mathematics student teachers and 64% of the honor calculus students were at this stage. Since this is the only study that has been found related to the analysis of cognitive ability in prospective teachers, a need for more research is obvious, before wide-spread conclusions can be drawn.

There are presently three studies reporting research on moral development in adults (Kohlberg and Kramer, 1969; Kohlberg, 1973; Papalia and Bielby, 1974). The second of these studies, that of Kohlberg (1973) repudiates the conclusions of the earlier study by Kohlberg and Kramer (1969). The new conclusions were that adult stages of moral development exist. That is, Kohlberg (1973) contended that Stage 5 and especially Stage 6 are adult developments, "typically not reached until the late twenties or later" (p. 190). Papalia and Bielby (1974) found that moral judgment rose from the lowest average stage of 2.5 in preadolescents to the highest average stage of 3.95 in the early middle-age adults. They found a curvilinear relationship between moral development and chronological age. Furthermore, they reported that late middle-age and elderly males were consistently, although not significantly, superior to their female peers in levels of moral judgments.

It is noteworthy that none of the above studies on moral development analyzed moral reasoning ability in teachers or even prospective teachers. As Sullivan and Beck (1976) point out,

> We are also struck by the possibility of the teacher's moral level influencing the classroom discussion. Our own conviction is that teachers at a postconventional level of morality are needed to stimulate higher levels of moral reasoning in students (p. 231).

Thus, information concerning the stages of moral development and their possible relations to other variables among teachers or prospective teachers is of interest.

Kohlberg and Gilligan (1971) have presented a model in which the attainment of certain Piagetian logical stages is a necessary but not sufficient condition for the attainment of certain stages in Kohlberg's moral judgment system. Thus, in this model, fully consolidated concrete-operational thought is necessary for the emergence of Kohlberg's stage 2 morality. And fully consolidated formal-operational thought is necessary for stage 5 morality. This model is confirmed by the studies of Lee (1971) and Tomlinson-Keasey and Keasey (1974).

Lee (1971) found that in children aged 5-15, an increase in certain moral responses (e.g., "peer" vs "authority type" responses) was associated with the development of concrete operational thinking, whereas an increase in certain other moral responses (e.g., "societal order" consideration) was associated with the development of formal operational thinking. Tomlinson-Keasey and Keasey (1974) reported similar findings with two samples of adolescent girls, and likewise interpreted their results as supporting

the notion that formal operations are necessary for the development of moral reasoning stages 5 and 6.

On the other hand, Damon (1975) reported that most of the data in his study discount the notion that certain levels of logical thinking are strictly necessary for certain levels of moral reasoning.

It seems apparent from these studies that evidence on the relationship between cognitive development and moral development is inconclusive. Lee (1971) and Tomlinson-Keasey and Keasey (1974) indicated that certain levels of logical thinking are necessary for certain levels of moral reasoning, while Damon (1975) found no relation between these two areas of development. The need for more information on this question is obvious. This study is designed to gather such information.

Piaget (1964) has asserted that the four main factors that influence cognitive growth are experience, social transmission, maturation, and equilibration. To a large extent, schooling affects the first two factors. Evidence relating mathematics and science experiences to cognitive development is inconclusive. McKinnon and Renner (1971) reported significant development due to a college science course which stressed the inquiry method. On the other hand, Schwebel (1973) found no relation between number of high-school science courses completed and level of cognitive development among college freshmen. The need for more information on this question is obvious.

Statement of the Problem

It has been suggested that the difficulties exhibited by many college students, including prospective teachers, in learning could be related to delayed cognitive development. Perhaps many of them have not advanced to the highest level of formal operations as usually assumed and some may not have established themselves beyond the concrete operational stage. With regard to moral development, it has been suggested that the difficulties exhibited by many teachers, in helping their students move from one stage to the next, could be related to delayed moral development of the teachers themselves. Perhaps some teachers are not at stages higher than their students, as often assumed. Moreover, cognitive and moral development probably continue during the college years, possibly at different rates for different operations for different students. It also can be said that delays in cognitive and moral development could possibly be related to other variables; e.g., school experiences, chronological age, grade point average, and SAT scores.

This study was designed to investigate the relationship between cognitive development and moral development, the differences and similarities between two selected groups of prospective teachers in stages of cognitive and moral development, as well as the relations between levels of cognitive and moral development and chronological age, experiences in mathematics, experiences in science, grade point average, and SAT scores.

More specifically, this study was designed to answer the following questions: (1) What relationship exists between cognitive development and moral development in prospective teachers? (2) Do prospective elementary teachers and prospective secondary teachers differ in attained stages of cognitive and moral development? (3) Are experiences in mathematics, experiences in science, chronological age, grade point average, and SAT scores reliable predictors of a prospective teacher's levels of cognitive and moral development so that they can be used singularly or in combination in predicting a prospective teacher's levels of cognitive and moral development?

Summary of Procedure

Seventy-five prospective teachers at a southern state university were administered Piagetian cognitive and Kohlbergian moral dilemma tests in order to determine their levels of cognitive and moral development, respectively. The Piagetian type test consisted of two parts, a proportional test, devised by Noelting (1975) and quantification of probabilities test, originally devised by Piaget and his associates (Inhelder and Piaget, 1958; Flavell, 1963). The standard Kohlberg moral dilemma test was also used in this study. Data on sex, chronological age, experiences in mathematics, experiences in science, grade point average, and SAT scores of subjects were collected. In order to answer the questions stated earlier, the data obtained were

analyzed, by computer, using the t-statistic and Pearson-Product-Moment correlation coefficients.

Limitations of the Study

When evaluating the results and conclusions of this study, one must consider the following limitations.

This study was limited to an examination of teacher education students who were seniors at a southern state university. Conclusions of this study are applicable only to the sample examined; however, these conclusions could be reflective of the larger population in teacher-training institutions. The subjects studied ranged in age from 20 through 34. Some students have entered college directly from high school while others have had a variety of intervening experiences.

This study has assumed that information available on grade point average, age, and scores on SAT was accurate. No effort was undertaken to validate these scores and records beyond the official certification by appropriate university authorities.

The instruments used in this study were assumed to be the useful measures of the level of cognitive development and moral reasoning in prospective teachers. The instruments' administration was supervised by the researcher with no unusual problems occurring.

Prior to testing, every effort was made by the researcher to ensure that each subject understood the

questions involved. However, since the tests were somewhat challenging to some and probably unfamiliar to most subjects, it is possible that some may not have fully understood the directions. No effort was undertaken to discover or examine the possibility that the above factor has influenced this study, since such an investigation was beyond the intended scope of this study.

Overview

This chapter has presented an introduction to the problem and background relative to the need for the study. Questions to be examined for purposes of clarification and to gain insight into some of the problems of teacher training were formulated. A design of study and procedure was summarized, and limitations of the study were given.

The second chapter will present a review of related literature. Several bodies of research and literature on cognitive and moral development in adulthood will be organized into four sections: studies of formal operations, theoretical issues of adult cognitive development, studies of moral development, and summary. A discussion of the effects of educational level, chronological age, sex, living condition, and other variables on performance will also be presented.

Chapter III will describe the design of a study of cognitive and moral development of teacher education students. The thirteen hypotheses will be stated, and

terminology will be explained. The research instruments used to determine each subject's stage of cognitive and moral development, as well as the methods of analyzing data will be described.

The fourth chapter will present results of a study with the data analysis and disposition of generated hypothses.

In Chapter V, the major findings will be discussed and conclusions will be offered. Implications for further investigation will be suggested. The dissertation will conclude with some personal thoughts on some implications for teacher training.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Very little theoretical and research attention has been paid to cognitive and moral development in adulthood. Piaget and Inhelder have indicated that adult years are not a time for meaningful cognitive change. Piaget and Inhelder (1969) state:

> Finally after the age of 11 or 12, nascent formal thought restructures the concrete operations by subordinating them to new structures whose development will continue throughout adolescence and all of later life (pp. 152-153).

In other words, Piaget and Inhelder conclude that the stage of formal operations theorized to be mastered during adolescence, is maintained throughout the remainder of the lifespan. However, only recently has Piaget (1972) more extensively addressed himself to the question of intellectual evolution in the years from 15-20. He suggests that formal operations may be reached at different times by different adolescents, depending upon their progressively differentiating attitudes and particular professional specializations. Because Piaget regards this differentiation as nonqualitative in nature, he does not suggest the development of a stage beyond formal thought. On the other hand, Riegel (1973) and Arlin (1975) have postulated an additional

qualitatively unique stage of development during adulthood. This fifth stage of cognitive development has been called the period of dialectic operations in Riegel's proposal and the stage of problem-finding in Arlin's study.

Although Piaget has considered adult cognitive development, he has not directly addressed the issue of cognitive ability in middle and old age. Flavell (1970) has stated that those cognitive changes between infancy and adolescence are momentous, directional and irreversible. It follows that he would not predict cognitive changes during the last period of life.

Several studies are organized, in this chapter, into three sections: studies of formal operations, theoretical issues of adult cognitive development, and studies of moral development in adults. A discussion of the effects of educational level, chronological age, sex, living condition, and other variables on performance is also presented.

Research on Formal Operations in Adults

The studies reviewed in this section deal with research on formal operational thinking with adult subjects. They consist of all studies which could be found in the literature based on the following criteria:

1. All or part of the sample consisted of subjects who were in college or 20 years of age and older.

2. The tasks employed to assess developmental level were similar to those used by Piaget in assessing cognitive development.

Formal Operations in College Students

The basic question is whether a majority of college students are performing at a formal level. Although an early investigator (Lovell, 1961), in agreement with Inhelder and Piaget, set the age of emergence of formal operations at between 11 and 12, more recent studies (McKinnon & Renner, 1971; Dulit, 1972; Kolodiy, 1975) have failed to find a majority of even middle and late adolescent subjects performing at a formal level. Interpretation of these data is especially difficult because the range of within-subject performance across tasks also varies between studies.

McKinnon and Renner (1971) questioned whether a majority of college freshmen were mentally prepared to adequately deal with many science principles taught at college level. While they recognized that Piaget had determined with Swiss students that formal thinking develops between the ages 11 and 15, McKinnon and Renner hypothesized that most American high school graduates were not at the formal operational level. In their study, five Piagetian tasks were administered to 131 university freshmen. It was found that almost 75% of subjects were either partially or completely concrete operational.

Results from this study reveal at least two crucial issues. Were Piaget's designation of formal operational thought to be interpreted as a description of young adult

reasoning, results from this study would have failed. Were the formal operational stage characteristics to be interpreted as norms, then the subject of this study would have failed. Furthermore, what evidence exists, therefore, to demonstrate that logical thought can be fostered among college students?

In contrast with McKinnon and Renner (1971), Renner and Stafford (1972) found that a large percentage of adults appeared to be at the formal operational level. Renner and Stafford (1972) randomly selected a total of 44 first- and third-year law students to interview. On the Piagetian elimination of contradiction tasks, 86% of subjects were rated formal operational, while 14% were rated concrete operational. On the exclusion of variable tasks, 70% were rated formal operational, while 30% were rated concrete operational.

Results from this study revealed that a majority of adults in this study appeared to be at formal operational level. But this is not surprising since the sample of this study was highly selected from the professional students. Interpretation of these data is, again, difficult because the range of within-subject performance across tasks also varies in this study.

In contrast with Renner and Stafford, Lovell (1961) found that there was substantial agreement in each subject's level of development across tasks. Lovell (1961) conducted

a replication study using 10 of 16 experiments devised by Inhelder and Piaget (1958) for their classic study of the development of logical thinking. The 200 subjects ranged in age from 8 to 32 years and included 10 college students. Each subject was examined on four tasks. By getting each subject to undergo four experiments and analyzing the results by means of a nonparametric statistical technique, they have been able to show that there is a considerable agreement between the level of thinking that the subjects display in the four experiments. Four out of ten college students (40%) were reported to be at concrete operational stage.

Although the results of Lovell's (1961) study confirmed the main stages identified by Inhelder and Piaget, the ages of transition were found to be somewhat later for the British subjects than for Piaget's Genevans. It is the opinion of this writer that the cultural settings, climate of opinion, or the general experience to which the person is subjected, are very important in developing thinking skills. With this in mind, results from Lovell's study seem to indicate that Swiss culture is more closely related to British culture in some aspects than to American culture since most studies with American subjects tend to disagree with Inhelder and Piaget.

Juraschek's (1974) study is the only one that included prospective teachers in his sample. He designed a study to investigate the possibility that the difficulties experienced

by prospective elementary school teachers in learning mathematics are related to delayed Piagetian cognitive development. The sample consisted of 141 prospective elementary teachers (136 females, 5 males) ranging in age from 18 to 28 years; 19 secondary school mathematics student teachers (14 females, 5 males) ranging in age from 20 to 48 years; and 11 honor calculus students (4 females, 7 males) ranging in age from 18 to 22 years. Three Piagetian tasks were used in this study. It was found that there was a significant difference in the proportions of subjects at different stages of cognitive development in the three groups. The 52% of prospective teachers who were classified as concrete operational was significantly different from the proportions of both secondary-school mathematics student teachers (6%) and the honor calculus students (0%). Only 5% of elementary school prospective teachers were at the highest stage of formal operations, while 47% of the mathematics student teachers and 64% of the honor calculus students were at this stage. It was also found that cognitive development of subjects in this study is very likely related to their ability in mathematics.

Although Juraschek's (1974) study had potential for making contribution to the field of cognition and learning ability, the research methodology tends to invalidate the findings. While the design itself was quite adequate, the sampling procedures present serious threats to

validity. No attempt was made to equate the subjects on the basis of their majors which leaves much room for doubt as to the validity of the results reported, especially when compared between groups. However, results from this study have profound educational implications since the serious problem has been shown to exist.

What relationships exist between cognitive development and other variables? Elkind (1962), Schwebel (1973), Kolodiy (1975), and Schindeler (1976) have addressed themselves to this question.

Sex differences in cognitive development have been found in three studies (Schindeler, 1976; Elkind, 1962; and Schwebel, 1973). Schindeler (1976) analyzed several factors thought to have a predictive value in the determination of cognitive development. The subjects were freshmen enrolled in American Government classes at a public community college. It was found that (1) high school grade point average was found to be a poor predictor of cognitive development levels; (2) the correlation between age and cognitive development was not as powerful as suggested in other Piagetian assessments; (3) sex served as a useful predictor as males performed significantly better than females on the instrument which was utilized; and (4) Florida Twelfth Grade Placement Test component scores demonstrated a high intercorrelation as well as a high correlation with the instrument.

Elkind (1962) investigated the ability of college students to conserve mass, weight, and volume. In his sample of 240, 92% conserved mass and weight, but only 58% conserved volume. Seventy-four percent of male subjects conserved volume while only 52% of female subjects did. He also noted that there was a significant increase with age in the percentage of females with abstract volume conceptions. In order to explain these findings about sex differences in relation to the attainment of volume conservation, Elkind offered a social-role hypothesis. He suggested that in contrast to many women, most college men adopt social roles during adolescence which are more conducive to the use of formal operations.

Schwebel (1973) used a Piagetian instrument which included the balance and chemical liquids tasks to investigate logical thinking among college students. He assigned a score of 1-4 to the four stages of performance on the tasks and compared mean scores. In his random sample of 58 freshmen, nine were judged concrete operational and only eleven were fully formal operational. He found that the mean task score of 3.23 for males was significantly higher than the mean score of 2.81 for the females. He also found, by analysis of variance, that performance on the task was not related to number of high-school science courses or to Scholastic Aptitude Test (SAT) Composite scores. A breakdown of mean SAT scores reveals no difference between verbal and

quantitative scores for females, but a difference of 63 points in favor of quantitative score for males. Male and female verbal mean scores differed by only eight points. These differences could be related to the superior performance of the male subjects on the Piagetian tasks.

Although Schindeler, Elkind, and Schwebel found that males performed significantly better than females, it seems that this might be expected to vary as a function of the content area in which the task is set.

SAT math scores appeared to be correlated with cognitive development in college students. Kolodiy (1975) investigated the relationship of cognitive level to SAT scores, college grades, and attrition. His sample consisted of 70 subjects representing three distinct groups (20 high school students, 25 college freshmen, and 25 college seniors). Subjects were presented with two Piagetian tasks, Combinations of Colored and Colorless Chemical Bodies and Hauling Weight on an Incline Plane, whose solution required formal thinking. It was found that the percentage at the upper formal level is roughly the same (35% and 32%) for high school sophomores and college freshmen, while for the college seniors it is somewhat higher (64%). For the correlational analysis, it was found that scores on Piagetian tasks were significantly correlated to SAT math scores but not to college grades. College grades were significantly correlated to SAT verbal scores. Kolodiy pointed out that

the implication seems to be that college grades are related to the ability to verbalize answers, either by impressing instructors in classroom discussion or on exams, and not to cognitive process. It was concluded, within the limitations of Kolodiy's study, that the majority of high school and college students are below the formal level in cognitive functioning; and that college grades are more closely correlated to verbal ability than to cognitive functioning.

It seems that results from this study have profound educational implications since a serious problem has been shown to exist: A majority of students are below formal level, grading system is not appropriate, etc. The question is whether cognitive development can be promoted among all levels of students. If so, colleges and universities need to consider their responsibility for the intellectual development of their students rather than continuing to look at their primary purpose as the transmission of information.

In summary, recent research has indicated that there are many unresolved questions. These involve the ages at which individuals become formal operational, the factors which can serve as useful predictors of cognitive ability, and the implication which exists for curriculum design and instructional theory. The research was found to be inconclusive regarding factors which can serve as useful predictors of cognitive ability. It did seem to indicate, however, that college students were not demonstrating the level of

cognitive development that one might expect of them given Piaget's theoretical framework. The literature did indicate that higher education institutions should undertake to diagnose student cognitive ability and as a result take into consideration instructional and/or curriculum changes in order to reflect student needs and to further their cognitive development.

Formal Operations in Other Adults

Three studies analyzed performance on different formal operations task in adults who were not in college (Clayton and Overton, 1976; Tomlison-Keasey, 1972; and Dulit, 1972). Tomlinson-Keasey (1972) investigated the performance of sixth-grade girls, college coeds, and middle-aged women (mean ages: 11.9, 19.7, and 54 years, respectively) on five Piagetian measures of formal operations using a pretest, training, immediate posttest, and delayed posttest design. During the pretest, subjects were tested with the pendulum, balance, and flexibility problems. Age differences were noted. Thirty-two percent of girls' responses were at the formal level with 4% of these at the most advanced stage. Sixty-seven percent of the coeds responded formally, with 23% of these at the most advanced stage. Of the middle-aged women, 54% responded at the formal level with 17% of these at the most advanced type. Significant increases in conceptual level occurred between pretest and immediate posttest for trained members of all three age groups as

compared to untrained controls. The immediate posttest involved having trained subjects teach the next subject, as confederates of the experimenter. However, when new formal operations tasks were introduced in the delayed posttest, little generalization occurred. On the delayed posttest, trained individuals performed similarly to untrained controls on the unfamiliar tasks (chemicals, incline plane, and a new version of the flexibility task). Trained subjects retained their superiority to the control group on the delayed posttest only on those tasks which were familiar to them.

Tomlinson-Keasey's study indicates that performance on immediate posttest was significantly increased for trained subjects as compared to untrained controls, while this significant was not found on the delayed posttest. The question to be raised is--to what extent do the trained subjects perform in the delayed posttest differently than in the immediate posttest? The lack of other experimental studies in later life precludes the ability to make generalizations regarding training factors. However, in order to go beyond our present normative data, we need to develop more standard procedures and adequate controls for the performance factors that affect the manifestation of the formal properties of adult thought.

Only one study examined the effect of high IQ on formal operations. Dulit (1972) found that high IQ is

associated with higher formal operations when compared to performance of same age subjects of average IQ. Dulit examined the formal stage in adolescence and adulthood by using two Piagetian tasks, The Ring Experiment and The Liquid Experiment. The sample in this study consisted of four groups: average younger adolescent group (age 14), average older adolescent group (age 16, 17), gifted older adolescent group (age 16, 17), and average adult group (age 20-55). It was found that no subject in the youngest group functioned at the fully formal level on both problems. Roughly 60% of the gifted group funtioned at the fully formal level. Among average adult subjects, 33% functioned at fully formal on Rings Experiment, while only 25% functioned at fully formal on Liquids Experiment. The highest percentage in Dulit's study was 75% functioning at fully formal level in a group of gifted older adolescent boys. Dulit concluded that fully developed formal operations thinking appears to be a kind of "cognitive maturity." Similar to other studies, Dulit has failed to find a majority of even late adolescent and adult subjects performing at a formal level. It is interesting to note that Dulit used a pencil and paper version of the chemical task, while other investigators used a clinical method on this task. The argument is that if subjects were at a formal level of thought they used a system either when combining the actual chemicals, or when simply noting which combinations were made.

Clayton and Overton (1976) designed a study to investigate the role of concrete and formal operations in a young and old population. The sample consisted of 80 females from three age levels: 20 subjects between 18 and 20 years of age, 20 subjects between 60 and 69 years of age, 40 subjects between 70 and 79 years of age. All subjects were tested on a series of Piagetian tasks and indices of fluid and crystalized intelligence. One concrete operational task (transitivity) and two formal operational tasks (Pendulum and Card Sorting) were used in this study. It was found that only 5% of the total population was able to perform at the highest stage of formal operations. Researchers also indicated that their findings supported the notion that age-related performance differences occur in the area of formal operational thought prior to the time they occur in concrete operational thought. Except for the young sample, the operational tasks were found to be unrelated to fluid intelligence at the age levels represented in this study. Living independently as opposed to living in an old-age home did not appear to be a significant factor in maintaining operational thought.

Results from this study indicate that performance on the more complex measures of cognitive functioning decline in the elderly. Since performance on the transitivity task, a less complex measure, did not disintegrate with advancing age, these data may be regarded as evidence of orderly

cognitive decline. This study also indicates that environmental factors do not influence Piagetian tasks since living conditions did not appear to be a significant factor in maintaining cognitive development.

The summary of the studies reviewed in this section are presented in Table 1.

It is apparent that the percentage of individuals at the formal operational level ranges from 0 to 100 percent. Likewise, the percentage of individuals at the concrete operational level ranges from 0 to 95 percent. The question arises, then, what accounts for the cognitive stage variation among adults?

Perhaps the most striking difference between studies is the actual task or tasks chosen by the investigator to measure cognitive development. Another factor that varies between studies is the degree to which the investigator uses a directed method of task presentation and questioning. A variation on this point is the distinction between use of the actual task apparatus described by Inhelder and Piaget (1958), or a pencil and paper version. For example, Dulit (1972) used a pencil and paper version of the chemicals task and argued that if subjects were at a formal level of thought they used a system either when combining the actual chemicals, or when simply noting which combinations were made.

Table 1

Percentage of Subjects at Various Developmental Levels

Researchers	Sample	No. of Tasks	Cognitive Stages		
			Concrete %	Transitional %	Formal %
McKinnon and Renner (1971)	131 college freshmen	5	50	25	25
*Kolodiy (1975)	70 Ss. (3 groups)	2			
	High school Ss.		15		85
	College freshmen		8		92
	College seniors		8		92
Schwebel (1973)	60 college freshmen	5			
	Males		3.5 (upper)		28.5 (upper)
	Females		30 (upper)		10 (upper)
Juraschek (1975)	141 prospective elementary teachers	3	52		47
	19 math student teachers		6		94
	11 honor calculus students		0		100

Table 1 (continued)

Researchers	Sample	No. of Tasks	Cognitive Stages		
			Concrete %	Transitional %	Formal %
Lovell (1961)	(200 Ss. age 8-32) 10 adults	(10) Balance task	40	60	0
*Dulit (1972)	21 average young adolescents	2	95		5
	40 average older adolescents		74		26
	23 gifted older adolescents		40		60
	12 average adults		71		29
*Tomlinson-Keasey (1972)	89 females, mean age: 11.9 years	3	68		32
	19.7 years		32		67
	54 years		46		54

* Percentages not reported in the study per se but calculated from the data given.

Sex differences, IQ, and educational level do appear to correlate cognitive development in adults and elderly. However, these results are still inconclusive and might be expected to vary as a function of the content area in which the task is set. Certainly these variables should be controlled in future research.

Theoretical Issues and New Models

Piaget (1972) acknowledged the problems encountered with his model at the level of formal operations. His work on intellectual evolution from adolescence to adulthood offers three solutions to these problems:

(1) that the speed of development is the important factor;

(2) that the diversification of aptitudes with age makes the attainment of formal operations impossible for some groups; or

(3) that all normal people attain the stage of formal operations but they reach this stage in different areas according to their aptitudes and professional specializations.

The third solution is Piaget's preferred explanation. It implies that the stage model is still the appropriate model but that the content to which formal operations are applied alters the appearance of those operations on their generality.

From a philosophic traditional viewpoint, Riegel's (1973) work called for a dialectic reinterpretation of Piaget's theory. He pointed out the essential dialectic basis of Piaget's theory as expressed in the assimilation-accommodation paradigm. This led to the suggestion that Piaget drops the dialectic interpretation of later stage development in favor of a static structural interpretation of the progress of cognitive development. Riegel calls for a rethinking of that theory in terms of the dialectic basis of each stage. He consistently employs in his argument, the physical analogy of the dualism of wave and corpuscle in contemporary light theory (i.e. that light is a wave and a particle at the same time). Riegel elaborates the implications of this analogy for developmental psychology through the notion of dialectic interpretation and the dismissal of the identity principle. His primary concern is to adequately account for the thought and emotions of mature and creative persons. To do this he proposes a fifth stage of cognitive development, the period of dialectic operations.

Although Riegel did not empirically validate the existence of the fifth stage of cognitive development generated by his model, Arlin (1975) provides such evidence. Arlin proposes a fifth stage of logical operations which she called the problem-finding stage. She identified a possible fifth stage by using 60 female college seniors at a southern state university. All 60 subjects were randomly selected to

participate in both task sessions, that of problem solving and that of problem findings. Problem-solving tasks consisted of 3 Piagetian tasks: Colorless Chemical Bodies, Pendulum, and Projection of Shadows. Problem-finding tasks consisted of a problematic situation, an array of 12 types of objects. It was found that there was a significant correlation between problem solving and problem finding: $r(59) = .31$, $p < .01$. Problem finding was normally distributed across the sample. The inference from these findings is that formal operational thinking in the Piagetian sense is a necessary condition for high problem finding. Arlin concluded that this fifth stage, the problem-finding stage, may best characterize creative thought, the envisioning of new questions, and the discovery of new heuristics in adult thought.

In summary these reports provide some fascinating ideas to the new structures of Piaget model. Although they have named a fifth stage differently, Riegel's period of dialectic operations and Arlin's problem finding stage may be two sides of the same coin. The dialectic operations may be the functional dynamic of creative thought, while problem finding may describe its competence structure. From this perspective, the models integrate into a single model which permits simultaneously contradiction and synthesis, process and product, structure and function. In other words, we have, at this point, both a frustration and a challenge.

The frustration is in the lack of accurate definition and explanation. At the same time, the challenge for further investigation is obvious. A thorough investigation is needed to determine the specific formal operations of this fifth stage that lend themselves to the development of the new structures of Piaget's theory.

Research on Moral Development in Adults

Only recently have the moral judgments of adults been of interest to researchers operating within a Piagetian perspective. Piaget (1932) originally postulated that mature moral thinking was attained by early adolescence. In an expansion of Piaget's stage of moral realism (inflexible moral thinking) and autonomous morality (flexible moral thinking), Kohlberg described six sequential levels of value orientation which can be attained by postadolescence: punishment and obedience orientation; naive instrumental hedonism; good-boy morality; authority-maintaining morality; morality of contract and democratically accepted law; and morality of individual principles of conscience. Kohlberg and Kramer's (1969) investigation of the moral judgments of 64 males, sixteen to twenty-five years of age, and their fathers supported Kohlberg's hypothesis that moral development is completed by postadolescence. They found no evidence of a new structural moral stage in adulthood.

Kohlberg (1973) has acknowledged that moral change can be a salient characteristic of adult life and has

postulated the existence of adulthood moral stages which represent distinct cognitive development change. Alterations in adult moral ideology are said to result from biography and common experience although a different kind of experience is required for attainment of the prior stages. Kohlberg also indicated that adult changes are generally due to vicarious symbolic experience (role-taking opportunity). Furthermore, each stage is a cause and result of a wider and more adequate process of taking the perspectives of others, personal and societal, upon social conflicts.

In a cross-sectional life-span analysis of moral judgment, using 72 healthy, middle-class, Caucasian subjects comprising six age intervals (10-14, 15-19, 20-34, 35-49, 50-64, and 65 years and over), Papalia and Bielby (1974) substantiated some of Kohlberg's theorizing. Using three of Kohlberg's moral dilemmas, Bielby and Papalia found a curvilinear relationship between moral development and chronological age. Moral judgments rose from the lowest average stage of 2.5 in preadolescents to the highest average stage of 3.95 in the early middle-age adults (35-49 year-olds). Thereafter, average stage levels declined, the oldest adults' average stage was 2.92. Analysis of the effects of education and sex on performance proved non-significant. However, inspection of anecdotal information offered by adult subjects (20-91 years) revealed that

frequently close, personal experiences influenced their thinking on moral issues.

The major problem to be addressed from these results would appear to be the status of moral development in the elderly. The primary question is: Does moral development in an aging population show evidence of a regression of Kohlberg's stages? If so, is there a consistent pattern of decline directly related to a reversal of Kohlberg's stages (Postconventional → Conventional → Preconventional)? Does this pattern obtain across a variety of Kohlberg's moral dilemmas?

However, both Kohlberg and Kramer (1969) and Papalia and Bielby (1974) found consistency on stage designations for individual young adult and early middle-age subjects who were responding at high levels of moral judgment. For late middle-age and elderly subjects, Papalia and Bielby noted increased variability in within-subject and within-group responses on various Kohlbergian dilemmas for subjects at all levels of moral development. (Kohlberg and Kramer, 1969, did not consider these older age groups.) The presence of such a trend was postulated to be a result of elderly subjects' decreased ability to apply their environmental experiences effectively to their moral judgments.

Podd (1972) verified the interrelationship between moral development and ego development with the evidence from

a sample of 134 white, middle-class male college juniors and seniors. Podd reported that subjects who achieved a mature ego identity generally exhibited the most mature level of moral judgment and subjects undergoing an identity crisis were found to be unstable and inconsistent in their moral reasoning.

It is possible that variability in moral judgment of the elderly could also be a result of the identity crisis associated with aging, beginning of physical or mental infirmity, and social isolation.

In Broughton's (1975) cross-sectional investigation, the sample contained three groups of eight subjects (4 males and 4 females) at ages 10, 14, and 18 from schools in middle-class Boston suburbs. To explore the possibility of continued development into adulthood, the sample included two further groups, one of six undergraduates, mean age 22, and the other of six postgraduates, mean age 26. Each subject was given three Piagetian tasks, a Kohlberg moral judgment questionnaire, and an epistemology interview. It was found that approximately 39% of subjects were at concrete operations and 61% were at formal operations. According to moral development, it was found that percentages of subjects at stages 2, 3, 4, 4½, and 5 were 36%, 36%, 14%, 11%, and 3%, respectively. The researcher concluded that reaching a

given logical stage is necessary but not sufficient for attainment of the corresponding level of natural epistemology, which in turn is necessary but not sufficient for reaching the corresponding stage of moral judgment. This conclusion would make theoretical sense, since epistemology reflects upon thought or logic, defining what "is," and morality adds to this further considerations of what "ought" to be.

Sex differences have been found in moral judgments. Holstein's (1973) sample of 53 white middle-class and upper middle-class families with an adolescent son or daughter revealed that females typically remain at about stage three into middle-age while adult males moved into stages four and five. Holstein interprets this phenomenon to be the result of Kohlberg's preoccupation with a moral hierarchy based on justice rather than love, where the former is an issue more relevant to men than to women whose primary concern as wives and mothers are with love. For women, concern with the struggle for power is often irrelevant to their existence.

Results from Bielby and Papalia's (1974) life-span study of moral judgments among middle-class subjects indicated that late middle-age and elderly males were consistently although not significantly superior to their female peers in levels of moral judgments. They also reported that in adulthood males consistently had greater variability than females in moral stage levels. And this difference was

attributed to the greater variety of life experiences typically encountered by males as compared to females in this society.

Haan, Smith and Block (1968) found similar sex differences in a sample of Bay Area college students and Peace Corps volunteers in training. Five of the ten Kohlberg stories were chosen for use in this study. It was found that approximately 5% of 510 subjects (253 males, 257 females) were at stage 2, 32% were at stage 3, 41% were at stage 4, 17% were at stage 5, and only 5% were at stage 6. Interestingly, twice as large a percentage of stage 3 women than of stage 3 men existed in their sample.

Cognitive development does appear to affect moral judgment in adults and elderly. In the study of Tomlinson-Keasey and Keasey (1974), the sample consisted of 30 sixth-grade girls and 24 college coeds. To examine the relationship between the period of formal operations and principled moral reasoning, all subjects were presented with six dilemmas from Kohlberg's (1958) moral judgment interview and three formal operational tasks (the pendulum, balance, and flexibility problems). It was found that eight of the coeds were at the most sophisticated stage of logical thinking, their average amount of principled moral reasoning was 41%, and only three of the subjects were dominantly at principled moral reasoning. Product moment correlations between formal operations and principled moral reasoning were .58 and .60

for the coeds and the girls, respectively. These high correlations and systematic relationships between the stages of cognitive development and moral development suggested that sophisticated cognitive operations are a prerequisite to advanced moral judgments, and that there is a lag or decalage between the acquisition of logical operations and their application to the area of morality. In other words, formal operations are necessary but not sufficient for the emergence of principled moral reasoning.

Educational attainment does not appear to affect moral judgments in adults and the elderly. This directly contradicts Kohlberg and Kramer's (1969) findings that noncollege subjects did not attain moral stage levels as high as those of college students. Apparently, adult life experiences allow the noncollege students to reach to the more highly educated subject. It would seem that low stage levels among the elderly are due to factors other than education since moral judgments have been strongly linked to cognitive functioning (as stated earlier) rather than educational attainment. In their study of 30 sixth-grade girls and 24 college coeds, Tomlinson-Keasey and Keasey (1974) found attainment of formal operations to have the central role of constraining or encouraging moral development. Bielby and Papalia (1974) reported a slight relationship ($r = .20$) across the life-span between the conceptually related moral and cognitive (egocentrism) realms of thought.

Level of education did not significantly affect performance in both moral and logical thinking.

In summary, literature related to moral development among adults reveals that there is a great deal of interest regarding this aspect of this life period. There is some evidence that with increasing age there is a decrease in moral development as well as social interaction (Bielby and Papalia, 1974; Podd, 1972). The question is that if social interaction is a factor in the development of moral reasoning, what is the role of socialization in the decline of moral judgment in adults? If one investigates the regression of moral stages it would be necessary to also determine the relevancy of social experiences in the lives of those changing moral thinking processes which are under investigation.

Age and educational attainment seem to be poor predictors of moral development, while sex differences have been found in many studies. Also ego identity, epistemology, and cognitive development do appear to affect moral judgment in adults.

Summary

This section provides a summary of research findings which would appear to be fruitful for the future. In many instances these have been anticipated in the previous discussion.

Several points can now be more clearly stated about cognitive functioning in adults and the elderly of the type assessed by Piagetian and Kohlbergian measures.

First, there appears to be considerable variability in adulthood cognitive functioning. At least some adults experience the further evolution of these areas during the years of adulthood; others seem never to obtain the ability to think formally and the ability to make the highest type of moral judgments. It is essential, at this point, to consider the particular life experiences (occupational, educational, etc.) which influence adult cognitive development.

Second, there is an apparent regression in cognitive functioning during old age. However, there has not as yet been a longitudinal study to provide conclusive evidence that particular cognitive abilities were once present and actually dropped out with age. Lower levels of cognitive functioning in the elderly have been noted on moral judgments. There is a decline in formal operations ability with increasing age, although these data must be interpreted cautiously since many middle-age adults appear never to attain the ability to think formally.

Third, there are many possible interpretations of the apparent cognitive regression in the aging. First, this may be due to the cross-sectional data collection technique. Second, this regression may be a result of the neurological decrement inherent in aging. Third, isolation from various

experiences (occupational, educational, and social) during aging may contribute to lowered performance levels in the elderly. Fourth, nearness to death may explain individual performance differences between different elderly individuals. Although no systematic examination of performance differences on Piagetian cognitive tasks between "survivors" and "nonsurvivors" has thus far been made, it is possible that those elderly subjects who "fail" cognitive tasks may be exhibiting a drop in performance prior to death.

Fourth, there is evidence that a majority of college students are not at formal operations as usually assumed. This evidence has profound educational implications.

Fifth, sex, IQ, educational level, and SAT math scores do appear to be related to cognitive development in college students. But these results are still inconclusive.

Sixth, a fifth stage of Piaget cognitive development has been proposed to be the characteristic of mature thought in adulthood. Clearly, more research is necessary on the fifth stage before widespread conclusions can be drawn.

Although a great deal of information has been gained from recent research, many critical research questions are still outstanding.

CHAPTER III

RESEARCH DESIGN AND PROCEDURES

Hypotheses

This study was designed to examine cognitive and moral development in prospective teachers. Two Piagetian paper and pencil tests and Kohlbergian moral dilemma, which assumed reading and writing competency, were used to determine stages of cognitive and moral development. Information about age, sex, classification, experiences in mathematics and science, grade point average, and scholastic aptitude test (SAT) scores of subjects was collected and used to test the following statistical hypotheses.

1. There is no significant correlation between a prospective teacher's score on cognitive development and moral development.

2. There is no significant correlation between prospective elementary teacher's score on cognitive development and moral development.

3. There is no significant correlation between prospective secondary teacher's score on cognitive development and moral development.

4. There is no significant difference between levels of cognitive development in prospective elementary teachers and prospective secondary teachers.

5. There is no significant difference between levels of moral reasoning in prospective elementary teachers and prospective secondary teachers.

6. There is no significant correlation between prospective teachers' experiences in mathematics and their scores on cognitive development.

7. There is no significant correlation between prospective teachers' experiences in science and their scores on cognitive development.

8. There is no significant correlation between age and level of cognitive development in prospective teachers.

9. There is no significant correlation between grade point average and level of cognitive development in prospective teachers.

10. There is no significant correlation between SAT scores and level of cognitive development in prospective teachers.

11. There is no significant correlation between age and level of moral reasoning in prospective teachers.

12. There is no significant correlation between grade point average and level of moral reasoning in prospective teachers.

13. There is no significant correlation between SAT scores and level of moral reasoning in prospective teachers.

Population Description and Procedure for Obtaining the Sample

The dissertation prospectus was reviewed and approved by the Human Subjects Committee of the School of Education. All subjects participated on a voluntary basis.

Sample

The sample consisted of two groups of teacher education students at a southern state university. One group of prospective elementary teachers contained 42 females and one male. Of these, 29 were majoring in Early Childhood Education and 13 were majoring in Child Development. Their ages ranged from 20 to 34 years with a mean of 23 years and a median of 22 years.

The second group was made up of 32 prospective secondary teachers (20 females and 12 males). Of these, 13 subjects were enrolled in "Teaching Practices and Curriculum in Social Studies," eight were enrolled in "Teaching Practices and Curriculum in Mathematics," and 11 were enrolled in "Teaching Practices and Curriculum in Science." Their ages ranged from 20 to 29 years with a mean and a median of 22.6 and 22 years, respectively.

A total of 84 subjects were administered Piagetian type test and Kohlberg's moral dilemma, but nine were eventually excluded because of one or both of the following reasons: (1) They stated that they were not regular undergraduate students. (2) Their Kohlberg's moral responses could not be scored.

No attempt was made to stratify the sample on the basis of socio-economic status, race, or sex.

Data Collection

Data obtained in this study were of two types, those which were obtained through direct testing and those obtained from student records. The instruments were administered by the researcher between January 26, 1977 and February 7, 1977. The purpose of the study was indicated in general terms. Questions raised regarding the nature of the study as well as the manner of treating the data were answered. The subjects were encouraged to answer questions to the best of their ability and to be cautious and honest in their explanations. No subject chose not to participate. A short discussion with classroom groups prior to testing introduced the material and provided general instructions. The answer sheets were hand-scored and double-checked by the researcher.

Another type of data, GPA and SAT scores, was obtained from student records. In order to minimize the potentiality of error occurring in the gathering of data, the researcher was solely responsible for administering the instruments and for gathering the personal data on each of the subjects.

The time required to finish the tests ranged from 45 to 60 minutes and averaged about 50 minutes.

Explanation of Terms

The Piagetian cognitive and Kohlbergian moral dilemma tests are described in detail in the following sections. This section contains explanations of the other terms appearing in the hypotheses.

The four stages of cognitive development examined in this study were those which Piaget calls Concrete Substage II-A, Concrete Substage II-B, Formal Substage III-A, and Formal Substage III-B (Inhelder & Piaget, 1958).

The five stages of moral development examined in this study were those which Kohlberg calls Stage 1: Punishment and Obedience Orientation; Stage 2: Instrumental Relativist Orientation; Stage 3: Good Boy--Nice Girl Orientation; Stage 4: Law and Order Orientation; and Stage 5: Contractual Legalistic and Principle Orientation (Kohlberg et al., 1976).

Grade Point Average (GPA) refers to subjects' third-year college grade point average (end of year 1976). These were obtained from student records made available by the university's research agency.

SAT scores refer to those obtained from student records made available by the university's research agency. Scholastic Aptitude Test, administered for the College Entrance Examination Board by Educational Testing Service, is an instrument used as a measure of basic reasoning abilities in two areas: verbal and mathematical. It is

specifically intended to measure ability rather than achievement. It has high reliability (KR - 20 = .90), and its test-retest correlation is near .88. The mathmatical section of the test requires as background only the mathematics usually taught in grades one through nine (Donlon & Angoff, 1971).

Chronological age was determined to the nearest year. Ages were rounded up if that subject has .5 year or more; otherwise, ages were rounded down to the nearest year. For example, the age 21.5 years was counted as 22 years and age 20.3 years was counted as 20 years.

The number of high-school mathematics courses taken was a whole number (1, 2, 3, 4, or 5). The number of college mathematics courses taken was a whole number (1-12). Some courses that required two or three consecutive semesters were counted as two or three courses, respectively.

The number of high-school science courses taken was a whole number (1, 2, 3, 4, or 5). The number of college science courses taken was a whole number (1-13). Courses dropped before the final examination were not counted. Courses requiring two or three consecutive semesters were counted as two or three courses, respectively.

Research Instruments

Instruments employed in this study were the Piagetian type test and Kohlberg's Moral Dilemma test. Both of them were presented in paper-and-pencil format that assumed reading and writing competency.

Piagetian Type Test

The Piagetian type test used in this study contained paper-and-pencil tests that were closely modeled after, and assumed equivalent to, those of Piaget and his associates. The test consisted of two parts, Noelting's (1975) Proportional Test and Quantification of Probabilities Test developed from Piaget and his associates (Inhelder & Piaget, 1958; Flavell, 1963). The solutions of these tests required formal operational thinking.

(A) Noelting's (1975) Proportional Test. This test consisted of 23 items of various degrees of difficulties bearing on the concept of proportion. Each item-problem consisted in the comparison of two ratios. These ratios were not presented between numbers, but between two subsets of glasses filled one with orange juice and the other with water. For example, set A included three glasses of orange juice and four glasses of water while set B included four glasses or orange juice and five glasses of water. The problem was to estimate the effects of mixing the water with the orange juice within each set. Subjects were asked whether there would be any difference in the strength of the orange juice taste between two sets and if yes, which one would be stronger. Thus, at each item, subjects were asked to choose among three possible answers and then to explain in their own words why they believed it was so. This would allow the subjects to freely describe their interpretations

of the problem at various levels of complexity (for each particular item) and further maintain the clinical aspect of the procedure. (See Appendix A and B)

(B) Quantification of Probabilities Test. This test was developed from Piaget and his associates (Inhelder & Piaget, 1958; Flavell, 1963) and designed to determine if a subject could apply the schema of metric proportions to compare simple probabilities. Seven items of various degrees of difficulties were drawn graphically on responses sheets with two parts of the answer: (a) A choice was to be made among three different answers with multiple choice procedures. (b) An explanation was to be given in the subject's own words. Each item-problem consisted in the comparison of two ratios. These ratios were presented between two containers which contained sets of black and clear marbles of different numerical composition. The subjects were asked to estimate from which can was there a better chance of rolling out a black marble, if each set of marbles has been placed in its own metal can and one marble poured from each can, or whether the two cans had equal chance. (See Appendix A and B)

Kohlberg's Moral Dilemma Test

The story that covers the issues of Life and Law, "Heinz and the Drug," was chosen from Kohlberg's standard moral delimmas (Kohlberg, Colby, Gibbs, Speicher-Dubin & Power, 1976) to measure subjects' stages of moral development. The test consisted of a moral dilemma of whether a husband,

Heinz, should steal an exorbitantly priced drug for his dying wife. Subjects were asked to consider and respond to such questions as "Should Heinz steal the drug? Why or why not?," "If Heinz doesn't love his wife, should he steal the drug for her? Why or why not?," "Why should people generally do everything they can to avoid breaking the law, anyhow?," etc. (See Appendix C)

Scoring Methods

Piagetian Paper-and-Pencil Test*

Not only the correct answers but also the explanations of each subject were considered in determining his/her stage of cognitive development.

(A) Proportional Test. The criteria for scoring this instrument were similar to those used by Noelting (1975). In addition, the criteria for determining a subject's stage of cognitive development on his explanations of this test were adapted from Inhelder and Piaget (1958), Lovell (1961), and Schwebel (1973). They are the following:

II-A The subject does not apply any proportional scheme. He uses trial and error to determine the qualitative concentration of mixture. He uses addition and subtraction to determine the taste of mixture but makes no attempts to generalize his observations.

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*Adapted from Noelting (1975), Inhelder and Piaget (1958), Lovell (1961), Schwebel (1973), McKinnon and Renner (1971), and Juraschek (1974).

II-B The subject predicts on the basis of absolute numbers of glasses of orange juice. He does not use ratio and proportion.

III-A The subject realizes the role of metrical correspondences and generalizes the proportion rule but he cannot explain it in terms of inverse proportions.

III-B The subject knows at the start that proportions are involved, and makes correct choices with confidence. He also explains the rule in terms of inverse proportions.

Based on the criteria, each subject was classified as characteristic of one of four stages of cognitive development. Numerical scores of 1, 2, 3, and 4 were assigned to classifications lower concrete, upper concrete, lower formal, and upper formal operational, respectively.

(B) Quantification of Probabilities Test. Similar to the proportional test, not only the correct answers but also the explanations were considered to determine each subject's stage of cognitive development. The criteria for determining a subject's stage of cognitive development on this test were similar to those used by McKinnon and Renner (1971), Schwebel (1973), and Juraschek (1974). They are the following:

II-A The subject does not apply any probabilistic concept. He predicts solely on the basis of intuition or non-quantitative aspects.

II-B The subject attempts to quantify probabilties, but predicts on the basis of absolute number of marbles. He does not use ratios.

III-A The subject quantifies probabilities in most cases and compares ratios, but he is not certain that this is a suitable general method.

III-B The subject quantifies probabilities in each trial and compares ratios. He is certain of the general suitability of this method. He indicates that comparing ratios is the best way to decide.

Based on the above criteria, similar to the proportional test, the responses of each subject were classified as characteristic of one of four stages of cognitive development. Numberical scores of 1, 2, 3, and 4 were assigned to classifications lower concrete, upper concrete, lower formal, and upper formal operational, respectively.

Mean scores of Proportional Test and Quantification of Probabilities Test, for each subject, were used as a measure of cognitive development for the statistical analysis, and also to determine each subject's overall stage of cognitive development.

Kohlberg's Moral Dilemma Test*

General Procedures. The method of scoring moral reasoning of subjects was derived from the Standard Form

*Essentially taken from Kohlberg et al., 1976.

Scoring Manual of Kohlberg and his associates (Kohlberg, Colby, Gibbs, Speicher-Dubin, & Power, 1976). Stage 6 was not included in this manual, as Kohlberg et al. pointed out, partly because it is so rare in most populations and partly because a more extensive interview than the standard form would probably be required for clear differentiation of Stages 5 and 6.

The manual consists of two forms, Form A and Form B. Each form of the manual is divided into three stories; each story covers two issues which are scored separately.

According to the mannual, subjects' responses were classified by issue, concern, and stage by using criterion judgments as follows:

Some Criterion Judgments for Issue of Life (Kohlberg et al., 1976, pp. 1-21):

Stage	Moral Concern	Criterion Judgment
1B	Individual Welfare	Heinz should steal the drug to save his wife (or a stranger) because she might be a very important person who has to be saved.
2A	Individual Welfare (Consequences)	Heinz should steal for his wife if he needs or loves her and wants her to live.
2	Character and Motives	Heinz should steal for his wife because if you (or I) were in Heinz shoes you'd steal too, you'd want your wife to stay alive.
3B	Individual Welfare (Intrinsic)	Heinz should save his wife even if he doesn't love her or should save a stranger because she/he is still a human being; you should always care or try to help when a person's life is at stake.

Some Criterion Judgments for Issue of Life (continued):

Stage	Moral Concern	Criterion Judgment
4B	Individual Welfare (Intrinsic)	Heinz should steal the drug for his wife or a stranger because human life is the highest value or is of intrinsic or sacred value, regardless of whether it is of value to family, friends, etc.
4A	Contracts, Agreements, and Trust/ Role, Norms, and Obligations.	Heinz in deciding whether or not to steal the drug should take into account his marital obligations or commitment to be responsible for his wife's welfare.
5	Individual Welfare	(1) Heinz should steal the drug because of the moral or logical priority of the right to life (or value of life), in general, to the right to property (or value of property). (2) Heinz should steal the drug because the law in this case is not fulfilling its underlying purpose of protecting fundamental rights or values such as life.
5	Fairness and Equity (Equality & Equity)	Heinz should steal the drug for his wife or a stranger because the right to life should be guaranteed equally to all individuals; the right to life (or the value of life) should not be made contingent upon special considerations about particular individuals.

Some Criterion Judgments for the Issue of Law (Kohlberg et al., 1976, pp. 21-39):

Stage	Moral Concern	Criterion Judgment
1A	Sanctions	(1) Heinz should not steal the drug because if he does he will be punished, get in trouble, go to jail, etc. (2) Stealing the drug would be wrong because you may or will be caught, get in trouble, etc.

Some Criterion Judgments for the Issue of Law (continued):

Stage	Moral Concern	Criterion Judgment
2B	Reciprocity (Positive)	Heinz should not steal the drug because he wouldn't want anyone to steal from him.
3	Rulefulness/ Group Welfare	Heinz should obey the law because if people went around selfishly making decisions to suit themselves there would be chaos.
4	Interpersonal and Group Welfare	It is important to obey the law in this case or in general because laws provide order and structure in society or are set up to maintain and promote smooth social functioning or the common good.
4A	Contracts, Agreements, and Trust	Heinz or anyone ought to obey the law because if one is a member of society and benefits from its laws and institutions, then one must accept the burdens and restrictions present in society, or if one as a member of society chooses to break a law, one should be willing to pay the legal penalty.
5B	Interpersonal and Group Welfare/ Individual Welfare	The fundamental purpose of the law is the protection of individual human or civil rights. Law exists for the welfare of society as a whole, which is defined by adherence to fundamental moral principles or by the welfare of the individual members of the society, with emphasis upon their basic human rights. OR: One should act in terms of this fundamental purpose or spirit of the law rather than its literal interpretation.
5	Rulefulness	Heinz should steal the drug because the law in this case is not fulfilling its underlying purpose of protecting fundamental rights or values such as life. One should act in accordance with the ideal spirit of the law rather than with its literal interpretation.

The scoring procedures include nine steps. They are the following:

1. Read through responses and separate by issue.

2. Reread responses on the first issue, selecting responses on one concern.

3. Guess at the stage and compare response with appropriate criterion judgment, first using the summary criterion judgment list, then turning to the explicated manual version.

4. If there is a clear match, enter the score and repeat for any other scorable concerns, up to the maximum of two per stage.

5. If judgment does not match the first choice criterion judgment, return to the summary criterion judgment list. Continue making comparisons until the response is judged to be unscorable or clear, ambiguous or transitional fit.

> Clear: The subject's response matches the criterion judgment very closely or is at least as good an exemplification of the concept as are the examples listed as acceptable in the manual (Kohlberg et al., 1976, p. 7).
>
> Ambiguous: The subject's response shows some but not all required elements of the criterion concept. It could be interpreted in more than one way but seems most likely to mean what the criterion concept says (Kohlberg et al., 1976, p. 7).
>
> Transitional: The subject's response is in some respects very close in meaning to one criterion concept while in other respects it closely resembles a criterion concept at an adjacent stage. The complete idea fits neither stage exactly, but seems to fall

somewhere between the two (Kohlberg et al., 1976, p. 8).

Unscorable: The subject's response does not provide enough information to be considered reasonable approximations of any of the criterion concepts at more than two stages or at two non-adjacent stages (Kohlberg et al., 1976, p. 9).

A full point is given for a clear judgment while a half point is given to an ambiguous judgment. For transitional statements, one half point at each of the two stages is given. Two subjects classified as unscorable were eliminated from this study. Repeat for other concerns on that issue.

6. Score the second issue using the above process.

7. Assign total score to each issue.

8. Calculate moral maturity score from issue totals.

9. Assign global score.

Global and Moral Maturity Scores. Global score is a single overall score of each story and it is used to represent the subjects' moral stage. It is computed from issue totals with a weight of three given to each issue.

First, frequencies from each stage across the two issues were calculated by assigning three points to a stage each time it occurred at a pure stage issue total, two points to a stage each time it occurred as a major stage, and one point for each minor stage occurrence. Examples :

	Life	Law
Issue Totals	2(3)	3

Stage	Stage Frequency
1	0
2	2 (2 + 0)
3	4 (1 + 3)
4	0
5	0

A major and, where appropriate, one minor stage was assigned for global score. Where only one stage is shown in the issue totals, that is the global stage score for the subject. Where two stages of equal frequency are shown the global score includes both, hyphenated as in the issue totals (e.g. 2-3). In case of two stages of unequal frequency, the stage with the largest number of issue total points was assigned as the major stage, the other was assigned as the minor stage. Based on these rules, the global score assigned for the above example would be 3(2).

In order to obtain Moral Judgment Maturity Score (the MMS), multiply each stage frequency (as calculated for the global score) by the number of the stage.

$$2 \times 2 = 4$$

$$4 \times 3 = 12$$

Add the products and divide by the sum of the frequencies. Then multiply by 100.

$$\frac{16}{6} = 2.66 \times 100 = 266$$

A score of 200 indicates a pure stage 2, 300 indicates a pure stage 3. The sample score of 266 indicates a protocol

midway between stage 2 and 3 with slightly more stage 3 than stage 2.

Reliability of Scoring Methods

Since the scoring procedure for each test was relatively simple and required no training, the scoring was done by the researcher.

To evaluate the interrater reliability for the scoring of Piagetian type test, a subsample of 11 subjects was randomly selected, representing 15% of the population in this study. Response sheets of 11 subjects and observational notations of the investigator were used by investigator and one professor (who was familiar with Piaget's theory of intellectual development and especially the tests being used in this study) to assign a score independently to each of the 11 subjects on each of two problems in Piagetian type test. The interrater reliabilities, using Pearson product moment correlation, were as follows: Proportional Test, .97; Quantification of Probabilities Test, .95.

Similarly, to evaluate the interrater reliability for the scoring of Kohlberg's moral dilemma, response sheets of 11 subjects and observational notations of the investigator were used by the investigator and one male doctoral student (who was familiar with global scoring method and the manual of scoring being used) to assign a score independently to each of the 11 subjects on Kohlberg's moral dilemma. Interrater reliability, using Pearson product moment correlation was .92.

Data Analysis

The data for the total sample were coded, transferred to punched cards, and most statistical analyses were computer-performed by using Statistical Analysis System (SAS) Package (Barr, Goodnight, Sall, & Helwig, 1976).

T-tests were run on hypotheses 4 and 5, the differences between levels of cognitive and moral development in prospective secondary teachers and prospective elementary teachers.

Hypotheses 1, 2, 3, 6, 7, 8, 9, 10, 11, 12, and 13 were tested by calculating Pearson Product-moment correlation coefficients. The level of significance for all tests was .05.

Summary

In this chapter, the 13 hypotheses were stated, and the terms used were explained. A sample and data collection were also described. A detailed description of Piagetian type test, Kohlberg's moral dilemma test, and scoring methods used to determine each subject's stage of cognitive development and level of moral reasoning were presented. Reliabilities of scoring methods were also described. The methods of analyzing data were given. Statistical results and their analysis are reported in the next chapter.

CHAPTER IV

DESCRIPTION OF FINDINGS

Introduction

When evaluating the findings and conclusions of this study, one must consider the following limitations. First, this study was limited to an examination of prospective teachers who were seniors at a southern state university. Conclusions of this study are applicable only to the sample examined. Second, this study has assumed that information available on grade point averages, age, and scores on SAT was accurate. Third, the instruments used in this study were assumed to be useful measures of the level of cognitive and moral development in prospective teachers. Finally, it was assumed that each subject who participated in this study had fully understood the directions, supervised by the researcher, of the test instruments used in the present study.

The study's findings presented in this chapter are reported in two sections. First, a description of the sample, the scores obtained from both student records and through direct testing on cognitive and moral development, and an analysis of the scores received on the instruments by major categories are given. The statistical analysis of the data is presented in the second section of this chapter.

Descriptive Analysis

A compilation of the data obtained from student records indicated a broad range on each of the predictive variables utilized in this study. Of the 75 subjects, 43 were prospective elementary teachers and 32 were prospective secondary teachers. Ranges, means, medians, and standard deviations for SAT scores, grade point averages, numbers of high-school math courses taken, numbers of college math courses taken, numbers of high-school science courses taken, number of college science courses taken, stage of cognitive development, level of moral reasoning, and age are presented in Table 2.

An examination of the table illustrates that neither all of the high nor all the low scores attained on the Scholastic Aptitude Test were represented by only a few individuals. Furthermore, the means of all components did not grossly deviate from the 50th percentile. This suggests a representiveness of the sample, since mean and median scores are so close to suggest that the sample is near enough to having a normal distribution.

Stage of Cognitive Development in Prospective Teachers

The subjects' raw scores on the cognitive developmental tests ranged from 1 to 4. The mean, median, and standard deviation were 3.15, 3.0, and .85, respectively. Table 3 provides scores attained which were used to classify

Table 2

Range, Mean, Median, and Standard Deviation of All Variables

Variable	Range		Mean	Median	S.D.
	Min	Max			
SAT-Math	380	690	508	500	71.01
SAT-Verbal	330	740	491.5	480	83.31
SAT-Composite	770	1430	999.5	990	135.97
Grade Point Average	1.98	4.0	3.07	3.04	.52
High-School Math (Courses Taken)	1	5	3.24	3.0	.91
High-School Science	0	5	2.68	3.0	1.02
College Math (Courses Taken)	0	12	2.63	2.0	2.16
College Science	0	13	2.72	2.0	2.28
Piagetian Type Test	1	4	3.15	3.0	.85
Kohlberg's Moral Dilemma Test	1.5	5	3.38	3.5	.89
Age	20	34	22.85	22	2.92

Table 3

Stage of Cognitive Development on Each Piagetian Type Test of Subjects by Frequency and Percentage

Piagetian Type Test	Stage of Cognitive Development	Frequency	Percentage
Proportional Test (Test A)	1. Lower Concrete	2	2.67
	2. Upper Concrete	16	21.33
	3. Lower Formal	20	26.67
	4. Upper Formal	37	49.33
Quantification of Probabilities Test (Test B)	1. Lower Concrete	3	4.00
	2. Upper Concrete	21	28.00
	3. Lower Formal	20	26.67
	4. Upper Formal	31	41.33
Mean of Test A and Test B	1. Lower Concrete	2	2.67
	2. Upper Concrete	10	13.33
	2.5 (Post Concrete)	13	17.33

Table 3 (continued)

Piagetian Type Test	State of Cognitive Development	Frequency	Percentage
	3. Lower Formal	13	17.33
	3.5 (Transitional Formal)	8	10.67
	4. Upper Formal	29	38.66

subjects as lower concrete, upper concrete, lower formal, or upper formal as well as gives the number and percentage of subjects at each level.

An examination of Table 3 shows that on the Proportional Test, 76% of the subjects were rated formal operational level, while 24% were rated concrete operational. On the Quantification of Probabilities Test, 68% were rated formal operational, while 32% were rated concrete operational. A large percentage of prospective teachers appeared to be at the formal operational level as might be expected with a highly selected sample of prospective teachers who were about to begin their student teaching assignments.

Level of Moral Reasoning in Prospective Teachers

The subjects' raw scores on the Kohlberg's moral dilemma test ranged from 1.5 to 5. The mean, median, and standard deviation were 3.38, 3.5, and .89, respectively. Table 4 provides scores attained which were used to classify subjects as transitional from stage 1 to stage 2, stage 2, transitional from stage 2 to stage 3, stage 3, transitional from stage 3 to 4, stage 4, transitional from stage 4 to 5, and stage 5 as well as gives the number and percentage of subjects at each level of moral reasoning.

An examination of Table 4 shows that most of the population in this study has centered on stages 3 and 3.5.

Table 4

Stage of Moral Reasoning of Subjects by Frequency and Percentage

Stage of Moral Reasoning	Frequency	Percentage
Transitional from Stage 1 to Stage 2	3	4.00
Stage 2	7	9.33
Transitional from Stage 2 to Stage 3	7	9.33
Stage 3	12	16.00
Transitional from Stage 3 to Stage 4	24	32.00
Stage 4	10	13.34
Transitional from Stage 4 to Stage 5	7	9.33
Stage 5	5	6.67
TOTAL	75	100.00

Distribution of Stage of Cognitive and Moral Development in Prospective Teachers

Table 5 presents an analysis of the number of subjects within two major groupings (elementary and secondary) for the purpose of ascertaining the significance of major as an influence on cognitive and moral reasoning abilities.

A cursory analysis indicates that prospective elementary teachers tended to exceed prospective secondary teachers on lower stages of cognitive development (i.e. stages 2, 2.5, 3), while prospective secondary teachers tended to exceed prospective elementary teachers on the highest level of formal operational thinking. On the other

Table 5

Stage of Cognitive and Moral Development by Major (Elementary and Secondary)

Stage of Development	Major	Number of Subjects	Percentage
Cognitive Stage			
Lower Concrete	Elementary	0	.00
	Secondary	2	2.67
Upper Concrete	Elementary	8	10.67
	Secondary	2	2.67
Transitional from Concrete to Formal	Elementary	10	13.33
	Secondary	3	4.00
Lower Formal	Elementary	11	14.67
	Secondary	2	2.67
Transitional Formal	Elementary	4	5.33
	Secondary	4	5.33
Upper Formal	Elementary	10	13.33
	Secondary	19	25.33
Moral Stage			
Transitional from Stage 1 to Stage 2	Elementary	3	4.00
	Secondary	0	.00
Stage 2	Elementary	3	4.00
	Secondary	4	5.33
Transitional from Stage 2 to Stage 3	Elementary	3	4.00
	Secondary	4	5.33
Stage 3	Elementary	8	10.67
	Secondary	4	5.33
Transitional from Stage 3 to Stage 4	Elementary	17	22.67
	Secondary	7	9.33

Table 5 (continued)

Stage of Development	Major	Number of Subjects	Percentage
Stage 4	Elementary	3	4.00
	Secondary	7	9.33
Transitional from Stage 4 to Stage 5	Elementary	4	5.33
	Secondary	3	4.00
Stage 5	Elementary	2	2.67
	Secondary	3	4.00

hand, no significance can be attributed to major as a predictor of stage of moral reasoning. Statistical analysis of data substantiated these findings.

Statistical Analysis of the Findings

Statistical Procedures

The nature of data collected in this study dictated the use of two statistical techniques for analysis. The technique known as t-statistic provides an appropriate technique for data analysis when assuming the variances are equal in each group. Another assumption is that the t-statistic is the most powerful test when both populations have the normal distribution (Hodges et al., 1975, p. 205).

The second test, the Pearson's Coefficient of Correlation was also used as it provides a measure of relationship between continuous variables where a linear relationship between variables is assumed (Spiegel, 1961, p. 244).

Prior to testing the hypotheses in this study, the assumption that the scores were normally distributed was tested by plotting a simple frequency polygon and comparing it visually with the normal shapes (Hodges et al., 1975, p. 87). Results indicated that both populations have an approximately normal shape. Therefore, the assumption of normality could be made and the t-statistic was employed for the data analysis in this study.

Tests of Hypotheses

For convenience each hypothesis will be restated along with the presentation of the relevant data and analysis.

Hypothesis 1: There is no significant correlation between a prospective teacher's score on cognitive development and moral development.

Hypothesis 1 was tested by calculating the Pearson product-moment correlation coefficient using program SAS developed by Barr et al. (1976, p. 92). The scattergram and related data are presented in Figure 1.

The correlation coefficient of .195 presented in Figure 1 indicates that hypothesis 1 could not be rejected. There was no significant relation between levels of cognitive and moral development within the sample of prospective teachers in this study. The subjects who scored at the highest level of moral reasoning (i.e. stage 5) performed at a level of formal operational thinking. Likewise, no subject

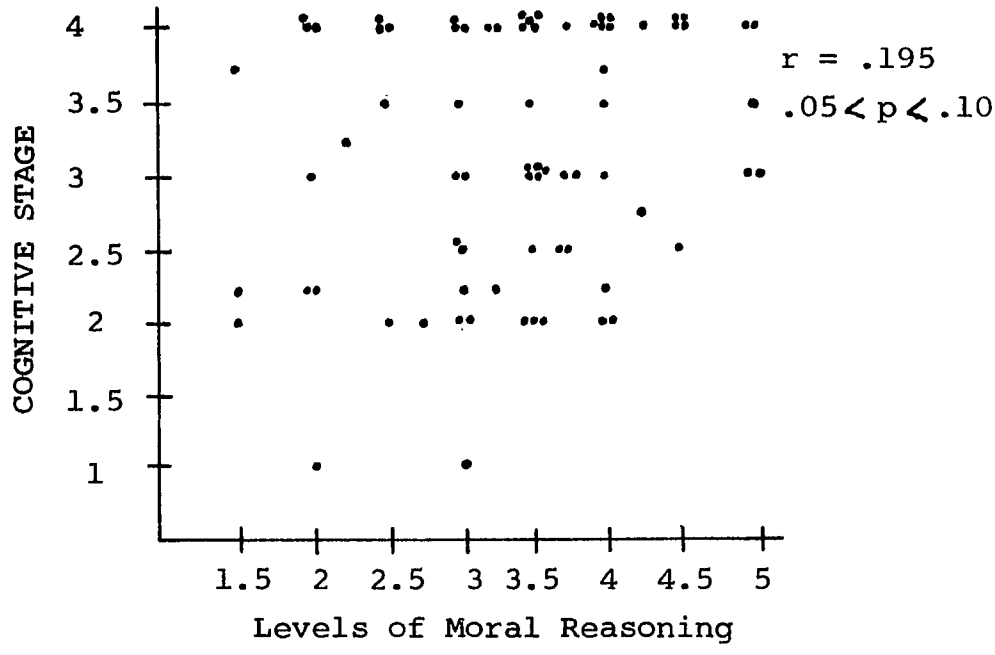

Figure 1: Scattergram and Data
Hypothesis 1

at a concrete operations was at a principled level of moral reasoning. This slight correlation, although not significant at the .05 level, suggests that formal operations are necessary but not sufficient condition for the development of principled moral reasoning. These findings are consistent with those reported by Tomlinson-Keasey and Keasey (1974) and Kuhn et al. (1971).

Hypothesis 2: There is no significant correlation between prospective elementary teachers' scores on cognitive development and moral development.

Hypothesis 2 was tested by calculating the Pearson product-moment correlation coefficient using program SAS developed by Barr et al. (1976). The scattergram and related data are presented in Figure 2.

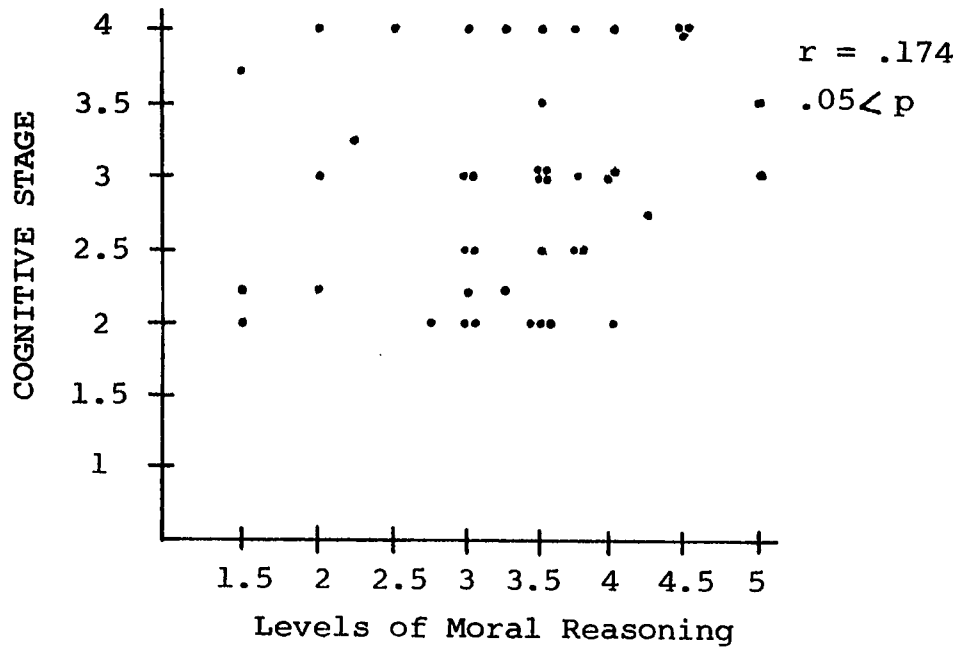

Figure 2. Scattergram and Data Hypothesis 2.

The correlation coefficient of .174 presented in Figure 2 indicates that hypothesis 2 could not be rejected. There was no significant relation between levels of cognitive and moral development within the group of prospective elementary teachers. This finding supports that which was found by Damon (1975). Further discussion of this report is presented in the next chapter.

Hypothesis 3: There is no significant correlation between prospective secondary teachers' score on cognitive development and moral development.

Hypothesis 3 was tested by calculating the Pearson product-moment correlation coefficient using program SAS developed by Barr et al. (1976). The Scattergram and related data are presented in Figure 3.

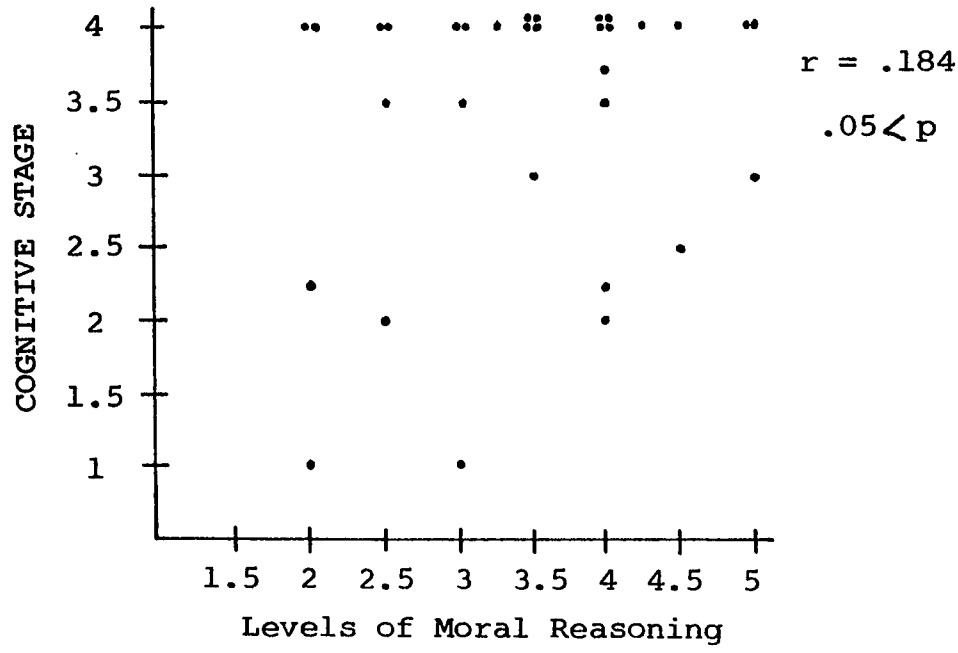

Figure 3. Scattergram and Data Hypothesis 3

The correlation coefficient of .184 presented in Figure 3 indicates that hypothesis 3 could not be rejected. There was no significant relation between levels of cognitive development and moral reasoning within the group of prospective secondary teachers. This finding is consistent with that found by Damon (1975). Further discussion of this result is presented in the next chapter.

Hypothesis 4: There is no significant difference between levels of cognitive development in prospective elementary teachers and prospective secondary teachers.

Hypothesis 4 was tested by calculating the appropriate t-statistic according to the procedure described by Barr et al. (1976, p. 275). Since the mean score of

Proportional Test and Quantification of Probabilities Test, for each subject, was used as a measure of cognitive development, all subjects were classified as having attained one of the seven stages of cognitive development as described in Chapter III. Table 6 presents the statistics related to hypothesis 4.

The t value of -2.33 for 73 degrees of freedom presented in Table 6 indicates that hypothesis 4 could be rejected. There was a significant difference between levels of cognitive development in prospective elementary teachers and prospective secondary teachers. Indeed, a mean score of 3.40 for secondary prospective teachers was higher significantly than a mean score of 2.96 for prospective elementary teachers.

Hypothesis 5: There is no significant difference between levels of moral reasoning in prospective elementary teachers and prospective secondary teachers.

Hypothesis 5 was tested by calculating the t-statistic according to the procedure described by Barr et al. (1976, p. 275). All subjects were classified as having attained stages of moral development ranged from 1.5 to 5 as described in Chapter III. Table 7 presents the statistics related to hypothesis 5.

The t-statistic of -0.78 for 73 degrees of freedom presented in Table 7 indicates that hypothesis 5 could not be rejected. There was no significant difference between

Table 6

Differences Between Cognitive Development of Prospective Elementary and Secondary Teachers (Elementary, n = 43; Secondary, n = 32)

Piagetian Type Test	Sub Sample	Mean	S.D.	F Ratio	t	Signifi-Level
Proportional Test	Elementary	3.07	0.78			
	Secondary	3.44	0.92	1.41 DF = 31,42	-1.87	NS
Quantification of Probabilities Test	Elementary	2.83	0.81			
	Secondary	3.36	0.95	1.39 DF = 31,42	-2.62	.05
$\bar{X}$ (P,Q)	Elementary	2.96	0.73			
	Secondary	3.40	0.97	1.60 DF = 31,42	-2.33	.05

Table 7

Differences Between Moral Development of Prospective Elementary and Prospective Secondary Teachers (Elementary, n = 43; Secondary, n = 32)

Sub-Sample	Mean	S.D.	F Ratio	t	Significant Level
Elementary	3.31	0.87			
Secondary	3.47	0.91	1.09 DF(31,42)	-0.78 DF(73)	NS

levels of moral reasoning in prospective elementary teachers and prospective secondary teachers.

Hypothesis 6: There is no significant correlation between prospective teachers' experiences in mathematics and their scores on cognitive development.

Hypothesis 6 was tested by calculating the Pearson product-moment correlation coefficient using program SAS developed by Barr et al. (1976). The results are presented in Table 8.

The correlation coefficients of 0.19 and 0.29 presented in Table 8 indicate that hypothesis 6 could not be rejected for experience in high-school mathematics, but could be rejected for experience in college mathematics. There was no significant correlation between stage of cognitive development and number of high-school math courses taken, while there was a significant relation between stage of cognitive development and number of college math courses taken by

Table 8

Pearson r's of Prospective Teachers' Stage of Cognitive Development and Experience in Mathematics

Cognitive Stage with	Elementary (n,43)	Signifi. Level	Secondary (n,32)	Signifi. Level	Total (n,75)	Signifi. Level
Number of High-School Math Courses	0.11	NS	0.21	NS	0.19	NS
Number of College Math Courses	-0.08	NS	0.34	NS	0.29	.05

prospective teachers. The magnitude of the correlation ($r = 0.29$), however, suggests that the relation was not very strong.

Hypothesis 7: There is no significant correlation between prospective teachers' experiences in science and their scores on cognitive development.

Hypothesis 7 was tested by calculating the Pearson product-moment correlation coefficient using program SAS developed by Barr et al. (1976). The results are presented in Table 9.

The correlation coefficients of 0.16 and 0.24 presented in Table 9 indicate that hypothesis 7 could not be rejected for experience in high-school science, but could be rejected for experience in college science. There was no significant correlation between stages of cognitive development and number of courses of high-school science taken, while there was a significant correlation between stages of cognitive development and number of college science courses taken by prospective teachers. The magnitude of the correlation ($r = 0.24$), again, suggests that the relation is not very strong.

Hypothesis 8: There is no significant correlation between age and level of cognitive development in prospective teachers.

Hypothesis 9: There is no significant correlation between grade point average and level of cognitive development in prospective teachers.

Table 9

Pearson r's of Prospective Teachers' Stage of Cognitive Development and Experience in Science

Cognitive Stage with	Elementary (n,43)	Signifi. Level	Secondary (n,32)	Signifi. Level	Total (n,75)	Signifi. Level
Number of High-School Science Courses	-0.12	NS	0.30	NS	0.16	NS
Number of College Science Courses	0.32	.05	0.14	NS	0.24	.05

Hypothesis 10: There is no significant correlation between SAT scores and level of cognitive development in prospective teachers.

Hypotheses 8, 9, and 10 were tested by calculating the Pearson product-moment correlation coefficient using program SAS developed by Barr et al. (1976). The results are presented in Table 10.

The results, as shown in Table 10, indicate that hypothesis 8 and hypothesis 9 could be accepted, while hypothesis 10 could be rejected. Pearson correlations for prospective teachers between stage of cognitive development and Age (.09) and GPA (.21) were not significant while that with SAT-math (.58), SAT-Verbal (.49), and SAT-Composite (.60) scores were significant at the .05 level.

Within the group of prospective elementary teachers, the rs between stage of cognitive development and Age (.11), GPA (.20), SAT-Math (.41), and SAT-Verbal (.34) were not significant, while that with the SAT-Composite was significant at the .05 level.

Hypotheses 11: There is no significant correlation between Age and level of moral reasoning in prospective teachers.

Hypothesis 12: There is no significant correlation between GPA and level of moral reasoning in prospective teachers.

Table 10

Pearson r's of Prospective Teachers' Stage of Cognitive Development and Age, GPA, and SAT Scores

Cognitive Stage with	Elementary	Signifi. Level	Secondary	Signifi. Level	Total	Signifi. Level
Age	0.11 (n = 43)	NS	0.14 (n = 32)	NS	0.09 (n = 75)	NS
GPA	0.20 (n = 43)	NS	0.26 (n = 32)	NS	0.21 (n = 75)	NS
SAT-Math	0.41	NS	0.62	.01	0.58	.0001
SAT-Verbal	0.34	NS	0.53	.05	0.49	.001
SAT-Composite	0.47 (n = 22)	.05	0.63 (n = 18)	.01	0.60 (n = 40)	.0001

Hypothesis 13: There is no significant correlation between SAT scores and level of moral reasoning in prospective teachers.

Hypotheses 11, 12, and 13 were tested by calculating the Pearson product-moment correlation coefficient. The results are presented in Table 11.

The results, as presented in Table 11, indicate that hypothesis 11 and 12 could be accepted while hypothesis 13 could be rejected. There was no significant relation between levels of moral reasoning and ages in prospective teachers. Likewise, there was no significant correlation between levels of moral reasoning and grade point average of prospective teachers. On the other hand, there was a significant correlation between levels of moral reasoning and Scholastic Aptitude Test (SAT) Composite scores. However, a breakdown of SAT scores reveals no significant correlation between levels of moral reasoning and SAT-Math and SAT-Verbal at the .05 level.

Interestingly, levels of moral reasoning were significantly correlated to SAT-Math, SAT-Verbal, and SAT-Composite scores among the group of prospective elementary teachers at the .01 level but neither of these correlations was significant among the group of prospective secondary teachers. It should be noted that the group of prospective secondary teachers consistently had greater variability than prospective elementary teachers in both moral developmental

Table 11

Pearson r's of Prospective Teachers' Level of Moral Reasoning and Age, GPA, and SAT Scores

Cognitive Stage with	Elementary	Signifi. Level	Secondary	Signifi. Level	Total	Signifi. Level
Age	0.25 (n = 43)	NS	0.05 (n = 32)	NS	0.17 (n = 75)	NS
GPA	0.04 (n = 43)	NS	0.25 (n = 32)	NS	0.13 (n = 75)	NS
SAT-Math	0.57	.01	0.01	NS	0.28	NS
SAT-Verbal	0.63	.01	0.03	NS	0.29	NS
SAT-Composite	0.76 (n = 22)	.0001	0.02 (n = 18)	NS	0.33 (n = 40)	.05

levels and SAT scores (twice as large a standard deviation of SAT-Composite scores of prospective secondary teachers than of SAT-Composite scores of prospective elementary teachers). A more complete discussion of these results is presented in the next chapter.

Summary of Findings

Hypotheses 1, 2, 3, and 5 were not rejected at the .05 level of significance, while hypothesis 4 was rejected at the .05 level. For hypothesis 4, the t-statistic was significant at the .05 level. Mean cognitive stage of 3.40 for prospective secondary teachers was higher significantly than that of 2.96 for prospective elementary teachers.

The test of hypothesis 6 revealed a significant, but low, correlation of .29 between stage of cognitive development and number of college mathematics courses taken. But the correlation of .19, between stage of cognitive development and number of high-school mathematics courses taken, was not significant at the .05 level.

Similarly, the test of hypothesis 7 revealed a significant, but low, correlation of .24 between stage of cognitive development and number of college science courses taken, while there was no significant correlation between stage of cognitive development and number of high-school science courses taken by prospective teachers in this study.

For hypotheses 8, 9, and 10, Pearson correlations between stage of cognitive development and Age and Grade

Point Average of prospective teachers were not significant while that with SAT-Math, SAT-Verbal, and SAT-Composite scores were significant at the .05 level.

Finally, for hypotheses 11, 12, and 13, Pearson correlations for prospective teachers between level of moral reasoning and Age, Grade Point Average, SAT-Math, and SAT-Verbal were not significant while that with SAT-Composite score was significant at the .05 level.

A more complete discussion of these findings is presented in the next chapter.

CHAPTER V

DISCUSSION, SUMMARY, AND SOME THOUGHTS ON THE IMPLICATIONS FOR TEACHER TRAINING

Discussion of Findings

This dissertation is concerned with gathering data on stages of cognitive development, levels of moral reasoning, chronological age, experiences in mathematics and science, grade point average, and SAT scores of prospective teachers. Data from this study was presented in Chapter IV and in this chapter, the findings are further discussed and analyzed.

The first aspect presented relates to cognitive development in prospective teachers, including the stages of cognitive development and the variables which serve as poor and good predictors of cognitive development. Second, findings pertinent to moral development in prospective teachers are presented. The third aspect presented is the relationship of cognitive development and moral development in prospective teachers.

Major Findings in Relation to Cognitive Development in Prospective Teachers

The level of cognitive development in prospective teachers in this study, as measured by Piagetian type test, is between the lower and upper levels of formal operations but the mean is closer to the lower level (3.15). This is not consistent with the evidence reported by McKinnon and

Renner (1971) and Schwebel (1973) that a majority of college students were classified as concrete operational thinkers.

This might be a function of the sample in the present study. All subjects involved in this study were college seniors who were about to begin their student teaching assignments, while subjects in McKinnon and Renner (1971) and Schwebel (1973) were college freshmen. In addition, the mean SAT scores, both mathematical and verbal, of subjects in this study were above average, as compared to means for all candidates taking the SAT from 1956-57 through 1968-69, as reported by William H. Angoff (1971, p. 92).

Within the group of prospective elementary teachers, the mean score of cognitive development approaches the lower level of formal operations (2.96). This is consistent with the evidence reported by Juraschek (1974) that a majority of prospective elementary teachers were classified as concrete operational thinkers. The group of prospective secondary teachers involved, on the other hand, performed somewhere between the lower and upper levels of formal operations but the mean is closer to the lower level (3.40). The mean of Piagetian type test score (3.40) for prospective secondary teachers is significantly higher than the mean score (2.96) for prospective elementary teachers (Table 6).

Since the sample of prospective secondary teachers in this study has a significantly higher score than the prospective elementary teachers, it is worth comparing their

backgrounds of relative ability and their academic performances to note the effects of their "advantages" and "disadvantages." These findings are strongly supported by a background of the relative ability of these prospective teachers, at least in terms of standard criteria. Based on SAT means scores for all candidates taking from years 1956-57 through 1968-69, as reported by William H. Angoff (1971), prospective secondary teachers in this study are above average on both SAT-Math and SAT-Verbal (SAT-Math = 531.1; SAT-Verbal = 515.5), while prospective elementary teachers are about average on SAT-Verbal and slightly below average on SAT-Math (SAT-Verbal = 471.8; SAT-Math = 489.1).

In addition, the grade point average for prospective secondary teachers is slightly lower than that of prospective elementary teachers. This might be a function of such attributes as differences in sex role expectations or such attributes as differences in patience, conformity, and conscientiousness that contribute to academic success. The fact that the percentage of female subjects within the group of prospective elementary teachers is higher (97.7%) than that of female subjects within the group of prospective secondary teachers (62.5%) might bear on the reason for the differences.

What are good predictors of cognitive development in prospective teachers? Findings from this study indicate that SAT scores, number of college math courses taken,

number of college science courses taken seem to be good predictors, while age, grade point average, number of high-school math courses taken, and number of high-school science courses taken seem to be relatively poor predictors of cognitive development in prospective teachers.

SAT scores appear to be correlated with cognitive development in prospective teachers. This conclusion is in conflict with that of Schwebel (1973) who found no relation between cognitive development and SAT-Composite scores in his sample of college students. In the present study, the correlation between Piagetian type test scores and SAT-Composite scores was .60. Considering the nature of the Scholastic Aptitude Test, SAT scores (at least SAT-Math scores) should correlate fairly well with performance on the Piagetian type test normally used to distinguish concrete from formal operational thinking. In their explication of the SAT, Donlon and Angoff (1971) state:

> In mathematical material the test has moved away from the curriculum-oriented type of item to items that depend more heavily on logical reasoning and on the perception of mathematical relationships (p. 16).

Possibly, the discrepancy between Schwebel's (1974) finding and that of the present study is related to the different sex ratios in the two samples examined. His sample contained 51% male subjects, but the sample with SAT scores available in the present study contained only 15% male subjects. However, since Schwebel did not report data on the

relation between cognitive development and SAT scores by sex, an explanation of the above disagreement in results must await further research.

As in the Juraschek (1974) and Schindeler (1976) studies, there is no relation between age and cognitive development. However, this is not consistent with the evidence reported by Elkind (1962) that suggested an increase with age in the ability of college females to solve problems dealing with conservation of volume.

Because of the age range (20-34) of the subjects considered in the present study, one would not anticipate any significant increase with age in Piagetian type test scores. Most intellectual growth curves tend to level off around late adolescence, and many studies have found negative correlations between age and traditional measures of intelligence (Guilford, 1967). In addition, there is evidence for a decline in the more complex measures of cognitive functioning with advancing age (Papalia, 1972; Clayton and Overton, 1976). Therefore, the absence of a relation between age and cognitive development among prospective teachers is consistent with most of the literature on intellectual growth.

Grade point average was found to be a poor predictor of cognitive development in prospective teachers involved in this study. This agrees with the similar findings of Kolodiy (1975) concerning college students in general. As

Kolodiy (1975) points out, this may be due to the observation that college grades are related to the ability to verbalize answers, either by impressing instructors in classroom discussion or on exams, and not to cognitive processes.

The findings also suggest that the experiences of high-school mathematics and science do not themselves have material effect upon the development of formal operational thinking in prospective teachers even though the correlations between cognitive development and number of college math and science courses taken were significant at the .05 level. The magnitudes of correlations, however, suggest that the relations were not very strong (.29 and .24 with numbers of college math and science, respectively).

In summary, the principal findings related to cognitive aspects of prospective teachers in this study are that a substantial number of prospective teachers in the sample were found to be at the lower formal operations (mean = 3.15), with the mean of 3.40 for prospective secondary teachers higher than that of 2.96 for prospective elementary teachers significantly. Their scores in SAT were strongly correlated (SAT-Math: r = .58; SAT-Verbal: r = .49; SAT-Composite: r = 60) with levels of cognitive development. Also, within this group, the number of college mathematics and science courses taken correlated slightly (r = .29 and r = .24, respectively) with levels of cognitive development. But no significant correlations were found between levels of

cognitive development and numbers of high-school math and science courses taken, grade point average, and chronological age.

Major Findings in Relation to Moral Development in Prospective Teachers

Percentages of subjects on each stage of moral development are presented in Table 12.

Table 12

Distribution of Levels of Moral Reasoning of Prospective Teachers by Major

Level of Moral Reasoning	Elementary	%	Secondary	%	Total	%
1.5	3	4.00	0	0.00	3	4.00
2	3	4.00	4	5.33	7	9.33
2.5	3	4.00	4	5.33	7	9.33
3	8	10.67	4	5.33	12	16.00
3.5	17	22.67	7	9.33	24	32.00
4	3	4.00	7	9.33	10	13.33
4.5	4	5.33	3	4.00	7	9.33
5	2	2.68	3	4.00	5	6.68
TOTAL	43	57.35	32	42.65	75	100.00

Compared with other studies, it was found that the percentage of the highest stage of moral reasoning in the present study is higher than that found by Broughton's (1975) in his cross-sectional investigation. However, the

sample in Broughton's study contained not only undergraduate and post-graduate subjects but also students at ages 10, 14, and 18, while the sample examined in the present study contained only undergraduate subjects whose age ranged from 20 to 34 years.

It was found that a majority of prospective teachers involved in this study, as measured by Kohlberg's Moral Dilemma Test, were between stage 3 and stage 4 of moral reasoning but the mean is closer to stage 3. Since the sample of this study consisted largely of female subjects, this supports the findings reported by Holstein (1973) that females typically remain at about stage 3 into middle age. Kohlberg and Kramer (1969) also reported that women are more likely to settle at the conventional level. One initial plausible explanation of this finding, as Holstein (1973) points out, would be the result of Kohlberg's preoccupation with a moral hierarchy based on justice rather than love, where the former is an issue more relevant to men than to women whose primary concern as wives and mothers are with love. Because Kohlberg (1973) has explicitly stated that Stage 5 and Stage 6 are adult stages, stages which people attain somewhere around 24 years of age and the mean age of subjects in this study was 22.85, one would not anticipate finding a majority of prospective teachers in this study performing at the advanced stages of moral reasoning. Therefore, it is quite clear that this conclusion is

consistent with most of the literature on moral development concerning adults in general.

Academic major does not appear to affect moral reasoning in prospective teachers. Although the level of moral reasoning of prospective secondary teachers (3.47) was slightly higher than that of prospective elementary teachers (3.31), the difference was not statistically significant.

The SAT-Composite score was the only factor that was found to have a predictive value in the determination of moral reasoning in prospective teachers. Although the correlation of .33 between these two variables was significant, its magnitude suggests that the relation was not very strong.

Interestingly, within the group of prospective elementary teachers there were significant correlations between level of moral reasoning and SAT-Math, SAT-Verbal, and SAT-Composite scores, while none of these correlations were found within the group of prospective secondary teachers. It seems that the discrepancy between these two groups of prospective teachers is subject to several different but not conflicting interpretations. For one, prospective secondary teachers consistently had greater variability than prospective elementary teachers in both moral reasoning and SAT scores (twice as large a standard deviation of SAT-Composite score of prospective secondary teachers than that of prospective elementary teachers). This might be attributed to

the greater variety of learning experiences typically encountered by prospective secondary teachers as compared to prospective elementary teachers in teacher training institutions. For another, this result might be related to the different sex ratios in the two groups examined. The group of prospective secondary teachers contained 20 females and 12 males, while the prospective elementary teachers' group contained 42 females and only one male. However, it is by no means clear how this variable would relate to the finding.

As with cognitive development, grade point average was not significantly correlated with moral development. Kohlberg (1973) has maintained that, "the experiences which generate stage movement have a strong general and symbolic component; they are experiences involving thinking" (p. 193). If this is indeed the case, then the lack of significant correlation between grade point average and moral development, found in this study, seems to indicate that academic success is not associated with level of moral reasoning to the same extent as experiences involving the kind of thinking that Kohlberg has in mind. However, lack of other studies reporting a relationship between grade point average and moral development makes generalization in this area very difficult.

Age was not found to be closely correlated with moral development in prospective teachers in this study. This

agrees with the findings of Claren Richard Coder (1975) concerning adults in general. This conclusion does not contradict Kohlberg's (1973) finding that there are adult stages but has helped to establish it. Kohlberg (1973) concluded that Stages 5 and 6 are adult stages, which, if people attain, they attain in adulthood, somewhere around 24 years of age. He was not contending that the mean stage for adults is five or six. As indicated earlier in this paper, prospective teachers gave responses on Kohlberg's Moral Dilemma at all stages, with some subjects at stage 2, some at stage 3, some at stage 4, and still others at stage 5. Prospective teachers in this study were found at all stages. Then, the question about how to account for the stage variation among prospective teachers is still very much an open one.

In summary, findings pertinent to moral development in prospective teachers reveal that a substantial number of prospective teachers in this study were found to be at between Stages 3 and 4 but the mean is closer to Stage 3 (3.38). There was no significant difference between prospective secondary teachers and prospective elementary teachers in levels of moral reasoning. And the SAT-Composite scores were the only variable seen to correlate significantly with moral reasoning in the total sample. Examination of age and grade point average indicated that these variables served as poor predictors of scores on Kohlberg's Moral Dilemma Test.

Major Findings in Relation to the Relationship of Cognitive and Moral Development in Prospective Teachers

Correlation coefficients between cognitive development and moral reasoning in prospective teachers are presented in Table 13.

Table 13

Pearson r's of Stage of Cognitive Development and Level of Moral Reasoning in Prospective Teachers

Major	Correlation Coefficient	Significant Level
Elementary (n = 43)	.174	NS
Secondary (n = 32)	.184	NS
Total (n = 75)	.195	NS

The absence of a significant correlation between stages of cognitive and moral development in this study is initially surprising in the light of findings reported by Lee (1971) that there was a substantial correlation between cognitive progress and a measure of moral judgment in his sample of 195 boys from kindergarten through twelfth grade. Damon (1975), on the other hand, found no relation between cognitive development and moral development in his sample of subjects aged 6 to 8 years. Lack of other studies including

college students or adults in general makes generalizations in this area very difficult.

However, Tomlison-Keasey and Keasey's (1974) suggestion that "formal operations are necessary but not sufficient condition for the development of principled moral reasoning" (p. 296), is supported by an examination of some data not discussed so far. All the prospective teachers who scored at the highest level of moral reasoning (i.e. stage 5) performed at the level of formal operations, but not all formal operational thinkers performed at the highest level of moral reasoning. This conclusion is clearly indicated by the scattergram shown in Figure 1.

Summary of Data

This study was designed to examine the differences and similarities among teacher education students at a southern state university in stages of cognitive development and moral reasoning, as well as the relations between levels of cognitive and moral development and chronological age, experiences in math, experiences in science, grade point average, and SAT scores.

Seventy-five prospective teachers (43 elementary school majors, 32 secondary school majors) were administered Piagetian Type Test and Kohlberg's Moral Dilemma Test between January 26, 1977 and February 7, 1977. Information about sex, age, experiences in mathematics and science, GPA, and SAT scores of subjects were also collected.

Based on the statistical results presented in Chapter IV and other data collected, the following conclusions are made.

1. For a total sample examined in this study, there is no significant relation between levels of cognitive development and moral development. However, when examined separately, it was found that the subjects who scored at the highest level of moral reasoning performed at a level of formal operations. Likewise, no subjects at a level of concrete operations were at the highest level of moral reasoning. This supports the findings reported by Tomlinson-Keasey and Keasey (1974) and Kuhn et al. (1971) that formal operations are necessary but not sufficient condition for the development of principled moral reasoning. This is clearly indicated by the scattergram shown in Figure 1.

2. Within the group of prospective elementary teachers there is no significant correlation between stage of cognitive development and the level of moral reasoning.

3. Within the group of prospective secondary teachers there is no significant correlation between stage of cognitive development and level of moral reasoning.

4. A mean score of prospective secondary teachers (3.40) was higher significantly than a mean score of prospective elementary teachers (2.96) in cognitive development. This is clearly indicated by the data shown in Table 5. One explanation for this difference is that prospective

secondary teachers, in this study, were more likely to have higher scores on SAT than were those prospective elementary teachers.

5. The null hypothesis that there was no significant difference between levels of moral reasoning in prospective secondary teachers and prospective elementary teachers was supported. Indeed, it is probable that the ability to reason morally requires experiences involving thinking, not simply logical experiences that can be found in typical classrooms at teacher training institutions.

6. Partly supported was the hypothesis that there was no significant correlation between prospective teachers' experiences in mathematics and scores on cognitive development. Cognitive development of prospective teachers in this study was related to number of courses of college mathematics taken, but not related to number of high-school mathematics courses taken.

7. There was no significant correlation between stages of cognitive development and number of high-school science courses taken, while there was a significant correlation between stages of cognitive development and number of college science courses taken by prospective teachers. The magnitude of correlation ($r = .24$), however, suggests that the relation was not very strong.

8. Within the group of prospective teachers in this study, there was no significant relation between age and

cognitive development. This agrees with the similar findings of Juraschek (1974).

9. There was no significant relation between grade point average and cognitive development in prospective teachers. This agrees with that reported by Kolodiy (1975) concerning college students in general.

10. Scholastic Aptitude Test score was well correlated with stage of cognitive development in prospective teachers in this study. This is not consistent with the evidence reported by Schwebel (1973) that there was no relation between cognitive development and SAT-Composite scores in his sample of college students.

11. There was no significant relation between age and level of moral reasoning in prospective teachers. This agrees with the evidence reported by Coder (1975) concerning adults in general. However, because of age-range (20-34) of the subjects considered in this study, one would not anticipate any significant increase with age in Kohlberg's Moral Dilemma scores.

12. There was no significant relation between grade point average and level of moral reasoning in prospective teachers.

13. SAT-Composite score seemed to serve as a probable index for moral development in prospective teachers. Although the correlation of .33 between SAT-Composite score and level of moral reasoning was significant, its magnitude suggests that the relation was not very strong.

Interestingly, it was found that, when examined separately, there were significant correlations between level of moral reasoning and SAT-Math, SAT-Verbal, and SAT-Composite score within a group of prospective elementary teachers. But none of these correlations was found within a group of prospective secondary teachers.

Suggestions for Further Research

The implications for further investigations in the area of this study are many but several seem to require noting.

1. The effect of level of teacher's cognitive functioning on the level of student's cognitive functioning should be extensively and intensively investigated. Daniels (1976) investigated the relationship between level of teacher's cognitive functioning and level of children's cognitive functioning during free play in preschool children. His results suggest that research in this area with older children would be fruitful.

2. It is hard to interpret what accounts for the stage of moral development of subjects in this study. However, one explanation would be that these prospective teachers lack certain experiences. It would be interesting to see whether their stages of development would be changed after three or four years of teaching experience which could produce more understanding of the children they teach. What is needed, then, is a follow-up study of this group of

prospective teachers in particular and studies of a longitudinal nature in general.

3. The methods of this study should be used with samples from different populations to determine the relationship between cognitive and moral development, as well as the extent of the relations between these two variables and SAT scores. The samples should include approximately equal numbers of male and female subjects.

4. The fact that age was not a prime indicator of both cognitive and moral development as demonstrated in this study indicates that there is a need for further exploration of the concept that age is a variable which is useful as an index of cognitive functioning amongst mature people. However, a wide age-range of subjects is needed for an analysis of developmental trends.

5. Since research on cognitive and moral development in experienced teachers has not yet appeared in the literature, the need for research in this particular occupation is obvious. Furthermore, analyses of specific life experiences (subjects of teaching, grades of teaching, number of years teaching, type of school, marital status, etc.) which enhance or retard cognitive or moral development in teachers would be fruitful.

6. Can intervention increase the level of cognitive and moral development in prospective teachers? Which kind of intervention will have most change effects? Would there

be more change among the prospective secondary teachers or prospective elementary teachers, or would change be the same in both groups? To help answer these questions, experimental research which carefully studies the influence of different types of intervention and their effects on cognitive and moral development in prospective teachers is needed.

7. The relations between cognitive and moral development and perceived social role in prospective teachers should be investigated. Such information would help explain the differential attainment of formal operations and principled moral reasoning by males and females, as well as sex differences in mathematics achievement (Fennema, 1974).

8. Mathematics course content and activities should be analysed to determine which types of reasoning are demanded. Content and activities that demand the use of formal structures should be identified. Karplus (1973) has attempted similar analysis of science course activities.

Some Concluding Thoughts on the Implications for Teacher Training

Even though this present study involved a limited sample whose representiveness may be open to question, it is possible to draw some implications for teacher training. The significance of developmental theories, the lack of knowledge about implications of developmental theories for teacher training, and the present state of what might be called "developmental education" are sufficient causes to

encourage this writer to share insights gathered from the study.

Who should become a teacher? Can any person be an effective teacher, or should they be developmentally (i.e. cognitively and morally) "advanced" and "ready" before being considered competent to teach children? How important are cognitive and moral reasoning abilities for a teacher? Certainly, the issues raised here are not endemic to teacher training alone but rather they concern the whole educational system. Investigation of the present study reveals some possible avenues that might be considered to relate to teacher training.

Findings from this study suggest that even among above average prospective teachers (with regard to SAT scores) there exists wide variability in cognitive functioning, with the majority of subjects at the lower formal operations for cognitive development and at the conventional stages (Stages 3 and 4) for moral reasoning. One might ask: How important are these capacities for a teacher? What is the disadvantage of prospective teachers who are not at the upper level of formal operations?

It would seem appropriate to use Piaget's definition of cognitive developmental stages to explain, at least partially, the behavior and effectiveness of prospective teachers involved in this study. According to Piaget, a concrete operational thinker accepts the givens as reality

because he or she is stuck with them; that is all he/she has available to him/her. In this study and presumably in any of his/her subject fields he/she is lost if an author or a professor fails to provide every step in a logical process. With these limitations a prospective teacher must resort to memory, that is, to meaningless (or only partly meaningful) memorization of the conclusions and problem-solving methods without understanding the process which can then be applied only by rote fashion to familiar problems. Prospective teachers at the lower level of formal operations have considerably less of a disadvantage than those at the concrete operational stage. Their handicaps are nonetheless substantial. In particular, they will lack an organized plan to solve the problem at hand which the individual at the advanced level of formal operations proceeds to carry out systematically.

In light of this, the teacher educator should assume responsibility for several other areas of knowledge. At least, learning experiences for prospective teachers, especially for prospective elementary teachers, should be directed more toward the individual than the group; the traditional lecture method is probably an inefficient learning technique for all except the very highest level of students, and "learning might proceed via a more even balanced approach of listening, talking, and thinking" (Kolodiy, 1975, p. 22). Whatever mode of instruction one believes in,

if there exists an awareness of the level of cognitive functioning, one can then proceed to plan educational activities on a more informed basis.

Findings from this study also indicate that a majority of prospective teachers remain in the conventional level (stage 3 and 4) of moral reasoning. This agrees with Sullivan and Beck's (1976) conclusion that, "a predominance of teachers remain for the most part in the conventional stages (stages 3 and 4) of morality" (p. 232). As Sullivan and Beck point out, this might be symtomatic of a more general problem with most teacher training institutions (i.e., they are "fortresses of conventional norms"). Of course, it is quite reasonable for teachers to be trained conventionally and effectively. There are, in fact, many questions on teaching effectiveness that remain unanswered.

Research on the characteristics of teachers that have been empirically shown to relate to classroom effectiveness is, at best, ambiguous. There is no empirical evidence, for instance, that achievement in college mathematics courses is related to the ability to teach mathematics in the classrooms. There is no empirical evidence that knowledge of the psychology of learning is related to the ability to teach anything in the classroom. Although there is an evidence that "level of teacher's cognitive functioning affected the level of children's cognitive functioning during free play in preschool children" (Daniels, 1976), very little of this research has appeared in the literature.

However, let me propose the definition which Joyce and Harootunian (1967) have offered:

> While we are not at all certain what . . . combination of qualities makes a good teacher, the potentially better teacher is one who is able to plan and control his professional behavior to teach many kinds of lessons, to reach many diverse learners, to create different climates and to adapt a wide range of teaching strategies to constantly changing conditions (p. 94).

This definition implies that the effective teacher will differ from the ineffective teacher primarily in his/her ability to adapt his/her behavior to the students, the purpose, and the situation in which he/she operates. It would seem difficult for concrete operational teachers to put themselves in this kind of role since they are limited to that which is presented to them and, more important, they are unable to handle the problems of situations which are not familiar to them. Consequently, it would seem difficult for stage 4 conventional, "law and order" teachers to put themselves in this role because, as Sullivan and Beck (1976) point out, "there will be a latent fear that if the teacher does not have all the answers, his classroom authority will be eroded" (p. 231).

With regard to the definition of teacher effectiveness proposed by Joyce and Harootunian, I wonder if we are satisfied with what we have or where we are now. If not, what is desirable, then? What kind of teachers do we need? According to Joyce and Harootunian, an effective teacher is one

who is able to teach many kinds of lessons, to reach many diverse learners, to create different climates, and to adapt a wide range of teaching strategies. Since the stage of formal operations is characterized by "the subject's capable of reversibility, flexibility, and the consideration of all possibilities," (Tomlinson-Keasey and Keasey, 1974, p. 292) then a "formal operational" teacher would seem to meet, at least partially, the requirement of this role. It would seem reasonable to hypothesize that an ability acquired during formal operations, such as a consideration of all possibilities, would help a teacher to think of answers other than the conventional ones when faced with a moral dilemma. Furthermore, McGeorge (1976) and Sullivan and Beck (1976) suggest that postconventional teaching is a necessary ingredient for the development of a truly moral atmosphere in the classroom.

McGeorge (1976) states that

> While the cognitive-developmental account of moral development has been presented as the gospel which offers the would-be moral educator salvation from the errors of unjustified dogmatism on the one hand and illogical relativism on the other (Kohlberg, 1970), the educational prescriptions which dangle from descriptions the stage sequence depend on teachers themselves grasping the theory or, at the very least, attaining a fair degree of principled thinking themselves. Teachers who meet the first of these requirements would presumably be able to effectively conduct planned or incidental discussion to stimulate their pupils' development through the stages. Teachers who have advanced beyond the conventional level would be required if the moral atmosphere of the school is to be one of justice and impartiality rather than conventionality, authority, or conformity (p. 271).

Consistent with McGeorge, Sullivan and Beck (1976) state that

> We are also struck by the possibility of the teacher's moral level influencing the classroom discussion. Our own conviction is that teachers at a postconventional level of morality are needed to stimulate higher levels of moral reasoning in students (p. 231).

These statements and some findings from this study lead me to believe that the implications for teacher training seem to lie not only in providing an understanding of developmental theory to prospective teachers but also in its contribution to the teacher's own level of cognitive and moral development. Consequently, the possibility that the prospective teacher is capable of achieving the top level of cognitive and moral development seems to be a moot question. To the extent that educational systems seek to enable individuals to enlarge their intellectual capacities, I personally feel that the attainment of that level ought to be an objective kept in mind in planning educational experiences. Furthermore, facilitating the development of the highest levels of thinking probably does call for changes both in the nature of learning experiences and in teacher training institutions themselves. These two are, in fact, inseparable, with the latter having great impact on the former, that is on the outlook of teacher educators, their teaching methods and expectations, and the reciprocal behavior of prospective teachers.

Another set of implications of this research has to do with some policy issues of teacher training programs. I personally feel that there are at least three possibilities for using developmental theory which teacher training programs might consider.

First, I suggest that teacher training programs consider screening on developmental dimensions, i.e., levels of cognitive and moral development. If a teacher training institution accepts the very basic tenets of what Piaget and Kohlberg are saying, i.e., (1) that cognitive and moral growth proceed in certain stages; (2) that these stages occur in the same order in all individuals; and (3) that each stage is characterized by the ability to perform certain mental functions and the inability to perform others (Piaget, 1952, 1963; Kohlberg, 1976), then it can proceed to develop selection standards based on these principles. Of course, these schema are theoretical ones and are not, by any means, the only theoretical framework available. These theories, like others, remain relatively untested and their validity is subject to serious question and deserve further critical inquiry. The implications I am suggesting are offered under the broad assumption that these theories are viable and have sufficient validity to warrant acting on them.

In so doing, however, teacher training institutions may have to consider their own programs of teacher

preparation as to how well they prepare students for programs where they are screened. In addition, simpler test instruments which reliably and validly measure development in prospective teachers need to be further developed. Such instruments would be useful in place of time-consuming clinical interviews. Hopefully, this device could help the complex and critical selection process.

Second, developmental theory probably can be used as a diagnostic device in teacher training. Inhelder and Piaget (1958) have said that not until one attains the final stage, formal operations, is he capable of understanding and assimilating many of the abstract concepts. In other words, if the assimilation of many concepts requires formal thought and the student does not firmly possess such thought, learning will be difficult and incomplete. Thus, it is desirable that instruction and content should be suited to the learner's level of cognitive development. There is, I suspect, a disparity between teacher educators' impression of the students' cognitive level and the actual cognitive level of the students. This disparity will frequently result in mutual dissatisfaction, frustration, and the unwillingness to alter expectations and procedures. To determine what experiences they can provide to make teacher training more meaningful for developmental aspects, I am suggesting that teacher educators should take

into consideration the wide range of individual developmental differences. Until such differences are taken into consideration, perhaps traditional instruction techniques and the assumptions upon which they are based will result in less learning than is potentially possible.

Of course, there are many other techniques that can be used to diagnose individual differences. But the measures of cognitive and moral development can be used not only to determine cognitive and moral development but also as a basis for selecting appropriate learning experience for students. Furthermore, the information provided by these measures can be used to group prospective teachers or to place student teachers with probably more appropriate schools or classrooms with regard to their developmental levels. In addition, this whole process can also be experienced as a "model" for prospective teachers. In order to serve this function, though, a teacher educator should be highly developed cognitively and morally, and plan and demonstrate his/her teaching strategies and techniques by using this device in the way that he/she expects prospective teachers to use it in their classrooms. A developmental teacher educator will, by his/her every word and act, set an example that will speak louder than any preachment.

Finally, the most important thread that has run throughout the findings reported here is that teacher training should take into consideration the importance of

conducting extensive and systematic studies in this area. As indicated previously, research on cognitive and moral development in teachers or even prospective teachers is very sparse. Furthermore, the need for empirical data indicating how teachers' levels of development are related to students' cognitive functioning is particularly important. It is to be hoped that, even if no crash program of research is initiated, there will be a substantial and continuing increase in organized research in teacher cognitive and moral development until the gap between what we know and what we need to know is much smaller.

However, the most vital link in the process of improving teacher effectiveness, i.e., cognitive and moral development, is probably not the research worker, or the teacher educator, but the teacher himself/herself, systematically implementing research findings in his/her own behavior and assessing the effects it has on his/her students.

A Concluding Caveat

The results of this study have provided empirical evidence that what was perhaps a suspicion among teachers of prospective teachers is indeed a fact; that is, many of these prospective teachers are at the lower formal operational and/or at between Stage 3 and Stage 4 of Kohlberg's moral reasoning. Also, it was found that the cognitive and moral development of these prospective teachers are very

likely related to their abilities in the Scholastic Aptitude Test. It would be premature and ungrounded, however, to conclude that these results will indicate the effectiveness in teaching of these prospective teachers. Teaching is a complex process and involves more than can be explained only by the developmental theories of Piaget and Kohlberg. Only further investigation in this area, investigation fusing the most relevant aspects of all teaching and learning-related theories, can provide needed insight and answers.

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APPENDIX A

ANSWER SHEET FOR PIAGETIAN TYPE TEST

Name_____ Sex_____ Date_____

Date of Birth_____ Grade (teaching/will teach)_____

Class_____ Major_____ Minor_____

Classification_____ Date Entered UNC-G_____

GPA_____ SAT_____

HS Math.	Grade	College Math.	Grade	HS Science	Grade	College Science	Grade
Alg. I	___	_____	___	Physical	___	_____	___
Geometry	___	_____	___	Biology	___	_____	___
Alg. II	___	_____	___	Chemistry	___	_____	___
Analysis	___	_____	___	Physics	___	_____	___
Other	___	_____	___	Other	___	_____	___
( )				( )			

Part A

Circle A if A would yield a mixture having a stronger-tasting orange juice, circle B if B would, and circle C if A and B would yield the same taste of orange juice.

1) A B C Because_____

2) A B C Because _____

3) A B C Because_____

4) A B C Because_____

5) A B C Because_____

6) A B C Because_____

7) A B C Because_____

8) A B C Because_____

9) A B C Because_____

10) A B C Because_____

11) A B C Because_____

12) A B C Because_____

13) A B C Because_____

14) A B C Because_____

15) A B C Because_____

16) A B C Because_____

17) A B C Because_____

18) A B C Because_____

19) A B C Because_____

20) A B C Because_____

21) A B C Because_____

22) A B C Because_____

23) A B C Because_____

Part B

Circle A if can A has a better chance for rolling out a black marble, circle B if can B has, and circle C if can A and can B have equal chance for rolling out a black marble.

1) A B C Because_____

_____

2) A B C Because_____

_____

3) A B C Because_____

_____

4) A B C Because_____

_____

5) A B C Because_____

_____

6) A B C Because_____

_____

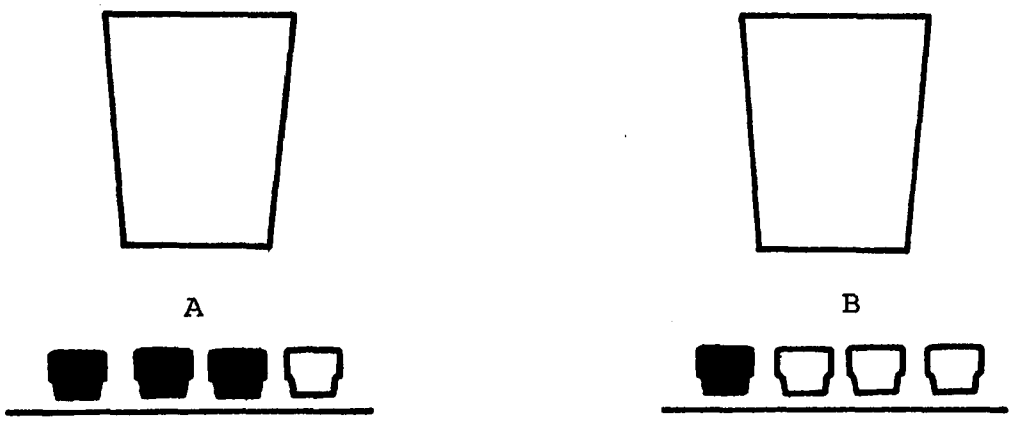
7) A B C Because_____

_____

APPENDIX B

PIAGETIAN TYPE TEST

Proportional Test



This apparatus consisted of two jars and two sets of glasses (set A and set B). Some glasses in these two sets are filled with orange juice and some glasses are filled with water. From the above example, set A includes three glasses of orange juice and one glass of water while set B includes one glass of orange juice and three glasses of water.

Imagine that the contents of the glasses in each set were mixed in its own jar. Which set would yield a mixture having a stronger-tasting orange juice?

1) 

Why? _____

2) A  B 

Why? _____

3) A  B 

Why? _____

4) A  B 

Why? _____

5) A  B 

Why? _____

6) A  B 

Why? _____

7) A  B 

Why? _____

8) A  B 

Why? _____

9) A  B 

Why? _____

10) A  B 

Why? _____

11) A  B 

Why? _____

12) A  B 

Why? _____

13) A  B 

_____

14) A  B 

Why? _____

15) A  B 

Why? _____

16) A  B 

Why? _____

17) A  B 

Why? _____

18) A  B 

Why? _____

19) A  B 

Why? _____

20) A  B 

Why? _____

21) A  B 

Why? _____

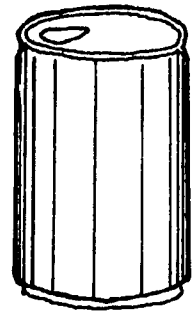
22) A  B 

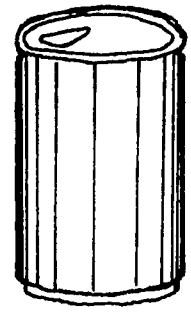
Why? _____

23) A  B 

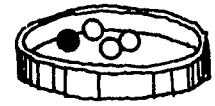
Why? _____

Quantification of Probabilities Test



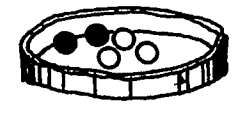


A 

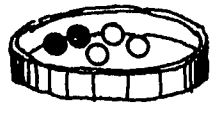
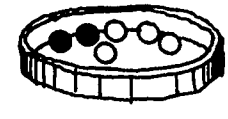
B 

This apparatus consisted of two metal cans, two containers which contained sets of clear and black marbles. For example, one set would contain three black and one clear marbles while the other would contain one black and three clear marbles.

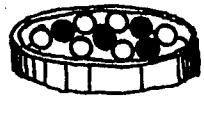
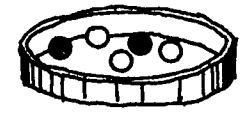
Imagine that each set of marbles has been placed in its own metal can, both cans shaken well, and one marble poured from each can. From which can is there a better chance for rolling out a black marble?

1) A  B 

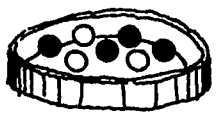
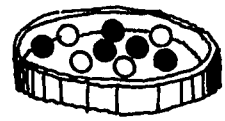
Why? _____

2) A  B 

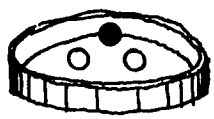
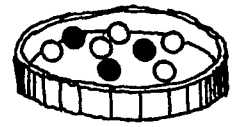
Why? _____

3) A  B 

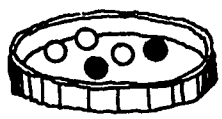
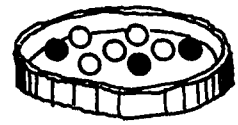
Why? _____

4) A  B 

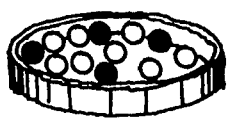
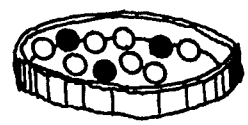
Why? _____

5) A  B 

Why? _____

6) A  B 

Why? _____

7) A  B 

Why? _____

APPENDIX C

KOHLBERGIAN MORAL DILEMMA TEST

Moral Dilemma:

In Europe, a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that the druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $1,000, which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug and I'm going to make money from it." So Heinz became desperate and considered breaking into the man's store to steal the drug for his wife.

1. Should Heinz steal the drug? Why or why not?

2. If Heinz doesn't love his wife, should he steal the drug for her? Why or why not?

3. Suppose the person dying is not his wife but a stranger. Should Heinz steal the drug for the stranger? Why or why not?

4. (If you favor stealing the drug for a friend:) Suppose it's a pet animal he loves. Should Heinz steal to save the pet animal? Why or why not?

5. Why should people do everything they can to save another's life, anyhow?

6. It is against the law for Heinz to steal. Does that make it morally wrong? Why or why not?

7. Why should people generally do everything they can to avoid breaking the law, anyhow?

7a. How does this related to Heinz's case?

APPENDIX D

DEFINITION OF KOHLBERG'S MORAL DEVELOPMENTAL STAGES

1. Pre-Conventional Level

At this level the child is responsive to cultural rules and labels of good and bad, right or wrong, but interpret these labels in terms of either the physical or hedonistic consequences of action (punishment, reward, exchange of favors) or in terms of the physical power of those who enunciate the rules and labels. The level is divided into the following two stages:

Stage 1: The punishment and obedience orientation. The physical consequences of action determine its goodness or badness regardless of the human meaning or value of these consequences. Avoidance of punishment and unquestioning deference to power are valued in their own right, not in terms of respect for an underlying moral order supported by punishment and authority (the latter being Stage 4).

Stage 2. The instrumental relativist orientation. Right action consists of that which instrumentally satisfies one's own needs and occasionally the needs of others. Human relations are viewed in terms of the marketplace. Elements of fairness, of reciprocity, and of equal sharing are present, but they are always interpreted in a physical pragmatic way. Reciprocity is a matter of "you scratch my back and I'll scratch yours," not of loyalty, gratitude, or justice.

2. Conventional Level

At this level, maintaining the expectations of the individual's family, group, or nation is perceived as valuable in its own right, regardless of immediate and obvious consequences. The attitude is not only one of conformity to personal expectations and social order, but of loyalty to it, of actively maintaining, supporting, and justifying the order and of identifying with the persons or group involved in it. At this level, there are the following two stages:

Stage 3. The interpersonal concordance or "good boy--nice girl orientation. Good behavior is that which pleases or helps others and is approved by them. There is much conformity to stereotypical images of what is majority or "natural" behavior. Behavior is frequently judged by intention--"he means well" becomes important for the first time. One earns approval by being nice.

Stage 4. The "law and order" orientation. There is orientation toward authority, fixed rules, and the maintenance of the social order. Right behavior consists of doing one's duty, showing respect for authority, and maintaining the given social order for its own sake.

3. Post-Conventional, Autonomous, or Principled Level

At this level, there is a clear effort to define moral values and principles which have validity and application apart from the authority of the groups or persons

holding these principles and apart from the individual's own identification with these groups. This level again has two stages:

Stage 5. Social contract, legalistic orientation. Generally with utilitarian overtones. Right action tends to be defined in terms of general individual rights and in terms of standards which have been critically examined and agreed upon by the whole society. There is a clear awareness of the relativism of personal values and opinions and a corresponding emphasis upon procedural rules for reaching consensus. Aside from what is constitutionally and democratically agreed upon, the right is the matter of personal "values" and "opinion." The result is an emphasis upon the "legal point of view," but with an emphasis upon the possibility of changing law in terms of rational considerations of social utility (rather than freezing it in terms of Stage 4 "law and order"). Outside the legal realm, free agreement and contract are the binding elements of obligation. This is the "official" morality of the American government and Constitution.

Stage 6. The universal ethical principle orientation. Right is defined by the decision of conscience in accordance with self-chosen ethical principles appealing to logical comprehensiveness, universality, and consistency. These principles are abstract and ethical (the Golden rule, the categorical imperative); they are not concrete moral

rules like the Ten Commandments. At heart, these are universal principles of justice, of the reciprocity and equality of the human rights, and of respect for the dignity of human beings as individual persons.

APPENDIX E

RAW SCORES

PROSPECTIVE ELEMENTARY TEACHERS

Subject	Sex	Age	GPA	SAT		Courses				Stage of Cognitive Dev.	Stage of Moral Dev.
				M	V	HS-M	C-M	HS-Sc	C-Sc		
1	F	22	3.33	560	550	5	2	2	2	4.0	3.0
2	F	32	3.88	-	-	3	-	1	2	4.0	3.3
3	F	34	3.00	-	-	3	-	2	-	3.0	3.7
4	F	22	3.00	-	-	3	-	4	-	2.3	3.0
5	F	22	2.28	490	420	4	2	2	3	2.0	3.0
6	F	21	3.42	-	-	3	2	2	3	2.0	2.7
7	F	21	2.20	-	-	3	1	3	4	4.0	3.5
8	F	22	3.65	530	480	4	2	3	2	4.0	4.5
9	F	21	3.15	490	430	3	2	2	2	2.5	3.0
10	F	22	3.28	410	430	3	2	4	3	4.0	2.5
11	F	21	3.00	450	460	3	2	3	2	2.5	3.0
12	F	22	2.66	550	470	5	2	2	2	3.0	4.0
13	F	22	3.24	500	460	3	2	3	3	3.5	3.5
14	F	21	3.46	-	-	2	2	2	2	3.3	2.3
15	F	20	2.72	570	460	3	2	3	2	2.3	3.3

PROSPECTIVE ELEMENTARY TEACHERS (continued)

Subject	Sex	Age	GPA	SAT		Courses				Stage of Cognitive Dev.	Stage of Moral Dev.
				M	V	HS-M	C-M	HS-Sc	C-Sc		
16	F	22	3.71	-	-	4	2	4	4	3.5	5.0
17	F	22	2.92	420	560	3	2	3	4	2.0	3.4
18	F	22	2.96	480	480	3	2	3	2	2.0	4.0
19	F	22	2.62	-	-	4	1	4	3	2.5	3.5
20	F	22	3.52	510	440	4	4	3	3	3.0	3.0
21	F	22	3.63	470	510	3	3	2	-	2.5	3.7
22	F	21	3.56	470	500	3	2	3	1	3.0	3.5
23	F	21	2.14	-	-	3	1	2	3	4.0	4.5
24	F	23	2.70	-	-	3	3	3	2	2.0	3.0
25	F	21	3.23	560	500	4	2	2	3	4.0	4.0
26	F	32	3.25	-	-	1	2	-	-	3.0	3.5
27	F	22	1.98	560	500	3	4	2	3	4.0	4.5
28	F	30	3.57	-	-	2	2	3	2	3.0	3.5
29	F	22	3.30	-	-	3	1	3	2	3.0	3.0
30	F	21	3.18	380	390	4	2	4	-	2.3	1.5

PROSPECTIVE ELEMENTARY TEACHERS (continued)

Subject	Sex	Age	GPA	SAT		Courses				Stage of Cognitive Dev.	Stage of Moral Dev.
				M	V	HS-M	C-M	HS-Sc	C-Sc		
31	F	21	2.62	-	-	3	2	3	2	2.0	3.5
32	F	22	2.75	480	330	3	3	2	1	2.0	1.5
33	F	28	3.63	-	-	2	1	1	3	3.0	5.0
34	M	22	2.30	-	-	3	2	2	-	2.3	2.0
35	F	22	2.83	480	440	2	2	3	3	2.5	3.8
36	F	27	3.00	-	-	3	2	1	3	2.8	4.3
37	F	21	3.75	-	-	3	2	3	2	3.0	3.8
38	F	22	3.30	460	540	3	2	3	2	2.0	3.5
39	F	22	2.53	450	450	5	4	2	2	3.0	2.0
40	F	24	2.90	-	-	1	2	1	3	3.0	3.5
41	F	21	4.00	-	-	4	2	3	4	4.0	2.0
42	F	21	3.04	-	-	4	2	2	2	3.8	1.5
43	F	26	3.32	490	580	1	2	2	3	4.0	3.8

PROSPECTIVE SECONDARY TEACHERS (MATH)

Subject	Sex	Age	GPA	SAT		Courses				Stage of Cognitive Dev.	Stage of Moral Dev.
				M	V	HS-M	C-M	HS-Sc	C-Sc		
1	F	26	2.42	-	-	4	5	2	1	4.0	3.0
2	M	29	2.63	-	-	5	10	4	-	4.0	4.5
3	F	21	2.58	510	420	4	6	3	1	3.0	3.5
4	F	22	3.87	610	680	4	9	4	2	4.0	3.5
5	M	23	2.75	-	-	3	12	4	6	4.0	4.0
6	F	22	3.89	550	640	4	10	3	2	4.0	3.5
7	F	22	3.65	570	430	4	12	3	4	4.0	5.0
8	F	22	3.94	620	490	4	10	4	4	4.0	4.0
PROSPECTIVE SECONDARY TEACHERS (SCIENCE)											
9	M	22	3.24	-	-	2	4	1	9	3.5	3.0
10	F	21	2.72	690	570	4	1	4	9	4.0	3.3
11	M	21	2.41	-	-	3	2	4	3	3.5	2.5
12	F	22	2.90	540	520	4	3	2	5	3.8	4.0
13	F	22	3.35	-	-	3	3	3	13	2.3	2.0

PROSPECTIVE SECONDARY TEACHERS (SCIENCE) (continued)

Subject	Sex	Age	GPA	SAT		Courses				Stage of Cognitive Dev.	Stage of Moral Dev.
				M	V	HS-M	C-M	HS-Sc	C-Sc		
14	F	27	3.96	-	-	3	4	4	13	4.0	5.0
15	F	21	3.48	-	-	4	1	5	10	4.0	2.0
16	F	21	3.55	440	480	5	1	5	5	2.5	4.5
17	F	28	3.03	-	-	4	2	2	4	4.0	2.5
18	F	23	3.80	690	740	4	2	4	13	4.0	3.5
19	M	22	2.41	510	500	3	3	4	3	4.0	3.0
PROSPECTIVE SECONDARY TEACHERS (SOCIAL STUDIES)											
20	F	20	3.66	-	-	4	-	3	1	3.5	4.0
21	M	22	2.69	500	610	3	2	1	-	4.0	4.0
22	M	23	3.12	530	560	3	1	3	-	4.0	4.3
23	M	22	2.41	-	-	1	2	2	1	4.0	4.0
24	F	22	3.63	550	530	4	1	3	2	4.0	2.5
25	F	21	2.27	450	370	3	2	3	4	1.0	2.0
26	F	22	2.63	-	-	3	2	1	1	1.0	3.0

PROSPECTIVE SECONDARY TEACHERS (SOCIAL STUDIES) (continued)

Subject	Sex	Age	GPA	SAT		Courses				Stage of Cognitive Dev.	Stage of Moral Dev.
						HS-M	C-M	HS-Sc	C-Sc		
27	M	21	3.16	550	450	3	3	2	1	4.0	3.5
28	M	22	2.00	-	-	2	1	2	1	2.3	4.0
29	M	22	2.35	420	420	3	3	3	1	4.0	2.0
30	F	22	3.53	400	500	4	2	2	1	2.0	4.0
31	M	21	2.96	430	370	3	2	2	1	3.0	5.0
32	F	28	2.88	-	-	2	1	2	1	2.0	2.5