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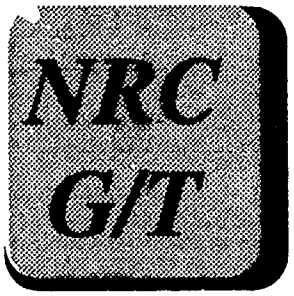
ABSTRACT

This study examined the effects of curriculum compacting, a curriculum modification technique for gifted and talented students, with approximately 436 elementary teachers and 783 students in 27 school districts throughout the United States. The study was designed to investigate the types and amount of curriculum content that could be eliminated for high ability students by teachers who received various levels of staff development. It also examined effects of curriculum compacting on students' achievement, content area preferences, and attitudes toward learning. Teachers were randomly assigned to one of four groups, three treatment groups that received increasing levels of staff development or a control group. After receiving staff development services, teachers in each of the treatment groups implemented curriculum compacting for one or two high ability students in their classrooms. A battery of pre/post achievement tests and a questionnaire regarding attitude toward learning were administered to identified students. Results indicated that the compacting process can be implemented in a wide variety of settings with positive effects for both students and teachers. Results also identified effective and efficient methods for training teachers to make appropriate curricular modifications for gifted and talented students. Appendices provide information on treatment and control group instrumentation and eight statistical tables. (Contains approximately 130 references.) (DB)



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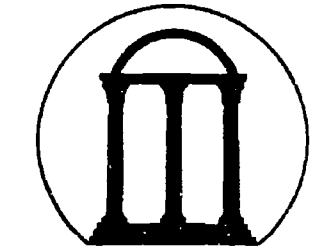

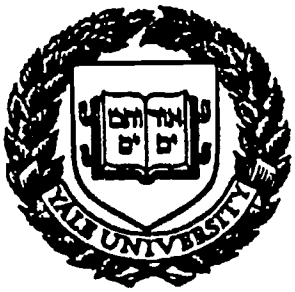

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ABSTRACT

During the 1990-1991 academic year, The University of Connecticut site of The National Research Center on the Gifted and Talented conducted a study to examine the effects of a curriculum modification technique entitled curriculum compacting. This technique is designed to modify the regular curriculum to meet the needs of gifted and talented students in the regular classroom. The study was designed to investigate the types and amount of curriculum content that could be eliminated for high ability students by teachers who received various levels of staff development. It also examined what would happen to students' achievement, content area preferences, and attitudes toward learning if curriculum compacting was implemented. To participate in this study, districts had to meet and accept the following criteria: (1) no previous training in curriculum compacting, and (2) random assignment to treatment groups. Efforts were made to recruit districts throughout the country with elementary student populations that included economically disadvantaged and limited English proficient students. Teachers in 27 school districts were randomly assigned by district to four groups, three treatment groups that received increasing levels of staff development or a control group. After receiving staff development services, teachers in each of the treatment groups implemented curriculum compacting for one or two high ability students in their classrooms. The control group teachers identified one or two high ability students and continued normal teaching practices without implementing curriculum compacting. A battery of pre and post achievement tests (out-of-level *Iowa Tests of Basic Skills*), *Content Area Preference Scales*, and a questionnaire regarding attitude toward learning were administered to identified students in the fall and at the completion of the school year. The results of this study indicate that the compacting process can be implemented in a wide variety of settings with positive effects for both students and teachers. In addition, the results expand previous knowledge about effective and efficient methods for training teachers to make appropriate and challenging curricular modifications for gifted and talented students in regular classrooms.

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EXECUTIVE SUMMARY

Many classroom teachers feel guilty about the amount of review that above average students do each year in their classrooms. Educators, parents and the students themselves are frustrated by the lack of challenge encountered in our nation's schools.

While advancement has influenced virtually every other aspect of our lives in the last century, it has not had the impact we might have expected on instructional practices. In virtually every elementary classroom in the country, all children will begin on the first page of their mathematics textbook during their first week in school, regardless of their ability level or whether they already know the material. Students who already know the material or who can master it in a fraction of the time it takes other students face boredom, inattentiveness, underachievement, and may become discipline problems. Worse yet, they never learn how to work or study because everything they encounter in school is often too easy for them. Curriculum compacting offers technical assistance to teachers in modifying the regular curriculum for students who need this adjustment.

What is Curriculum Compacting

Curriculum compacting (Renzulli & Smith, 1978) is an instructional technique which has been developed and field-tested over the last fifteen years (Imbeau, 1991; Renzulli, Smith, & Reis, 1982) as part of a total educational program for gifted and talented students. It can be used, however, as part of any educational program for more capable students and has been mentioned by several other developers of programming models as a method for modifying curriculum for high ability students (Betts, 1986; Clifford, Runions, & Smith, 1986; Feldhusen, 1986; Treffinger, 1986). Tannenbaum has advocated a similar process called telescoping in which students "...complete the basics in the least amount of time thereby sparing themselves the tedium of dwelling on content that they either know already or can absorb in short order" (1986, p. 409). VanTassel-Baska has labeled a similar practice "compression of content" (1985, p. 51).

During the curriculum compacting process, a form entitled the Curriculum Compactor (Renzulli & Smith, 1978) is used by teachers to document the compacting services provided to students. The form is divided into three columns arranged

sequentially to represent the stages of curriculum compacting. In the first column, the teacher identifies a content area or areas in which a student has strengths or has demonstrated proficiency and cites evidence of that ability. Evidence might include: achievement test scores, prior grades in the subject area, informal discussions with a student's previous teacher, and student demonstration of proficiency. In the second column of the compactor, the teacher lists curricular material that the student has not yet mastered, but needs to master to meet curricular objectives. The teacher also lists the procedures that can be used to achieve mastery at a pace that is commensurate with student ability (e.g., independent or small group work with students of similar ability), the strategies to be used to assess the student's mastery of the curriculum and the standard for mastery (e.g., 80%, 90%, 100%). The time saved through curriculum compacting is then used by the teacher to provide a variety of enrichment or acceleration opportunities for the student which are listed in the third column of the curriculum compactor. Enrichment strategies might include: self-selected independent investigations, mini-courses, advanced content, mentorships, and alternative reading assignments. Acceleration might include the use of material from the next unit or chapter, the use of the next chronological grade level textbook or the completion of even more advanced work with a tutor or mentor. Alternative activities listed in the third column of the compactor should reflect an appropriate level of challenge and rigor that is commensurate with the student's abilities and the student's interests.

The Need for Curriculum Compacting for High Ability Students

The "Dumbing Down of Textbooks"

One reason that so many average and above average students demonstrate mastery of the curriculum is because contemporary textbooks have been "dumbed down," a phrase used in 1984 by Terrel Bell, former secretary of education. Chall and Conard (1991) concur with Bell's assessment, documenting a trend of decreasing difficulty in the most widely used textbooks over a thirty-year period from 1945-1975. "On the whole, the later the copyright dates of the textbooks for the same grade, the easier they were, as measured by indices of readability level, maturity level, difficulty of questions and extent of illustration" (p. 2). Kirst (1982) also believes that textbooks have dropped by two grade levels in difficulty over the last 10-15 years. Most recently, Philip G. Altbach (1991), noted scholar and author on textbooks in America, suggests that textbooks, as evaluated across a spectrum of assessment measures, have declined in rigor.

Researchers have discussed the particular problems encountered by high ability students when textbooks are "dumbed down" because of readability formulas or the politics of textbook adoption. Bernstein (1985) summarized the particular problem that current textbooks pose for gifted and talented students, "Even if there were good rules of thumb about the touchy subject of textbook adoption, the issue becomes moot when a school district buys only one textbook, usually at 'grade level,' for all students in a subject or grade. Such a purchasing policy pressures adoption committees to buy books that the least-able students can read. As a result, the needs of more advanced students are sacrificed" (p. 465). Chall and Conard (1991) also cite particular difficulties for the above-average student with regard to less difficult reading textbooks.

> Another group not adequately served was those who read about two grades or more above the norm. Their reading textbooks, especially, provided little or no challenge, since they were matched to students' grade placement, not their reading levels. Many students were aware of this and said, in their interviews, that they

preferred harder books because they learned harder words and ideas from them. Since harder reading textbooks are readily available, one may ask why they were not used with the more able readers, as were the easier reading textbooks for the less able readers. (p. 111)

Repetition in Content

Recent findings by Usiskin (1987) and Flanders (1987) indicate that not only have textbooks decreased in difficulty, but also that they incorporate a large percentage of repetition to facilitate learning. Usiskin argues that even average eighth grade students should study algebra since only 25% of the pages in typical seventh and eighth grade mathematics texts contain new content. Flanders corroborated this finding by investigating the mathematics textbook series of three popular publishers. Students in grades 2-5 who used these math textbooks encountered approximately 40-65% new content over the course of the school year which equates to new material two to three days a week. By eighth grade, the amount of new content had dropped to 30% which translates to encountering new material once every one and one half days a week. Flanders suggests that these estimates are conservative because days for review and testing were not included in his analysis, and concludes, "There should be little wonder why good students get bored: they do the same thing year after year" (p. 22).

Repetition in content is also reflected by the scores students attain on pretests taken before they open their textbooks. For example, a study conducted by the Educational Products Information Exchange Institute (1980-81), a non-profit educational consumer agency, revealed that 60% of fourth graders in certain school districts studied were able to achieve a score of 80% or higher on a test of the content of their math texts before they had opened their books in September. In a more recent study dealing with average and above readers, Taylor and Frye (1988) found that 78% to 88% of fifth and sixth grade average and above average readers could pass pretests on comprehension skills before they were covered by the basal reader. The average students were performing at approximately 92% accuracy while the better readers were performing at 93% on comprehension skill pretests. The mismatch between what students are capable of doing, what they already know and the curricular materials they are expected to study becomes even more disturbing when one considers the heavy reliance on textbooks and their declining challenge level.

The Mismatch Between Student Ability and Instruction

It is clear that students should be matched with curriculum that is appropriate to their ability level. That is, for learning to occur, instruction should be above the learner's current level of performance. Chall and Conard (1991) stress the importance of the match between a learner's abilities and the difficulty of the instructional task, stating that the optimal match should be slightly above the learner's current level of functioning. When the match is optimal, learning is enhanced. However, "if the match is not optimal [i.e., the match is below or above the child's level of understanding/knowledge], learning is less efficient and development may be halted" (p. 19). It is clear that the current trend of selecting textbooks which the majority of students can read is a problem for high ability students.

A mismatch seems to exist between the difficulty of textbooks, the repetition of curricular material in these texts, and the needs of our high ability learners. It is reasonable to conclude that many of these students spend much of their time in school practicing skills and learning content they already know. All of these factors may be causing our most capable children to learn less and may be encouraging their underachievement.

The Curriculum Compacting Study

The general purposes of the study were to: (1) provide training to teachers on how to modify curriculum for high ability students; (2) assess how teachers implemented the curriculum compacting technique; and (3) assess the effects of curriculum compacting on students' achievement, content area preferences, and attitudes toward learning. Seventeen research questions, addressed through qualitative and quantitative analyses, guided this study.

Sample

A sample of 27 school districts and approximately 436 second through sixth grade classroom teachers throughout the country from Collaborative School Districts that are a part of The National Research Center on the Gifted and Talented (NRC/GT) were selected for this study. To participate, districts had to meet two criteria: no previous training or implementation of curriculum compacting and a willingness to accept random assignment to a treatment or control group. Efforts were made to recruit districts with elementary school populations that included economically disadvantaged, limited English proficient, and handicapped students. The districts participating in the study represented a wide range of elementary schools from across the country, ranging from a small rural school in Wyoming to a magnet school for Hispanic students in California.

After receiving staff development about curriculum compacting and the characteristics of students who need to have their curriculum modified, teachers were asked to select one or two students from their classroom. These students had either been identified as gifted and talented and participated in a district's program, or had clearly demonstrated superior ability and achievement in a content area that indicated the student would benefit from curriculum compacting.

Several subtests of out-of-level (one grade higher) *Iowa Tests of Basic Skills* were given to the 783 participating students in the fall. The median percentile for all students in the out-of-grade-level reading and math concepts subtests was 93. The median percentile in the out-of-level math computation subtest was 90. These data indicate that teachers selected students for whom compacting was necessary.

Procedure

Three treatment groups which received increasing levels of staff development were used to examine the most efficient but effective method for training teachers to modify curriculum. All treatment group teachers received the first staff development session which provided two half hour videotapes and a book about the compacting process. After receiving the first staff inservice session in October, 1990, teachers were asked to select one or two qualified students from their classroom. Teachers in Treatment Group 2 received the videotape training and book, as well as approximately two hours of group compacting simulations conducted by the local gifted and talented resource teacher or consultant. The simulations developed by Starko (1986) have been a standard resource in this type of training. Treatment group 3 received the same training as Treatment Group 2, with the addition of local peer coaching and/or consultant services. Local consultants provided informal peer coaching throughout the year and provided 6-10 hours of organized peer coaching between March and June, 1991.

Each district appointed a research liaison for the curriculum compacting research study who was usually a director or teacher in the gifted program in the district. The

liaison worked closely with project staff at the NRC/GT throughout the year. Contact was made regularly with each district at least twice each month, and liaisons were encouraged to call upon the NRC/GT staff for information and assistance as needed. All contact was documented and progress reports were completed by the NRC/GT project staff. Additionally, anecdotal reports were recorded by district liaisons when significant events relating to the compacting process occurred in the district.

Instrumentation

Several pre and post instruments were administered to students and teachers who participated in the study. Student instruments included several subtests of the *Iowa Tests of Basic Skills*, the *Arlin Hills Attitude Survey Toward School Learning Processes* (Arlin, 1976), and the *Content Area Preference Scale* (Kulikowich, 1990). Teacher instruments included the *Stages of Concern Questionnaire*, the *Teacher Data Form*, the *Compactor Form* (Renzulli & Smith, 1978), The *Curriculum Compactor Assessment Form* (Reis, 1991), the *Classroom Practices Questionnaire and the Anecdotal Incident Report Form.*

Results

The following statements summarize the results of the curriculum compacting study:

1. Ninety-five percent of the teachers were able to identify high ability students in their classes and document students' strengths.

2. Eighty percent of the teachers were able to document the curriculum that high ability students had yet to master, list appropriate instructional strategies for students to demonstrate mastery, and document an appropriate mastery standard.

3. Approximately 40-50% of traditional classroom material could be eliminated for targeted students in one or more of the following content areas: mathematics, language arts, science, and social studies.

4. The most frequently compacted subject was mathematics, followed by language arts. Science and social studies were compacted when students demonstrated very high ability in those areas.

5. Teachers in Treatment Group 3 used significantly more replacement strategies than did teachers in Treatment Groups 1 or 2.

6. Replacement strategies consisted of three broad instructional activities: enrichment, acceleration and other (i.e., peer tutoring, cooperative learning, correcting class papers).

7. While approximately 95% of teachers used enrichment as a replacement strategy, 18% of teachers also used acceleration.

8. Replacement strategies did not often reflect the types of advanced content that would be appropriate for high ability students, indicating that additional staff development, as well as help from a specialist in the district, would be beneficial.

9. Approximately 60% of the replacement strategies reflected students' interests, needs and preferences.

10. When teachers eliminated as much as 50% of the regular curriculum for gifted students, no differences in the out-of-level post achievement test (ITBS) results between treatment and control groups were found in reading, math computation, social studies, and spelling.

11. In science, Treatment Group 1 scored significantly higher on the out-of-level post test (ITBS) than did the control group whose curriculum was not compacted.

12. Students in all treatment groups whose curriculum was compacted in mathematics scored significantly higher in the math concepts post test (ITBS) than did control group students whose curriculum was not compacted in mathematics.

13. A substantial difference was found among treatment groups with respect to the overall quality of curriculum compacting as documented on the Compactor Form. Treatment Group 3 had higher quality compactors than did Treatment Groups 1 or 2.

14. Anecdotal records indicated that three different types of requests were made by teachers as they compacted curriculum:
    - Additional time for students to work with the gifted specialist (if one was available)
    - Assistance in locating additional appropriate materials
    - Consultant assistance as teachers worked through the compacting process

15. A majority of the teachers in all treatment groups said they would compact curriculum again; some said they would try again if they had additional information and assistance from a specialist.

These results demonstrate the following:

- Curriculum compacting can be implemented in the regular classroom to provide more appropriate educational experience for gifted and talented students.
- Staff development and peer coaching can improve teachers' use of the compacting process.
- Teachers will need additional training and help to be able to substitute appropriately challenging content and work to students whose curriculum has been modified.
- Curriculum compacting can have positive effects on students.

Significance

The importance of what happens to high ability students every day in classrooms across our nation is a concern to everyone. Teachers must use diverse strategies to challenge and meet the individual needs of students in their classrooms. Given the elimination of gifted programs due to economic problems in our country and the reduced use of various types of ability groups, teachers will be called upon to provide even more modifications for high ability students if regular textbooks do not improve and the challenge level of regular classroom curriculum does not increase. Curriculum compacting is one strategy that can be effectively used by classroom teachers.

This study examined how teachers acquire the skills necessary to implement curriculum compacting in the classroom and provides school personnel with information regarding successful staff development procedures for adopting this innovation for the bright students in their district. Teachers who received the most help in implementing compacting (Treatment Group 3) were most successful in carrying out the various steps in the process. Implementing the process, however, means that teachers will need materials and assistance if they are to substitute appropriately challenging material for targeted students. This assistance must be provided in several ways: locating and/or developing pretest instruments and finding and/or creating appropriately challenging and rigorous replacement strategies. Teachers cannot be encouraged to eliminate up to 40-50% of content if alternative materials for students are not provided. Accordingly, district policies that do not allow classroom teachers to use out-of-grade level textbooks need to be changed to enable classroom teachers to use resources at hand to provide effective instruction.

The amount of content that was eliminated should indicate that more challenging textbooks, curricular materials, and homework can be provided to high ability students. Most teachers involved in this study also indicated that they were able to extend the compacting process to students who would not have been identified for a gifted program. Instead of providing compacting to 1-2 students originally targeted for the study, some teachers targeted 10-12 students to receive the service. This certainly would indicate that many other students can benefit from compacting and that if teachers are provided with staff development in compacting, they will eventually use this practice for other students. Compacting may then have significance for many other students.

It also seems clear from test results that compacting a certain percentage of a student's curriculum did not result in any detrimental changes in achievement test scores of targeted students, and in fact, in some content areas, slight gains were realized. This information should provide both encouragement and reassurance to administrators, teachers, and parents about the use of this procedure and the elimination of large amounts of content that is often unnecessary for high ability students.

Conclusion

Clearly, the curriculum of the elementary students in this study could be modified and large amounts of curriculum could be eliminated. A high percentage of curriculum in all content areas was eliminated for these students. Curriculum compacting can be implemented in the regular classroom to meet the needs of academically able elementary students, and the findings of this study indicate that staff development and peer coaching can improve teachers' use of the compacting process. This study also indicates that teachers will need more help and staff development if they are to substitute appropriately challenging advanced work for high ability students.

References

Altbach, P. G., Kelly, G. P., Petrie, H. G., & Weis, L. (1991). *Textbooks in American society.* Albany, NY: State University of New York Press.

Arlin, M. (1976). *Manual for Arlin-Hills Attitude Surveys.* Jacksonville, IL: Psychologists & Educators, Inc.

Bernstein, H. T. (1985). The new politics of textbook adoption. *Phi Delta Kappan, 66,* 463-466.

Betts, G. T. (1986). The autonomous learner model. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 27-56). Mansfield Center, CT: Creative Learning Press.

Chall, J. S., & Conrad, S. S. (1991). *Should textbooks challenge students?: The case for easier or harder textbooks.* New York: Teachers College Press.

Clifford, J. A., Runions, T., & Smyth, E. (1986). The learning enrichment service (LES): A participatory model for gifted adolescents. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 92-125). Mansfield Center, CT: Creative Learning Press.

Educational Products Information Exchange Institute (1980-1981). *Educational Research and Development Report, 3*(4).

Feldhusen, J. F., & Kollof, M. B. (1986). The Purdue three-stage enrichment model for gifted education at the elementary level. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 126-152). Mansfield Center, CT: Creative Learning Press.

Flanders, J. R. (1987). How much of the content in mathematics textbooks is new? *Arithmetic Teacher, 35,* 18-23.

Imbeau, M. B. (1991). *Teachers' attitudes toward curriculum compacting: A comparison of different inservice strategies.* Unpublished doctoral dissertation, University of Connecticut, Storrs, CT.

Kirst, M. W. (1982). How to improve schools without spending more money. *Phi Delta Kappan, 64*(1), 6-8.

Kulikowich, J. M., Reis, S. M., Owen, S. V., & Smist, J. (1992). *The reliability and validity of scores derived from the Content Area Preference Scale (CAPS).* Manuscript in preparation.

Reis, S. M. (1991). *Curriculum compactor assessment form.* Storrs, CT: The National Research Center on the Gifted and Talented.

Renzulli, J. S., & Smith, L. H. (1979). *A guidebook for developing individualized educational programs for gifted and talented students.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., Smith, L. H., & Reis, S. M. (1982). Curriculum compacting: An essential strategy for working with gifted students. *Elementary School Journal*, 82(3), 185-194.

Starko, A. J. (1986). *It's about time: Inservice strategies for curriculum compacting.* Mansfield Center, CT: Creative Learning Press.

Tannenbaum, A. J. (1986). The enrichment matrix model. In J. S. Renzulli (Ed.) *Systems and models for developing programs for the gifted and talented.* Mansfield Center, CT: Creative Learning Press, 126-152.

Taylor, B. M., & Frye, B. J. (1988). Pretesting: Minimize time spent on skill work for intermediate readers. *The Reading Teacher*, *42*(2), 100-103.

Treffinger, D. J. (1986). Fostering effective, independent learning through individualized programming. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* . Mansfield Center, CT: Creative Learning Press, 126-152.

Usiskin, Z. (1987). Why elementary algebra can, should, and must be an eighth-grade course for average students. *Mathematics Teacher*, *80*, 428-438.

VanTassel-Baska (1985). Appropriate curriculum for the gifted. In J. Feldhusen (Ed.), *Toward excellence in gifted education.* Denver, CO: Love Publishing Company.

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CHAPTER 1: Introduction

During the 1990-1991 academic year, The University of Connecticut site of The National Research Center on the Gifted and Talented (NRC/GT) conducted a study to examine the effects of a curriculum modification technique known as curriculum compacting. This technique is designed to modify the regular curriculum to meet the needs of gifted and talented students in the regular classroom. The study was designed to investigate the types and amount of curriculum content that could be eliminated for high ability students by teachers who had received various levels of staff development. The elimination of regular curriculum content was investigated in prior field tests or studies (Imbeau, 1991; Reis, 1989; Schultz, 1991) because of the lack of challenge in the basic curriculum for high ability students. It also examined what would happen to students' achievement, content area preferences, and attitudes toward learning if curriculum compacting was implemented. To participate in this study, teachers had to meet and districts had to accept the following criteria: (1) no previous training in curriculum compacting and (2) random assignment to treatment groups. Efforts were made to recruit districts throughout the country with elementary student populations that included economically disadvantaged and limited English proficient students. Teachers in 27 school districts from throughout the country were randomly assigned by district to four groups, three treatment groups that received increasing levels of staff development or a control group. After receiving staff development services, teachers in each of the treatment groups implemented curriculum compacting for one or two high ability students in their classrooms. Control group teachers identified one or two high ability students and continued normal teaching practices without implementing curriculum compacting. A battery of pre- and post achievement tests (out-of-level *Iowa Tests of Basic Skills*), content area preference scales, and a questionnaire regarding attitude toward learning were administered to identified students in November 1990 and at the completion of the school year.

This report includes six chapters. In chapter one, an overview of the research study and the research questions is provided. In chapter two, a review of related research is summarized. Chapter three includes the methods and procedures used to complete the study, and chapter four documents the results of the research. In chapter five, a discussion of the findings and implications are included, as is the significance of this study. Chapter six provides the results of a follow-up study conducted the year after the compacting study was completed.

Background

It is clear that a major problem facing gifted and talented students is the mismatch between their abilities and the lack of curricular differentiation and challenge in the work they are assigned in regular classroom settings. Research supports this claim. In a recent study dealing with average and above-average readers, Taylor and Frye (1988) found that 78 to 88% of fifth and sixth grade average readers could pass pretests on basal comprehension skills before they were covered in the basal reader. The average students were performing at approximately 92% accuracy while the better readers were performing at 93% accuracy on the comprehension skills pretests.

One reason so many average and above average students demonstrate mastery of the curriculum is that contemporary textbooks have been "dumbed down," a phrase first used in 1984 by Terrel Bell, former secretary of education. Chall and Conard (1991) concur with Bell's assessment, documenting a trend of decreasing difficulty in the most widely used textbooks over a thirty-year period from 1945-1975: "On the whole, the later the copyright dates of the textbooks for the same grade, the easier they were, as measured by indices of readability level, maturity level, difficulty of questions and extent of illustration" (p. 2). Kirst (1982) believes that textbooks have dropped by two grade levels in difficulty over the last 10-15 years. Most recently, Altbach (1991), noted scholar and author on textbooks in America, suggests that textbooks, as evaluated across a spectrum of assessment measures, have declined in rigor.

> Textbooks are a central part of any educational system. They help define the curriculum and can either significantly help or hinder the teacher. The "excellence movement" has directed its attention to textbooks in the past few years. American textbooks, according to the critics, are boring and designed for the lowest common denominator. They have been "dumbed down" so that content is diluted and "readability" is stressed. Textbooks have evolved over the past several decades into "products" often assembled by committees in response to external pressures rather than a coherent approach to education. Most important to many of the critics, textbooks do not provide the knowledge base for American schools in a period of reform, renewal and improvement. (p. 2)

Researchers have discussed the particular problems encountered by high ability students when textbooks are "dumbed down" because of readability formulas or the politics of textbook adoption. Bernstein (1985) summarizes the particular problem that current textbooks pose for more able students, "Even if there were good rules of thumb about the touchy subject of textbook adoption, the issue becomes moot when a school district buys only one textbook, usually at 'grade level,' for all students in a subject or grade. Such a purchasing policy pressures adoption committees to buy books that the least-able students can read. As a result, the needs of more advanced students are sacrificed" (p. 465). Chall and Conard (1991) also cite particular difficulties for the above-average student with regard to less difficult textbooks.

> Another group not adequately served was those who read about two grades or more above the norm. Their reading textbooks, especially, provided little or no challenge, since they were matched to students' grade placement, not their reading levels. Many students were aware of this and said, in their interviews, that they preferred harder books because they learned harder words and ideas from them. Since harder reading textbooks are readily available, one may ask why they were not used with the more able readers, as were the easier reading textbooks for the less able readers. This practice of using grade-level reading textbooks for those

> who read two or more grades above the norm has changed little through the years, although it has been repeatedly questioned (see Chall, 1967, 1983). It would appear that, for various administrative reasons, teachers do not use a reading textbook above the student's grade placement. The reason most often mentioned is really a question: If the third-grade teacher uses fourth grade books, what is the fourth-grade teacher going to do? (p. 111)

Further, Chall and Conard stress the importance of the match between a learner's abilities and the difficulty of the instructional task, stating that the optimal match should be slightly above the learner's current level of functioning. When the match is optimal, learning is enhanced. However, "if the match is not optimal [i.e., the match is below or above the child's level of understanding/knowledge], learning is less efficient and development may be halted" (p. 19). It is clear that the current trend of selecting textbooks which the majority of students can read is a problem for high ability students.

Recent findings by Usiskin (1987) and Flanders (1987) indicate that not only have textbooks decreased in difficulty, but they also incorporate a large percentage of repetition to facilitate learning. Usiskin argues that even average eighth grade students should study algebra since only 25% of the pages in typical seventh and eighth grade mathematics texts contain new content. Flanders corroborated this finding by investigating the mathematics textbook series of three popular publishers. Students in grades 2-5 who used these math textbooks encountered approximately 40-65% new content over the course of the school year which equates to new material two to three days a week. By eighth grade, the amount of new content had dropped to 30% which means that students encountered new material once every one and one half days a week. Flanders suggests that these estimates are conservative because days for review and testing were not included in his analysis, and concludes, "There should be little wonder why good students get bored: they do the same thing year after year" (p. 22).

In light of these recent findings by researchers, a mismatch seems to exist between the difficulty of textbooks, the repetition of curricular material in these texts, and the needs of our high ability learners. These students spend much of their time in school practicing skills and learning content they already know. All of these factors may be causing our most capable children to learn less and proceed haltingly in their development, thereby creating or encouraging their underachievement. Many of these bright students will learn at an early age that if they do their best in school, they will be rewarded with seemingly endless pages of the same kind of practice materials.

Curriculum compacting (Reis, Burns, & Renzulli, 1991; Renzulli & Smith, 1978; Renzulli, Smith, & Reis, 1982) is an instructional technique which has been developed and field-tested over the last fifteen years (Imbeau, 1991; Renzulli & Reis, 1985; Renzulli, Smith, & Reis, 1982) as part of a total educational program for gifted and talented students. It is generally used by classroom teachers to eliminate curricular activities that students have already mastered or to streamline work to allow students to complete work at a rate commensurate with their abilities. Research indicates that the time gained through this system may then be used to provide students with appropriately challenging enrichment and/or acceleration activities (Imbeau, 1991).

Research Questions

The general purposes of the study were to: 1) provide training to teachers on how to modify curriculum for high ability students; 2) assess how teachers implemented the curriculum compacting technique; and 3) assess the effects of curriculum compacting on students' achievement, content area preferences, and attitudes toward learning. The following research questions, addressed through qualitative and quantitative analyses, guided this study:

1. In what content areas and to what extent do teachers modify instructional practices and regular material to meet the needs of gifted and talented students in regular classroom settings?

2. What are the strategies used by teachers to determine the curricular strength areas of students and student mastery of the regular curriculum?

3. What types of replacement activities are used by teachers, and does a significant difference exist among treatment groups with respect to the replacement strategies?

4. Is there a significant difference among the treatment groups with regard to teachers' decisions about whether they will compact curriculum in the future?

5. Is there a significant difference among treatment groups with regard to the quality of the compactor forms completed by teachers?

6a. Do students whose curriculum was compacted perform differently on measures of achievement than students whose curriculum was not compacted?

6b. Do students whose curriculum was compacted in mathematics significantly outperform their control counterparts on measures of achievement?

6c. Do students whose curriculum was compacted in language arts significantly outperform their counterparts on measures of achievement?

7a. Do students whose curriculum was compacted perform differently on measures of content area preference than students whose curriculum was not compacted?

7b. Do students whose curriculum was compacted in mathematics perform differently than their control counterparts on measures of content area preference?

7c. Do those students whose curriculum was compacted in language arts perform differently on measures of content area preference than those students in control groups whose curriculum was not compacted in language arts?

8a. Do students whose curriculum was compacted have significantly different attitudes toward learning than those students whose curriculum was not compacted?

8b. Do those students whose curriculum was compacted in mathematics have better attitudes toward learning than students whose curriculum was not compacted?

8c. Do those students whose curriculum was compacted in language arts show significantly better attitudes toward learning than students whose curriculum was not compacted?

9. How do the specific (measured) indicators, such as gender and grade, reflect the research (latent) variables (student achievement in mathematics and reading, other student characteristics)?

10. What is the impact of each research (latent) variable on students' math and reading achievement post tests?

11. Does the proposed model of students' attitudes toward learning and achievement adequately explain the observed covariance among the specific (measured) indicators?

12. What is the impact of each research (latent) variable on students' content area preferences?

13. Does the proposed model of content area preference adequately explain the observed covariance among the specific (measured) indicators?

14. What are the background characteristics of the teachers in the sample as indicated on the *Teacher Data Form*?

15. What types of support services are available to classroom teachers as indicated on the *Teacher Data Form*?

16. Is there a difference among the treatment groups with respect to classroom teachers' practices as measured by the *Classroom Practices Questionnaire (CPQ)*?

17. What are the concerns of treatment group teachers regarding curriculum compacting before and after treatment as indicated on the *Stages of Concern Questionnaire (SoCQ)* profiles?

CHAPTER 2: Review of the Related Literature

This review of the literature will examine five areas. They include: teacher reliance on textbooks, an historical perspective about the concern for textbook difficulty, the quality of textbooks across content areas, successful practices in staff development, and curriculum compacting.

Teachers' Reliance on Textbooks

Since the publication of *A Nation at Risk* (National Commission on Excellence in Education, 1983), the focus of school reform has been primarily on the poor performance of students, the low expectations of student achievement, and the school curricula. There has been no acknowledgement that textbooks represent an important link between educational change, teacher professionalism, and student challenge and success (Woodward & Elliott, 1990). Accordingly, textbook quality has not been considered crucial in the reform process.

Although textbooks have attracted little attention from the advocates of the educational reform movement, research evidence indicates that textbooks are pervasive and widely used in classrooms across the nation. As early as 1913, Cubberly noted the important role that textbooks played in instruction. Since then, many studies have confirmed the dominance of the textbook in the classroom. McMurray and Cronbach (1955) pointed out that textbooks had played a major part in Western education for 500 years. A survey by Bagley (1959) of 539 lessons delivered in 30 states found high reliance on textbooks. In a survey of 1580 elementary school teachers and 141 elementary school principals, Barton and Wilder (1966) found that 98% of first-grade teachers and 92 to 94% of second and third grade teachers used basals on "all or most of the days of the year." Eighty-five percent of elementary school principals in the sample considered basal materials "absolutely essential" or "very important."

Following the flurry of post-Sputnik reform enthusiasm, the new curricula suggested by reformers failed to take root in the schools. Materials developed from federally funded projects of the 1960s and 1970s were not often selected for classroom use. The dominant instructional material continued to be conventional textbooks, and the dominant modes of instruction continued to be large-group, teacher-controlled recitation and lecture based primarily on the textbook (Elliott & Woodward, 1990).

In a study of the planning activities of twelve teachers, McCutcheon (1980) found that the suggestions in mathematics and reading textbooks were the source for 85 to 95% of instructional activities in these subject lessons. In a follow-up study of textbook use in an Ohio elementary school, McCutcheon found that 9 of 10 teachers used the teacher's guide extensively and with few modifications. When teachers modified suggestions in the teacher's guide, the changes consisted of reordering questions, inserting relevant local examples, omitting material considered redundant or too difficult, and omitting activities requiring manipulations, group work, or divergent thinking. Estimates from a number of classroom studies completed in the 1980s (Barr & Dreeban, 1983; Durkin, 1981; Mason & Osborn, 1983) also indicated that the content of basal reading programs accounted for a large portion of time spent during reading periods in elementary schools. The Educational Products Information Exchange Institute (EPIE, 1980-81) found that textbooks and other commercially produced, instructional materials were the basis for 67% of classroom instruction, and another 22% of classroom instruction was based on nonprint materials.

Thus, 89% of instructional time was organized around the use of instructional materials. In 1984, Former Secretary of Education Terrell Bell, speaking before the American Association of School Administrators in February, stated:

> Current efforts to reform the schools will 'fall flat and fail' if textbooks are not improved. Efforts to reform the schools cannot succeed unless these problems are resolved...because textbooks are so influential in determining what is taught in the schools. Textbooks drive content, set the level of rigor, and influence the degree of intellectual challenge to students. (Carus, 1986, p. 1)

According to testimony before the Commission of Excellence, Bell noted that up to 95% of classroom instruction in the country was based on textbooks and related materials.

Most recently, Weiss (1987) found that 90% of science and mathematics classes at each grade level used textbooks, and Turner's (1988) survey of 339 teachers found that 85% of them used basal readers. Fifty-six percent of the districts represented by the teacher sample in Turner's study required basals to be followed strictly.

History of Concern Related to Textbook Difficulty

The concern for appropriate text difficulty has been prompted by changing social conditions in schools and society since the 1920s.

> Beginning in the 1920s, more students than ever before were attending secondary schools, and these 'new' students were often the first in their families to do so. At the same time, the textbooks being used had been written for an earlier generation, a more select population of young people who had stronger academic backgrounds and who were expected to continue their education through college. Thus, a mismatch existed between the students and their texts. (Chall & Conard, 1991, p. 12)

Consequently, beginning in the late 1920s, the vocabulary level of reading textbooks started to decrease with each subsequent edition. Comparative studies document the introduction of fewer and fewer new words and more repetition of the newer words (Chall, 1967). Within a period of ten years, the average number of different words in second-grade reading texts decreased from 1,147 to 913 (Hockett, 1938). During this same period new words introduced in first-grade reading texts decreased from 644 to 462, and within the following ten years, to 338 (Hockett, 1967). This simplification of vocabulary in reading textbooks continued through the 1950s and into the 1960s, during which new words in first-grade reading texts were repeated on an average of six to ten times immediately following their introduction (Willows, Borwick, & Hayvren, 1981). Reading textbooks for the upper elementary grade levels also became much easier. The vocabulary in sixth-grade basals decreased consistently from 1947 to 1967, and Gates (1961) described the vocabularies of fourth-grade basals published in the early 1960s as limited enough to be appropriate for average third-grade students.

In the 1960s, when a national concern about the American educational system lagging behind that of the Soviet Union's gained momentum, educational views on textbook difficulty began to change (Elliott & Woodward, 1990). By the middle 1960s, publishers reacted to reverse the trend toward easier textbooks. Willows, Borwick, and Hayvren (1981) noted a fivefold increase in the rate of vocabulary introduction in first-grade readers from 1962 to 1972, and increasing difficulty in sixth-grade readers from

1967 through 1975 was reported by Chall, Conard, and Harris (1981). By the late 1970s, concern for the overall quality of education had reached national proportions and continued to accelerate. Bell citing *A Nation At Risk*, claimed that contemporary textbooks were much easier than they were only two or three decades ago, labeled this practice the "dumbing down" of textbooks, and criticized the publishing industry for the content of textbooks as well as the policies and procedures of textbook adoption committees. The "dumbing down" of textbooks became a watchword for educational reform and has continued ever since (Elliott & Woodward, 1990).

However, Chall and Conard's recent analysis (1991) indicated that between 1979 and 1989, no changes were found in readability levels of textbooks. The trend toward more complex content of the 1960s and early 1970s abated, and textbooks did not continue to become more challenging even after public concern was raised. The qualitative analysis done by Chall and Conard indicated that when changes were made, they were toward greater ease, not greater difficulty. Their research also indicated that the subject-matter textbooks published in the United States represented a rather narrow range of difficulty for each grade level, more narrow than the range of reading ability found among students. Chall and Conard indicate that this range is also narrower than the range found on standardized tests.

> Although the publishers described their textbooks as being developed for 'wide use' or for 'more able' or 'less able' readers, our analysis found them suitable mainly for the middle range of achievement within each grade. Practically none of the content textbooks seemed to be written for the students in the lowest quartile in reading. Further, the books that publishers labeled for less able readers were often more difficult than those labeled for a wide audience or for more able readers. (p. 111)

Textbook Quality Across Content Areas

Accordingly, it is not surprising that textbooks, across content areas, have been harshly criticized during the last decade at both the elementary and secondary level. In 1983, the National Commission on Excellence in Education (NCEE) concluded that textbooks had been "written down" and recommended in its widely disseminated report, *A Nation at Risk*, that "[these] and other tools of learning and teaching be upgraded to assure more rigorous content and that states and school districts should evaluate texts and other materials on their ability to present rigorous and challenging material clearly" (NCEE, 1983, p. 28). Studies by Kantor, Anderson, and Armbruster (1983) and Armbruster and Anderson (1984) found texts to be "badly written, rambling, inconsistent, disconnected and inconsiderate" (p. 61). They concluded that students would have difficulty making sense out of the text prose. Armbruster (1984) completed a study in which adults were asked to read 20 paragraphs from several sixth grade texts, and underline or state the main idea. Adults were unable to state the main idea because of disjointed writing and dumbed down content.

Language Arts Textbooks

Traditional reading programs. Robinson (1986) notes that, in practice, elementary schools in the United States continue to maintain a largely skill-based language arts curriculum anchored by the basal reader. Mangieri and Madigan (1984) reported that most reading programs for gifted students use the same basal series as is used by the rest of the students. Robinson (1986) explains that the basal readers often break down the act of

reading into sub-skills, such as distinguishing between long and short vowel sounds, determining the main idea of a paragraph, or predicting the outcome of a story. Teachers using the basal reader approach tend to concentrate on workbook skill exercises and oral reading. In the early grades, skill work heavily emphasizes word attack and vocabulary development. For the many gifted students who enter school already reading, excessive time is often spent on decoding skills. Robinson (1986) explains "vocabulary development is more likely to be suitable for gifted primary students, but only if the curriculum offers these students the opportunity to learn more sophisticated words and concepts. For example, it makes little sense to teach a first grader the names of zoo and farm animals when she is already able to name and describe several fresh-water trout" (p. 178). Bacharach (1986) found that with the exception of the use of The Great Books Program, basal reading series were attempting to meet the needs of gifted students primarily in the enrichment sections of the teacher's manual, which may be infrequently used by teachers.

Ohanian (1987) refers to the basal readers in American classrooms as "homogenized and bowdlerized grade-school texts, edited according to elaborate readability formulas and syllable schemes" (p. 20). Ohanian illustrates how high quality children's literature is altered by textbook companies through the "dumbing down" of the story of *Flat Stanley* by Jeff Brown. Stanley has gotten himself flattened, and the story describes the very special things that a flat boy can do, including travel across the country by mail. Brown describes Stanley's experience below:

> The envelope fit Stanley very well. There was even room left over, Mrs. Lambchop discovered, for an egg-salad sandwich made with thin bread, and a flat cigarette case filled with milk.
>
> They had to put a great many stamps on the envelope to pay for both airmail and insurance, but it was still much less expensive than a train or airplane ticket to California would have been. (p. 20)

Here is how the description appears in a basal reader:

> The envelope fit Stanley very well. There was even room left over for a sandwich. (p. 20)

Story type. When a six-year-old who loves to read and is accustomed to reading several books a day encounters the typical basal reading system, the beginning of the end of a love affair with reading may result. As Brown and Rogan (1983) have stated, "For primary level gifted children who have already begun to read, modification toward the mean represents a serious regression" (p. 6). Experts in reading also caution educators against the exclusive use of basals in teaching the gifted (Labuda, 1985). In a study comparing characteristics of basal reader stories with those of trade book stories, Bruce (1984) found a number of differences between the two groups and concluded that publishers of basal programs should expand the range of story types they include in their readers. Bruce concluded that children reading in basal readers are not exposed to many of the story types they will encounter in "real-life" reading. Savage (1983) believes that basals may not be the best way to promote reading interest and ability: "Very capable readers often find the story content uninteresting, the reading level unchallenging, and the tedious inevitability of the follow-up workbook pages an anathema. Children with considerable reading ability can be held back by rigidly marching page by page through a basal program" (p. 9). Brown and Rogan (1983) stress that since basal reading programs are paced for average ability children, these basals can become boring and sterile for gifted children: "Keeping the gifted children plugged into the regular reading program frustrates

their belief that their schools and all the wonderful books found there were going to be exciting and joyful" (p. 6).

Whole language. Experts in the field of gifted education (Feldhusen & Kolloff, 1986; Kaplan, 1986; Renzulli & Reis, 1986; Treffinger, 1986) advocate a differentiated curriculum for gifted and talented students and describe what a differentiated curriculum in the language arts should include. Descriptions of whole language classrooms seem to indicate strong connections between curriculum differentiation in language arts for the gifted and whole language. Matthews' (1991) research targeted gifted students in whole language classrooms. Matthews found whole language to be a positive change from the basal system in reading/language arts instruction for all students as both students and teachers were highly enthusiastic about this approach. Yet, she discovered a contradictory picture of whether differentiated experiences for the gifted exists in whole language classrooms which are considered to be exemplary by local experts in whole language. She noted relatively few instances of differentiation for high ability students in the four exemplary whole language classrooms studied. However, recent trends in whole language seem to suggest that the use of trade books and the elimination of workbooks may provide positive experiences for all children.

Mathematics Textbooks

Textbook emphasis on low-level skills. The importance of textbooks in the U.S. mathematics curriculum cannot be overstated. Begle (1973) pointed to data from the National Longitudinal Study of Mathematical Achievement to emphasize the influence textbooks have on student learning, citing evidence that students learn what is in the text and do not learn topics not covered in the book. The National Advisory Committee on Mathematical Education (1975) acknowledged the importance of textbooks as guides for teachers. Fey (1980) emphasized the influence of texts and pointed out that textbook content is usually not based on research. McGinty, Van Beynen, and Zalewski (1986) found that we have actually regressed in the expectations of our students because of the decline of rigorous content in mathematics textbooks. Their study revealed that the number of word problems found in 1984 mathematics textbooks was only one-third the number found in textbooks from 1924, while the number of drill problems increased by almost 57%. In two studies of Michigan teachers, 70 to 75% of mathematics instruction was spent teaching basic arithmetic skills and, occasionally, how to read a graph. The emphasis on skill development found among teachers was mirrored by the textbooks they used. In content analyses of fourth-grade textbooks, 65 to 80% of the exercises involved skill practice, while 10 to 24% focused on conceptual understanding and 6 to 13% on problem solving (Porter, 1989).

The dumbing down of textbooks in elementary mathematics has also been eloquently summarized by parents. Consider the editorial by Kie Ho (1990) that recently appeared in *Education Week*:

> Five girls and three boys reached the top of Hurricane Mountain. How many children reached the top together?
>
> Mark, Theo, and Jake are brothers. Theo was born second. Mark is the youngest. Who is the oldest?
>
> In an unscientific survey, I passed these problems to 15 children, all under 8 years old; two were kindergartners. To no one's surprise, they solved them handily.

> These problems, however, did not come from our 1st or 2nd grade textbooks; they appear in a mathematics textbook for 5th graders in one of the most prestigious public schools in California.
>
> I have lived in different cities from coast to coast, and I have noticed that everywhere, instruction in addition and subtraction is repeated religiously from 1st to 7th grade. As a frustrated parent, I once stormed into a high-school principal's office to protest - futilely - the repetition of division and multiplication in my son's 10th grade class. At another time, I was saddened to discover that what was taught to 14-year-olds in the Netherlands and Indonesia - the solution of quadratic equations - was given at the college level here.
>
> My anguish is shared by many immigrant parents. In Taiwan, a 5th grader has already started studying motion problems ("At what time will the two cars meet?"). In the Dutch system, multiplication and division are considered finished by the 3rd grade level.
>
> Our 10-year-olds, however, are still in the crawling stage with the most basic of fractions (one-third equals two-sixths). When I took a peek at a Japanese 5th grade level math book in a bookstore in Los Angeles, I felt sad, embarrassed, and outraged. Who made the decision that our 5th grades, even in classes for the gifted, are not qualified to learn elementary algebra (negative numbers and first degree equations) and geometry (Pythagorean theorem) like their counterparts in Asia?
>
> I shudder to think that if this is happening in schools that are nationally ranked in the 90th percentile, what is being taught to our children in the inner cities? (p. 20)

Yearly repetition of skills. Another distinctive feature of elementary school mathematics is the slowness with which content changes as students progress through the grades. The overlapping content across grades occurs because topics begun at the end of one grade are continued into the beginning of the next grade. To some extent, topics are returned to again and again, each time seeking a greater depth of understanding (Porter, 1989). Corroborating this finding, Flanders (1987) investigated three separate mathematics textbook series to examine just how much new content is presented each year. His primary finding was that a relatively steady decrease occurs in the amount of new content over the years up through eighth grade, where less than one-third of the material taught is new to students. Overall, students in grades 2 through 5 encountered approximately 40 to 65% new content, an equivalent of new material two or three days a week. By eighth grade, this amount had dropped to 30%, just one and one-half days a week. Flanders found that most of the new content in any text is found in the second half of the book. In grades 7 and 8, where the total new content is lowest, new material occurs in less than 28% of the first half of the books. Flanders' study shows that the mathematical content of some textbooks is mostly review of previous topics. Flanders states, "The result is that early in the year, when students are likely to be more eager to study, they repeat what they have seen before. Later on, when they are sufficiently bored, they see new material - if they get to the end of the book" (p. 22). He elaborates,

> There should be little wonder why good students get bored: They do the same thing year after year. Average or slower-than-average students get the same message, and who could blame them for becoming complacent about their mathematics studies? They know that if they don't learn it now, it will be retaught next year. (p. 23)

Usiskin (1987) corroborates that not only have textbooks decreased in difficulty, but they also incorporate a large percentage of repetition to facilitate learning. Usiskin argues that even average eighth grade students should study algebra because only 25% of the pages in typical seventh and eighth grade mathematics texts contain new content. Usiskin points out that the current practice of spending a great deal of time reviewing work of earlier grades, in the same context as the earlier grades, is counterproductive. He states,

> For the student who does not know the material, the review is simply repeating what they are bad at. We find out what some students do not know and give them little else. It is not the spiral approach winding its way up the helix of understanding; it is the circular approach going round and round and back to the same place. (p. 432)

The findings presented here concerning the amount of repetition in mathematics textbooks were recently summarized in a National Research Council publication entitled, *Everybody Counts: A Report to the Nation on the Future of Mathematics Education* (1989). The Council reported that "we have a national curriculum in mathematics education. It is an 'underachieving' curriculum that follows a spiral of almost constant radius, reviewing each year so much of the past that little new learning takes place" (p. 45).

Science Textbooks

As in reading and mathematics instruction, science textbooks play a central role in the teaching of science, as described in several national reports on science education in the United States. The Project Synthesis (Harms & Yager, 1981) suggested that over 90% of all science teachers use a science textbook over 90% of the time. Yager (1983) and Yager and Stodgill (1979) maintain that most teachers use lectures and/or question-and-answer methods in presenting science content, which is based on information in the text. Brandwein (1981) reported that mastery of science terms introduced in text was the focus of most science teaching, with little or no emphasis devoted to the use or understanding of the words presented in the text.

Elliott, Nagel, and Woodward (1986) conducted an extensive examination of 10 elementary school science textbook programs and found that they did not involve students in scientific thinking or applying the cognitive processes that are basic to the understanding of science. They concluded that if teachers were to use these series to teach science without drawing on supplementary resources, students would understand science mainly as a collection of conclusions to be memorized. Students would not be brought to an adequate understanding of the nature and methods of science, nor would they be afforded opportunities to explore the relationship of science to technology. Elliott, Nagel, and Woodward (1986) found that nine elementary science textbook series published between 1984 and 1986 emphasized the products of science through topic coverage, memorization of content, and cookbook-style hands-on activities with predetermined results, rather than the processes used to investigate and create scientific knowledge. Elliott, Nagel, and Woodward (1987) conclude:

> When the rather dry, predictable, quick-fix textbook science is compared to what scientists really do, a number of distortions become really clear. Compressing science activities into short lesson segments gives students little opportunity to experience either the spark of curiosity and suspense of a possible discovery or the often dreary monitoring of long experiments that add only small bits of insight. (p. 10)

Social Studies Textbooks

Studies indicate that students at all grade levels find social studies classes more boring than language or mathematics classes (Schug, Todd, & Beery, 1984). In 1987, a national assessment of 17-year-olds found low levels of student understanding of the people, places, and events that constitute our nation's history (Ravitch & Finn, 1987). Students also believe that textbooks are undoubtedly part of the problem. A Roper Poll of American students between the ages of 8 and 17 found that 40% of them cite better textbooks as one way to improve the quality of education (Roper Organization, 1987). Elliott, Nagel, and Woodward (1985) interviewed elementary school students to discover their opinions of social studies and found that while they had definite likes and dislikes, many students were keenly interested in a multitude of topics that the social studies textbooks encompass. However, when the researchers questioned them about what they liked and disliked about their social studies textbooks, they heard negative comments such as the following: "Sometimes, they just me. 'on a person's name and then don't talk about them anymore in the whole bc k" or "They should talk more about each topic. For the War of 1812 there should be more information about the fighters and the treaties. What did the Treaty of Ghent contain? Who wrote it?" (Elliott, Nagel, & Woodward, 1985, pp. 22-23).

"Dumbing down" of social studies textbooks. Sewall (1988) compared the social studies textbooks of the 1950s with present day social studies textbooks. He discovered that textbook passages, which covered the same event, were considerably different, as illustrated by the following two passages from fifth grade textbooks which describe the battle in which John Paul Jones was a participant:

> **Passage 1:** After a time Captain Jones had command of another ship, the "Bonhomme Richard." It was an old vessel and not very strong. But in it the brave captain began a battle with one of England's fine ships. The cannons on the two ships kept up a steady roar. The masts were broken, and the sails hung in rags above the decks. Many of the men on the "Bonhomme Richard" lay about the deck dead or dying. The two vessels crashed together, and with his own hands the American captain lashed them together. By this time the American ship had so many cannon-ball holes in its side it was beginning to sink. The English captain shouted:
>
> "Do you surrender?"
> "Surrender? I have just begun to fight," John Paul Jones roared back at him.
> It was true. The Americans shot so straight and fast that the English sailors dared not stay on the deck of their ship.
> Their cannons were silent. At last the English captain surrendered. (p. 555)

Compare the above excerpt with a description of the same battle from a current popular (1985) fifth grade social studies textbook entitled *The United States and Its Neighbors.*

> **Passage 2:** The greatest American naval officer was John Paul Jones. He was daring. He attacked ships off the British coast. In a famous battle, Jones' ship, the "Bonhomme Richard," fought the British ship "Serapis." At one point in the battle Jones' ship was sinking. When asked to give up, Jones answered, "I have not yet begun to fight." He went on to win. (p. 556)

The comparison of these two excerpts dramatically illustrates the "dumbing down" of the curriculum described by Bell and others, and makes even more apparent the difficulty faced by bright students concerning their needs for challenging curriculum and textbooks.

Mentioning. "Mentioning" refers to textbook prose that flits from statement to statement, and topic to topic, without giving the reader the context that would enable them to make sense of the factual information. Books that are said to use mentioning are usually filled with facts and terms but are short on ideas and explanations. Without the necessary context, readers often fail to see the significance of the connections between statements (Tyson-Bernstein & Woodward, 1989).

The problem of mentioning is an important issue related to social studies textbooks addressed by many experts. Sewall (1988) points out that history textbooks have been drained of voice, drama, and coherence, and concludes:

> Textbooks have relied more on broken text and pictorial flash to hold students' interest. Efforts to render textbooks 'readable' - at least by the standards of readability formulas - have contributed to their arid prose. To make a narrative 'readable' publishers break up complex sentences, shorten paragraphs, and excise stylistic flourishes. The conjunctions, modifiers, and clauses that help create subtle connections and advance student understanding are routinely cut. The result is, at its best, straightforward, and, at its worst, choppy, monotonic, metallic prose... Deprived of connectors and qualifiers, historical narrative often becomes cryptic and more difficult to understand. A young person's interest in or affection for a memorable story counts for nothing. (p. 554-555)

Tyson-Bernstein (1988) also examined the mentioning problem in social studies textbooks and reported: "The Thirty Years' War will be 'covered' in a paragraph; the Nixon presidency in two sentences.... All of the small facts and terms that can be tested on a multiple-choice test will appear in the index, because that is where adoption committees usually check on curricular and test 'congruence' if they check at all" (p. 30). Following an extensive content analysis of the five leading American-history textbooks, Gagnon (1988) found that the texts:

> omit or dumb down the Old World background, as though it were of little importance.... The Middle Ages, when they are mentioned at all, are dark and stagnant, their people without ideas or curiosity and interested only in life after the grave.... Then, suddenly, the Renaissance springs forth, as "Europe Awakens." People begin to think for themselves and seek "new horizons." Hence the explorers, and the discovery of America. (p. 49)

At least two problems, including mentioning, are evident in primary grade textbooks. Sewall (1988) concluded the following about one of the leading elementary level history textbooks:

> Abraham Lincoln warrants two paragraphs, slightly more than Molly Pitcher... Valley Forge goes unmentioned, and World War II receives about two pages of text, a little more than the Dawes Act and the production of maple syrup. Explanations may simply be absent: "In 1816, James Monroe was elected President. Things went so smoothly that this time is called the Era of Good Feelings." (p. 555)

Larkins, Hawkins, and Gilmore (1987) analyzed primary-grade social studies content and reported the materials were providing children with "hopelessly noninformative content, such as that families contain parents and children, and that people live in houses, wear clothes, and eat food" (p. 299). The researchers found most of the content in current texts was "redundant, superfluous, vacuous and needlessly superficial" (p. 299).

It seems reasonable to conclude that the decline in the quality of textbooks contributes to the mismatch that exists between the ability level of more able students and the school curriculum. The majority of instruction, across content areas, is anchored by textbooks that concentrate on lower-level skills, unnecessarily repeat large amounts of instruction to facilitate learning, and contain "watered down" versions of content.

Staff Development

Because today's teachers remain in their positions for longer periods of time than teachers in the past, and fewer new teachers enter the profession, improvements in our schools require the enhancement of the professional skills of mature staff members. High quality staff development is necessary to bring about this educational improvement. Guskey (1986) defines staff development programs as "systematic attempts to bring about change - change in the classroom practices of teachers, change in their beliefs and attitudes, and change in the learning outcomes of students" (p. 5). Other researchers (Brophy, 1979; McDonald & Elias, 1976; Medley, 1977) have reported it is necessary to examine the variables that contribute to quality staff development programs.

In a recent meta-analysis of nearly 200 research studies of staff development, Showers, Joyce, and Bennett (1987, p. 79) believe that certain variables contribute to the quality of staff development. These variables include, for example:

1. What the teacher thinks about teaching determines what the teacher does when teaching. In training teachers, therefore, we must provide more than "going through the motions" of teaching.

2. Almost all teachers can take useful information back to their classrooms when training includes four parts: (1) presentation of theory, (2) demonstration of the new strategy, (3) initial practice in the workshop, and (4) prompt feedback about their efforts.

3. Teachers are likely to keep and use new strategies and concepts if they receive coaching (either expert or peer) while they are trying the new ideas in their classrooms.

4. Competent teachers with high self-esteem usually benefit more from training than their less competent, less confident colleagues.

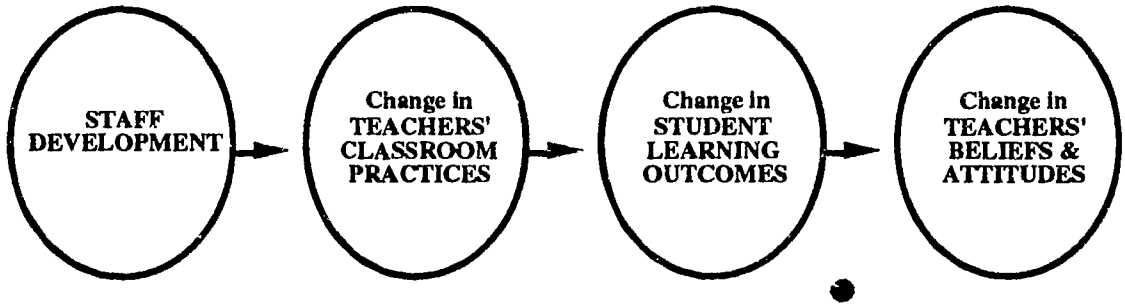
5. Flexibility in thinking helps teachers learn new skills and incorporate them into their repertoires of tried and true methods.

6. Individual teaching styles and value orientations do not often affect teachers' abilities to learn from staff development.

7. A basic level of knowledge or skill in a new approach is necessary before teachers can "buy in" to it.

Guskey (1986) suggests that staff development efforts are not influenced by teachers' beliefs and attitudes, but rather, attitudes and beliefs are a result of teachers implementing new practices and observing changes in students' learning outcomes (Guskey, 1986). Guskey's model of teacher change is illustrated in Figure 1.

Figure 1. Guskey's Model of the Process of Teacher Change.



Guskey (1986) believes that there are three major outcomes to staff development efforts. The outcomes are changes in the practices of teachers, changes in teachers' beliefs and attitudes, and changes in the learning outcomes of students. The order of these outcomes is in contrast to the popular belief that staff development programs influence teachers' attitudes and beliefs first, which in turn influence teachers' implementation of new teaching practices to observe the effects of the new practice on student learning outcomes. He further maintains that the kind of teaching practices that are sustained are those that teachers find to be "useful in helping students attain desired learning outcomes". Therefore, a key factor in maintaining any change in instructional practices is the existence of demonstrable results in students' learning, and Guskey states that "the point is that evidence of improvement (positive change) in the learning outcomes of students generally precedes and may be a prerequisite to significant change in their beliefs and attitudes of most teachers" (p. 7).

It follows, then, that the support teachers receive following training in a new practice is a critical component in the successful implementation of that practice (Guskey, 1986; Hall & Hord, 1987; Joyce & Showers, 1982, 1983, 1987). What type of support is necessary and under what conditions? These questions were addressed in several research studies investigating the coaching of teachers who were trying to improve their teaching skills and/or implement new practices.

Baker and Showers (1984) have operationally defined coaching as the "provision of on-site, personal support and technical assistance for teachers" (p. 1). Joyce and Showers (1982) state that there are five major functions of coaching: (1) provision of companionship, (2) giving of technical feedback, (3) analysis of application: extending of executive control; (4) adaptation to the students; and (5) personal facilitation.

Joyce and Showers (1983) reviewed a number of research studies to determine the elements of training needed to enable teachers to implement new teaching practices. The necessary components for training teachers were:

1. the study of the theoretical basis or the rationale of the teaching method
2. the observation of demonstrations by persons who are relatively expert in the model

3. practice and feedback in relatively protected conditions (such as trying out the strategy on each other and then children who are relatively easy to teach); and

4. coaching one another as they work the new model into their repertoire, providing companionship, helping one another to learn to teach the appropriate responses to their students and to figure out the optimal uses of the model in their courses, and providing one another with ideas and feedback. (p. 4)

The suggestions of Joyce and Showers (1982, 1983, 1987) involve detailed elements of training that must be present in order for teachers to successfully implement new strategies in their classrooms. Elements of the staff development practices recommended by both Guskey and Joyce and Showers are included in the study described in this report.

Curriculum Compacting

Curriculum compacting (Renzulli & Smith, 1979) is an instructional strategy designed to address the decline in textbook difficulty, the large amount of repetition in instructional materials, and the needs of above-average learners who finish class work easily and consequently become bored with routine tasks (Betts, 1986; Clifford, Runions, & Smith, 1986, Feldhusen & Kolloff, 1986; Renzulli & Reis, 1986; Treffinger, 1986). Three textbooks have been written to serve as guides to the curriculum compacting process (Reis, Burns, & Renzulli, 1992; Renzulli & Smith, 1979; Starko, 1986). Reis, Burns, and Renzulli delineate eight steps to the curriculum compacting process, including:

1. Identification of the relevant learning objectives in a particular subject area or grade level

2. Identification of students who may possess mastery of these objectives

3. Development of some means to pretest students on one or more of the objectives prior to instruction

4. Pretesting students

5. Streamlining practice, drill, or instructional time for students who have demonstrated mastery of the objectives

6. Individualization of instructional options for students who have not yet mastered all of the specified objectives, but who are capable of mastering the objectives more quickly than other classmates

7. Development of enrichment or acceleration options for students who have demonstrated mastery of the learning objectives

8. Devising and maintaining records of this process and the instructional options available to "compacted" students

Research on Curriculum Compacting

Over the past six years, various research studies (Imbeau, 1991; Reed, 1987; Rogers, 1991a, 1991b; Rubin, 1987; Schultz, 1991) have examined curriculum compacting using a variety of dependent variables, including: the achievement of students whose curriculum was compacted in mathematics, the attitudes of students whose curriculum was compacted in reading, teacher attitudes toward the procedure, and the extent to which teachers used curriculum compacting one year after an inservice on the strategy was provided.

Compacting and student achievement in mathematics. Schultz (1991) examined the effect of curriculum compacting on the mathematics achievement of fourth-grade math students in a midwestern school district. One hundred and thirty-two students took part in this ex post facto research, in which achievement was measured in both October and May of one school year using the Mathematics Concepts, Mathematics Problem Solving, and Mathematics Computation subtests of the *Iowa Tests of Basic Skills*. Schultz (1991) reported no significant differences between control and treatment groups with respect to scores on any of the mathematics subtests; students whose curriculum was compacted achieved equally as well as their agemates whose curriculum had not been compacted.

Compacting and student attitude in reading. A quasi-experimental study conducted by Reed (1987) investigated the effects of curriculum compacting in reading on students' pre and post attitudes toward reading. Using a modification of Estes' attitude Toward Reading Scale, Reed found significant differences between control and experimental students. The students in the experimental group preferred self-directed reading activities over teacher-directed reading activities significantly more than did control group students and stated a preference for independent library research significantly more often than did control group students. Reed also reported that students in the experimental group expressed a dislike for doing workbook pages they already knew.

Extent of teachers' use of compacting following inservice. Rubin (1987) surveyed fourth and fifth grade teachers from a suburban school district one year after an initial inservice on curriculum compacting. The purpose of the survey was to determine the extent to which the procedure had been implemented. Rubin (1987) reported that teacher use of the procedure increased by 27%.

Teacher variables, inservice strategies, and curriculum compacting. Imbeau (1991) investigated teacher variables (i.e., years of teaching experience, number of graduate credits in education of the gifted) and staff development strategies which influenced teachers' use of curriculum compacting. One hundred and sixty-six teachers, grades K through 12, in a large, urban school district participated in a quasi-experimental research study in which three levels of treatment were provided. After a full day of inservice provided by the researcher, teachers in one group were provided with encouragement and technical assistance, teachers in a second group were provided with peer coaching (teacher to teacher), and teachers in the third group were provided with peer coaching from district program specialists. Imbeau concluded that peer coaching (teacher to teacher) was significantly more effective as an inservice strategy than the assistance provided by the district coach when using teachers' attitudes toward compacting as the dependent variable.

To summarize, a limited amount of research exists with respect to the instructional strategy called curriculum compacting, and some of the studies present contradictory findings. The staff development research that does exist (Imbeau, 1991) suggests that the

type of inservice strategy provided to teachers about curriculum compacting may influence teachers' attitudes toward the procedure. Specifically, peer coaching (teacher to teacher) was found to be more effective in promoting positive teacher attitudes toward curriculum compacting than was encouragement and technical assistance. Additionally, research (Reed, 1987) suggests that use of the procedure may also positively affect second grade students' attitudes toward reading. Students who are not provided with a challenging learning environment that is appropriate for their ability level may find school "too easy" and are, therefore, unlikely to learn how to deal with the frustration that is frequently experienced when learning new and difficult skills or concepts. Students may become behavior problems, drop-outs, or, as Feldhusen suggests, become "systematically demotivated" (1989, p. 58) because schools have failed to provide them with a challenging curriculum. The students may grow to dislike learning simply because their academic curriculum or the reliance on inappropriate textbooks did not meet their ability level. Educators must strive to have high ability students enjoy learning and must promote this love of learning in young people by addressing the mismatch between what our brightest students are capable of doing and a curriculum which no longer challenges them. Teachers may implement various types of curriculum change or modification, including curriculum compacting, if appropriate staff development is provided.

CHAPTER 3: Procedures

In this chapter, procedures for selecting districts and students are described. Instrumentation, data collection, and data analysis procedures are also explained.

Sample

Districts

Recruitment of Collaborative School Districts for the curriculum compacting study was completed in August and September of 1990. Collaborative School Districts, having volunteered to be potential research sites, are an integral part of the NRC/GT. Over 60 school district contact persons from various geographic regions and school district types were called. Concerted efforts were made to recruit districts with student populations that included economically disadvantaged, limited English proficient, and handicapped students. Interested districts received an initial mailing which included:

Abstract of Research Project
Timeline for Procedures
Description of Information to be Collected
Agreement Between Collaborative School District and the NRC/GT
Superintendent's Letter of Agreement
Cover letter from the NRC/GT for districts
Sample letter for districts to send to parents
Parent Consent Form
Press Release

After the initial mailing, telephone calls were made to each interested district to describe the study in more detail and provide a thorough explanation of random assignment to treatment and control groups, a requirement for district participation. Each district liaison was also questioned about the degree to which curriculum compacting was implemented in the district. If any evidence of the use of curriculum compacting was present, the district was eliminated from participation in the study.

Of the districts contacted, 27 agreed to participate in the study. Three additional districts which qualified for participation but whose paperwork was not returned on time were also retained as alternates in the event that districts dropped out of the study. Random assignment of districts to treatment or control groups was completed after superintendents' letters of agreement were returned.

After random assignment was completed, all districts were called and questions were answered about any aspect of the study. Special attention was given to districts that had been assigned to the control group; in certain situations, school district liaisons were disappointed to be assigned to the control groups, but they understood the importance of the assignment for the research study.

The first phase of the compacting study for the treatment groups consisted of two teacher inservice sessions. In the first inservice, teachers saw the first part of a two-part video on curriculum compacting. Teachers viewed the second half of the video in the second teacher inservice of the first phase for treatment groups. At the end of this staff development session, classroom teachers were asked to select one or two students in their

classroom who clearly were eligible to have their curriculum compacted. They were asked specifically to target youngsters who are not traditionally identified for gifted programs (e.g., economically disadvantaged, limited English proficient, handicapped). To assist them in their selection of students, teachers used materials developed for the project: *Guidelines for Selecting Students for Curriculum Compacting and Behaviors Which Suggest Compacting is Necessary*. These materials are included in Appendix A along with other instrumentation used in the study.

Liaisons in districts selected as control groups were also asked to schedule a meeting for their staff. Teachers were told they were participating in a study involving classroom practices and were asked to complete the Teacher Data Form. They were told to select two youngsters using the criteria explained in the guidelines for selecting students that were used by the treatment group teachers. Testing of control group students proceeded in exactly the same manner as with the treatment group students.

In October 1990, one treatment district dropped out of the study due to union-related ("work to rule") problems and was replaced by an alternate district that had been held in reserve. Three other districts also reduced the numbers of schools involved in the study due to the amount of work involved in the student assessment process. Accordingly, a decision was made to randomly assign the two remaining alternate districts to the treatment groups in which numbers had been decreased. The list of districts, including the numbers of teachers and students who participated in the study, is shown in Table 1.

Table 1

Characteristics of Districts

Group	District Location	Type of Community	Socio-economic Status[a]	Students	Teachers
Control					
	Guam	Rural	Low	42	22
	New Hampshire	Urban	Medium	32	17
	Alaska	Suburban	Medium	17	16
	Arizona	Rural	Low	40	17
	Michigan	Urban	Low	39	20
	Connecticut	Rural	Medium	24	14
	Idaho	Rural	Medium	99	50
				293	156
Treatment 1					
	Michigan	Suburban	Medium	35	20
	Arizona	Urban	Medium	35	28
	Virginia	Urban	Medium	14	7
	Connecticut	Rural	Medium	27	16
	California	Urban	Low	11	7
	Rhode Island	Suburban	Medium	16	15
				138	93
Treatment 2					
	Iowa	Urban	Low-Medium	48	25
	Connecticut	Suburban	Medium	12	8
	New Hampshire	Rural	High	19	7
	Minnesota	Suburban	Medium-High	19	15
	Louisiana	Suburban	Medium	39	23
	Connecticut	Suburban	High	20	10
	Connecticut	Suburban	Medium	9	5
				166	93
Treatment 3					
	Utah	Suburban	Medium	53	27
	Montana	Rural	Low-Medium	26	13
	Mississippi	Suburban	Medium	62	31
	Minnesota	Suburban	Medium	15	12
	New York	Rural	Medium	7	5
	Wyoming	Rural	Low-Medium	7	4
	Oklahoma	Suburban	Medium	16	2
				186	94
		Total		783	436

[a]Self-reported

It should be noted that many participating teachers originally indicated that they would target more than 1-2 students in their classroom. However, when it was time to administer the *ITBS* and all of the other student instruments, teachers decided to target the number of students originally suggested by the researchers, 1-2 per classroom.

Sample of Students in the Study

Classroom teachers selected one or two high ability students in their classrooms for participation in the study. If students were identified for a gifted program, classroom teachers selected one or more of the identified students for compacting services. If a gifted program did not exist at that target grade level or in the school, teachers used guidelines provided to them for selecting students. Guidelines directed teachers to respond to questions, such as "Who consistently completes tasks quickly?" or "Who consistently demonstrates high performance in one or more academic areas?" While compacting services would be appropriate for more than one or two students in a classroom (in most situations), teachers were encouraged to select students for this study who clearly demonstrated a need for curriculum compacting in one or more subject areas. The selected students belonged to the following racial groups: eighty-six percent Caucasian-American, six percent Asian-American, four percent African-American, two percent Hispanic-American, one percent Native American, and one percent, Other. Fifty-one percent of the students were female.

The results of the out-of-level *Iowa Tests of Basic Skills* (see instrumentation section) pretests indicated that teachers did indeed select high ability students in their classrooms. The median percentile score obtained by all students on the out-of level reading subtest of the *ITBS* (using national norms) was the 93rd percentile. The median score by all students on the mathematics concepts subtest was the 93rd precentile, and the median on the mathematics computation subtest was the 90th percentile.

Instrumentation

Several pre and post instruments were administered to students and teachers participating in the study. This part of the report is divided into two sections: student instruments and teacher instruments. Copies of all instrumentation used in this study, with the exception of the *Iowa Tests of Basic Skills* , are included in Appendix A.

Student Instruments

Iowa Tests of Basic Skills. Pre and post student achievement was assessed by the *Iowa Tests of Basic Skills (ITBS)*, which was administered to students in the control and experimental groups. One grade level higher (out-of-level) *ITBS* tests were administered to all students. The reading, mathematical concepts, mathematical computation, science, social studies, and spelling subscales of Form J of the *ITBS* were administered, and to guard against ceiling effects, tests designed for students one grade level above each student's current grade level were administered. Because out-of-level testing was used, the reliability coefficients for grade levels three through seven were inspected. For the language arts subscales (grades three through seven, Spring 1988 Norms), reliability coefficients are greater than 0.95 (see *Iowa Tests of Basic Skills*, form J, 1990). KR-20 coefficients, as determined by spring 1988 norms for the mathematical concepts, mathematical computation, science and social studies subscales, respectively, are reported to be better than: 0.85, 0.90, 0.85, and 0.85, respectively (*ITBS*, 1990).

For two districts, Forms G and H of the *ITBS* were used. The KR-20 coefficients for all subscales (e.g., language arts, social studies) are reported to be greater than 0.80 (*ITBS*, 1990). Validity information on the *ITBS* is well documented (1990), as is additional technical support. While the detailed information is reported in *The Tenth Mental Measurement Yearbook*, Brown and Burton (1989), reviewers of the *ITBS* in the Buros' Yearbook, said, "the *ITBS* is not a perfect battery, but it represents the best that modern educational measurement can produce" (p. 398). Extensive content validity studies in addition to analyses for test fairness have been reported for the *ITBS* batteries (1990).

Arlin Hills Attitude Survey Toward School Learning Processes. Pre and post student attitudes toward learning were measured with the *Arlin-Hills Attitude Survey Toward School Learning Processes* (Arlin, 1976). Two forms of this survey were used in this study, one for primary level students (Grades K-3) and one for elementary level students (Grades 4-6). These two 15-item surveys assess a number of factors that are of concern in the creation of a school climate appropriate for the implementation of curriculum compacting. For example, factor analytic validity studies of the *Arlin-Hills Attitude Survey* based on a sample of 13,806 students revealed that constraints related to learning choices (e.g., students work in small groups, students study with friends) and teacher dominance (e.g., teacher talk, students need permission) are represented by scores (see *Manual for Arlin-Hills Attitude Survey*, 1976, p. 7). The internal consistency coefficient for the instrument, as determined by a split-half procedure with a Spearman-Brown adjustment (n=6000), was 0.90.

The Content Area Preference Scale. The *Content Area Preference Scale (CAPS)* (Kulikowich, 1990) was developed to measure student preference toward school subjects (i.e., reading, mathematics, science, and social studies) before and after the compacting intervention. The *CAPS* consists of twenty 3-point Likert items where students circle either a happy face (I agree with statement), an uncertain face (I neither agree nor disagree with statement) or a sad face (I disagree with the statement). An initial pool of 40 items was developed for the scale. All items were inspected for the suitability of vocabulary for these academic levels through two basic means. First, textbooks at the elementary school level were inspected for commonly used words and phrases. Second, teachers who had experience working with elementary school children (grades 2-6) were asked to inspect the items and suggest changes as they saw necessary. Two pilot studies were performed to eliminate poor items and to reduce the item pool from 40 to 20. The 20 items were then examined for reliability and validity using an extensive set of procedures (Kulikowich, Reis, Owen, & Smist, 1992). The items that loaded onto each of the four factors are displayed in Table 2. With two exceptions (item 5 and 20), all factor loadings were greater than 0.35. Item 5, "Learning about other countries is interesting," had a factor loading of 0.34 and loaded most heavily on the social studies construct. Item 20, "Students should know how to read," had its highest loading for the reading construct. It appears that the low factor loading (0.18) arises from the fact that students were most inclined to agree that students should know how to read. Thus, there was little variability among students' responses for that item. The reliability coefficients for the reading, mathematics, science, and social studies subscales, as determined by Cronbach's Alpha, were greater than 0.80.

Table 2

The Subject Subscales of the *Content Area Preference Scale (CAPS)*

Subscale	Item Stem	Factor Loading
Reading (no. of items = 7); Score Range (0 to 14)		
Item no.		
18	Reading is important to me	0.7225
8	I like to read stories	0.7133
4	I think reading is fun	0.6902
11	Students should read often	0.5737
14	I read stories in my free time	0.5722
1	I learn a lot from reading	0.4522
20	Students should know how to read	0.1840
Mathematics (no. of items = 4); Score Range (0 to 8)		
Item no.		
2	I think that mathematics is interesting	0.8868
15	Mathematics is fun to do	0.8117
19	Schools should teach mathematics	0.5870
6	Mathematics is simple for me	0.4931
Science (no. of items = 4); Score Range (0 to 8)		
Item no.		
12	Science is important to me	0.7935
9	I want to take more science classes	0.7466
3	Science is an interesting subject	0.7162
16	Students need science classes	0.6340
Social Studies (no. of items = 5); Score Range (0 to 8)		
Item no.		
17	Schools should teach social studies	0.7583
7	Students need social studies classes	0.7471
10	Social studies is important to me	0.7012
13	I want to know more about the United States	0.3692
5	Learning about other countries is interesting	0.3434

*The Rotated Factor Pattern for the *Content Area Preference Scale* is included in Appendix B.

Teacher Instruments

Stages of Concern Questionnaire. The Concerns-Based Adoption Model (CBAM) was developed at the Texas Research and Development Center to conceptualize and monitor educational change. One of the instruments developed at that center is the *Stages of Concern Questionnaire (SoCQ)*, a 35-item survey measuring seven stages of concern with regard to the adoption of an innovation: awareness (awareness and concerns about the innovation), information (concerns about what the innovation is and what use of the innovation entails), personal (personal concerns and uncertainties about the innovation), management (concerns about management, time, and, logistical aspects of the innovation), consequence (concerns about the impact of the innovation upon students), collaboration (concerns about working with others), and refocusing (concerns about new ideas to replace or alter the innovation) (Hall, George, & Rutherford, 1979). The reported alpha reliabilities of the *SoCQ* for these factors are 0.64, 0.78, 0.83., 0.75, 0.82, and 0.71, respectively. This instrument yields an individual profile and is used for diagnostic purposes only (Hall et al., 1979). The *SoCQ* instrument was administered to teachers in treatment groups in this study to examine changes that may have resulted after teachers received different levels of staff development and provided curriculum compacting for students.

Teacher Data Form. A teacher data form was developed to gather information from teachers in the treatment and control groups on the following variables: staff development hours in gifted education, availability of enrichment resources, hours of planning time, classroom grouping practices, availability of pretests and curriculum guides, years of teachers' experience, and graduate hours in gifted education. Teachers completed this form prior to the implementation of the intervention.

The Compactor Form. A form entitled the *Curriculum Compactor* (Renzulli & Smith, 1978) was used by teachers to document the compacting services provided to students. The form is divided into three columns arranged sequentially to represent the stages of curriculum compacting as depicted in Figure 2. In the first column, the teacher is asked to identify a content area or areas in which a student has strengths or has demonstrated proficiency and to cite evidence of that ability. Evidence might include: achievement test scores, prior grades in the subject area, informal discussions with a student's previous teacher, and student demonstration of proficiency. In the second column of the compactor, the teacher is asked to identify and list curricular material that the student has not yet mastered, but needs to master to meet curricular objectives. The teacher also indicates in column two the procedures that can be used to achieve mastery at a pace that is commensurate with student ability (e.g., independent or small group work with students of similar ability), the strategies to be used to assess the student's mastery of the curriculum and the standard for mastery (e.g., 80%, 90%, 100%). The time saved through curriculum compacting is then used by the teacher to provide a variety of enrichment or acceleration opportunities for the student which are listed in the third column of the curriculum compactor. Enrichment strategies might include: self-selected independent investigations, mini-courses, advanced content, mentorships, and alternative reading assignments. Acceleration might include the use of material from the next unit or chapter, the use of the next chronological grade level textbook or the completion of advanced work with a tutor or mentor. Alternative activities listed in the third column of the compactor should reflect an appropriate challenge and rigor commensurate with the student's abilities and interests.

INDIVIDUAL EDUCATIONAL PROGRAMMING GUIDE

The Compactor

Prepared by: Joseph S. Renzulli
Linda M. Smith

NAME Elizabeth AGE 9 TEACHER(S) _____ Individual Conference Dates And Persons Participating in Planning Of IEP

SCHOOL Lincoln GRADE 3 PARENT(S) _____ _____ _____ _____ _____

CURRICULUM AREAS TO BE CONSIDERED FOR COMPACTING Provide a brief description of basic material to be covered during this marking period and the assessment information or evidence that suggests the need for compacting.	PROCEDURES FOR COMPACTING BASIC MATERIAL Describe activities that will be used to guarantee proficiency in basic curricular areas.	ACCELERATION AND/OR ENRICHMENT ACTIVITIES Describe activities that will be used to provide advanced level learning experiences in each area of the regular curriculum.
Math - Holt TTBS Math Achievement Test Grade 2 = 98% Pre-tests in units: Computation: +, -, x, * (beginning division) Problem solving Measurement Metric Geometry Fractions (intro) Math Grade: A	Pre-test each unit from column one Cut up to 50% of paper work Applied use of manipulatives for each unit as recommended and outlined in "Math A Way of Thinking" Student demonstrated understanding, skill and accuracy by "flashing" slates, board work and seatwork activities. Post-test each unit from column one with 90% accuracy Participated in enrichment math	Free access to computer when it was not in use SRA Schoolhouse Math (self-check) Loved this at first but only stayed with it for a short while Much free reading time Did creative writing of her choice, even wrote a play Worked with Mind Benders Favorite part for both Elizabeth and Brent was working with the gifted and talented coordinator for one hour a week Evaluating compacting program and give it high ratings Did extra science projects - (demonstrated experiment to rest of the class)

☐ Check here if additional information is recorded on the reverse side.

The Curriculum Compactor Assessment Form. *The Curriculum Compactor Assessment Form* (Reis, 1991), was developed to assess the quality of teachers' implementation of the curriculum compacting, as depicted in Figure 3. The following procedure was used to provide an estimate of the instrument's reliability. First, a nine item checklist for assessing completed compactors was developed. The nine items on the checklist reflected the elements of quality compactors advocated by curriculum compacting experts (Renzulli, Smith, & Reis, 1982; Starko, 1986). Four research team members used the checklist to evaluate independently five completed compactors. Items were rated 0 to 1, indicating the absence (0) or presence (1) of the characteristic on the compactor. After completing the checklists on five compactors, research team members with extensive experience in the compacting process discussed their evaluations to improve the reliability of their ratings. Eleven compactors were then assessed by the two team members who later evaluated all compactors completed by teachers in the study. Interrater percent agreement on these ratings was calculated using the following formula (Good & Brophy, 1987): Percent Agreement = 1 -(A - B)/(A + B)

A and B refer to the ratings by the two raters; the A term is always the largest number. The results of this analysis are listed below in Table 3. After discussing the evaluations of the 11 compactors, a 10th (and final) item was added to the checklist that would provide a summative, qualitative rating of each compactor. The final *Compactor Assessment Form*, which was used to assess the compactors submitted in this study, is shown in Figure 3.

Table 3

Interrater Percent Agreement from Trial Ratings of Compactors

Compactor	Rater 1	Rater 2	% Agreement
#1	6	5	91
#2	7	6	92
#3	6	6	100
#4	5	2	57
#5	5	6	91
#6	7	8	93
#7	5	4	89
#8	6	7	92
#9	8	8	100
#10	5	4	89
#11	7	7	100

Mean Interrater Agreement = 90.36%

Figure 3. The Curriculum Compactor Assessment Form.

Column on Compactor	Rating
Column 1	
1. Are curricular strength areas of the student(s) clearly identified (e.g., language arts, mathematics)?	_____
2. Are pretests or general assessments of student strength areas provided (such as language arts pretests or achievement test information)?	_____
Column 2	
3. Are specific areas of content to be eliminated or modified listed?	_____
4. Are various types of skills assessment to prove evidence of proficiency (i.e., passed various level tests) documented?	_____
Column 3	
5. Are alternative activities listed for students?	_____
6. Are the activities based on alternative enrichment activities, i.e., not extensions of regular curricular exercises?	_____
7. Do the alternative activities listed appear to have taken into account the students' interests (e.g., independent study options, specific types of alternative reading assignments)?	_____
Columns 1-2-3	
8. Is it apparent that various pieces of information have been taken into account, regarding students' curricular strengths, the documentation of proficiency and the replacement of more appropriate enrichment and/or acceleration? In other words, is there a clear connection between Columns 1-2-3 on the compactor?	_____
9. Does the teacher appear to have completed the form with care and attention to detail, and does the compactor form reflect appropriate time spent by the classroom teacher?	_____
10. Does the completed compactor form reflect the overall quality expected in the curriculum compacting process?	_____
Total Score (0 to 10 possible)	_____

The Classroom Practices Questionnaire. The *Classroom Practices Questionnaire (CPQ)* was developed to ascertain the classroom practices used by teachers when providing compacting services to students. The instrument includes several questions about how frequently classroom teachers use certain practices and techniques. Items include strategies such as "assign reading of more advanced level work" and "give pretests to document student proficiency." Open-ended questions about content areas selected for compacting and percentage of curriculum eliminated are also included. The internal consistency reliability coefficient was 0.85 with the sample of teachers in this study.

The Anecdotal Incident Report Form. It became evident early in the study that district research liaisons had interesting experiences to report to the NRC/GT staff. Due to the high number of telephone calls from research liaisons reporting incidents early in the semester, a *Compacting Study Anecdotal Incident Report Form* was designed and distributed to all participating school districts. The form was developed to record all important incidents, the research liaisons' responses to the incident, and possible implications of the incident for the NRC/GT staff. An example of a reported incident is as follows:

Description of Incident
Two second grade teachers saw me about two students they had selected as the most capable in their classroom. They wanted to know what they could do with these students in the American Indian unit they were covering. The four students seemed so far ahead of the other students.

Responses and/or Actions to the Incident
I gave these teachers three books on American Indians and the name of the Pequot Indian woman who represents the Connecticut River Powwow Society who had expressed an interest in working with students.

Possible Implications
NRC/GT needs to discuss in reports what classroom teachers should learn to be able to provide support, direction, and techniques to work effectively with more capable students.

Procedures

Each district appointed a research liaison for the curriculum compacting study who was usually a director or teacher in the district's gifted program. Each district was contacted by the researchers at least twice a month during the study, and liaisons were encouraged to call upon the NRC/GT staff for information and assistance as needed. All contact was documented on progress reports completed by the NRC/GT staff. Additionally, anecdotal reports were recorded on the *Anecdotal Incident Report Form* by district liaisons and sent to the University of Connecticut site when significant events related to the curriculum compacting process occurred in the district. Anecdotal reports were also completed by the NRC/GT staff to document all phone calls received from district liaisons.

Three treatment groups, which received increasing levels of staff development, were used to determine the most efficient and effective method for training teachers to modify their curriculum. The levels of treatment are explained in Figure 4. A lengthy explanation of the staff development session(s) and the various inservice materials were

mailed to the district liaisons. All treatment group teachers received the first treatment, which provided two half-hour videotapes and a book about the compacting process. Teachers completed the *Teacher Data Form (TDF)* and *Stages of Concern Questionnaire (SoCQ)* before seeing the videotapes. These instruments were returned to the NRC/GT research team when they were completed. After receiving the first staff inservice session in October 1990, teachers were asked to select one or two students from their classrooms. As detailed earlier, these students had either been identified as gifted and talented and participated in the district's program, or had clearly demonstrated superior ability and achievement in a content area that indicated the student would benefit from the compacting process.

After being selected, students' attitudes toward learning were assessed using the *Arlin Hills Attitude Survey (AHAS)*, their content area preferences using the *Content Area Preference Scale (CAPS)*, and their achievement in selected content areas using the *Iowa Tests of Basic Skills (ITBS)*. Correspondence and telephone conversations helped determine the best time for administration of these tests and instruments. Extensive information related to the administration of *ITBS* and the other student instrumentation was sent to district liaisons. All testing was targeted for November, 1990, and was organized by the district research liaison in collaboration with the local district testing specialist, if one was available.

Figure 4. Description of Materials to be Used by Different Treatment Groups.

Treatment No. 1:
- 2 Videotapes (1 hour total) explaining how to compact curriculum
- 1 Book including more explanatory information about how to implement curriculum compacting (130 pages)
- Related articles/examples

Treatment No. 2:
- 2 Videotapes (1 hour total)
- 1 Book including more explanatory information about how to implement curriculum compacting (130 pages)
- Related articles/examples
- Group compacting simulations and practice conducted by local gifted and talented education consultant

Treatment No. 3:
- 2 Videotapes (1 hour total)
- 1 Book including more explanatory information about how to implement curriculum compacting (130 pages)
- Related articles/examples
- Group compacting simulations and practice conducted by local gifted and talented education consultant
- Local consultant services and peer coaching experiences

Teachers in Treatment Group 2 received the videotape training and book as well as approximately two hours of group compacting simulations conducted by the local gifted and talented resource teacher or consultant in January, 1991. The simulations, developed by Starko (1986), have been a standard resource in this type of training. Using either the fictitious child portrayed in Starko's simulation or a real child identified by the liaison and

classroom teachers, participants were asked to complete all three of the columns of the curriculum compactor.

Treatment Group 3 received the same training as Treatment Group 2 with the addition of local peer coaching and/or consultant services. Local consultants provided informal peer coaching throughout the year and provided 6-10 hours of organized peer coaching between April and June, 1991; that is, local consultants worked individually or with small groups of teachers who had questions or requested assistance as they worked through the stages of the curriculum compacting process. Additionally, liaisons provided organized peer coaching during the last quarter of the school year. This was accomplished in two ways. In smaller school districts, each liaison worked with individuals or small groups to discuss successful practices related to each step of the compacting process. In larger districts, the liaisons or consultants were unable to meet with all participating teachers. Instead, liaisons identified mentor teachers who had successfully implemented the compacting process and expressed an interest in working with teachers who were hesitant about curriculum compacting. Together, the liaison and mentor teachers were able to provide the peer coaching.

Two codebooks were developed for organizing the data from the pre-assessment and post-assessment measures. The data were entered on data tapes by Advanced Automation, a professional data processing company based in Vernon, Connecticut. Pre and post-assessment measures for students included the *Arlin-Hills Attitude Toward Learning Processes Survey*, the *Content Area Preference Scale*, and the *Iowa Tests of Basic Skills*. Pre and post-assessment measures for teachers included the *Classroom Practices Questionnaire* and *Stages of Concern Questionnaire*. All post-assessment measures were administered in late May or June.

Data Analysis

Several quantitative and qualitative analyses were used to address the 17 research questions formulated for the study. A variety of descriptive and inferential statistical procedures were employed to investigate Research Questions 1 - 8 and 14 - 17. Frequency distributions, percentages, means, medians, and standard deviations were used for descriptions, as dictated by the scale of the variable in question. Statistical analyses were conducted using Chi-square, analysis of variance, and analysis of covariance procedures. Follow-up procedures included planned contrasts on adjusted means, and Scheffé' post hoc comparison tests. SPSS-X and SAS were the statistical packages used for these analyses, which were performed on the mainframe computer at the University of Connecticut. Research Question 3 in this study was addressed through a combination quantitative and qualitative procedures to examine the enrichment and acceleration activities used by teachers in the treatment group.

Structured equation modeling using LISREL VII (Joreskog & Sorbom, 1979) was used to address Research Questions 9-13. Latent trait modeling was selected based on concerns about limitations of regression-based path analysis technique (Kenny, 1979). The model parameters were estimated using maximum likelihood confirmatory factor analysis (Sorbom & Joreskog, 1989). A total of eight models were examined. Models were created to determine the relationships between gender, grade, compacting, subject area targeted, pre and post achievement, pre and post subject area preferences and post attitudes toward learning. For simplification, separate models were tested for each compacted subject area. Numerous alternative hierarchical models were tested and rejected

based on fit. The subject areas of mathematics and language arts proved to be the most popular for compacting and, thus, were selected for LISREL models.

In the original proposal, underachieving gifted students were to be included in the LISREL model dealing with student achievement; however, classroom teachers in the study did not nominate underachieving students for curriculum compacting. In the original proposal, we also specified that a LISREL model would be created dealing with teacher variables such as training, years of teaching, staff development, and other variables. However, preliminary data analyses revealed too few differences among treatment and control group teachers to be able to create such a model. Accordingly, descriptive statistics were used to address these issues which are included in Research Questions 14 and 15.

CHAPTER 4: Results

Various statistical procedures and qualitative methods detailed in Chapter 3 were used to address the seventeen research questions listed in Chapter 1. The results are organized by these questions.

1. In what content areas and to what extent do teachers modify instructional practices and regular material to meet the needs of gifted and talented students in regular classroom settings?

To address Research Question 1, teachers' responses to questions on the *Classroom Practices Questionnaire* were tabulated and the first column of all the compactors was analyzed to determine the content areas in which teachers completed curriculum compacting. Modifications to curriculum were made; most often by the participating teachers in mathematics, followed by language arts. Modifications were also made in science and social studies when students displayed high ability and interest in those subject areas. The self report, open-ended questions on the *Classroom Practices Questionnaire* were tabulated to determine the percentage of regular curriculum that teachers eliminated. The means for the percent of material compacted for treatment Groups 1, 2 and 3 were 45%, 42%, and 54%, respectively (Table 4). A one-way analysis of variance indicated there were significant differences in the percent of materials compacted among the groups ($F = 6.54$, $p < .01$). A Scheffé' post hoc procedure on the differences among the group means indicated that Group 3 was significantly different from Group 1 and significantly different from Group 2 ($p < .05$). Thus, teachers in Treatment Group 3 compacted significantly more content than did teachers in Treatment Groups 1 and 2 and saved proportionally more time for students with high ability. Ninety-five percent of the teachers involved in the study completed compactor forms on the students they selected. Previous experience in the compacting process has demonstrated that teachers are more successful in the process when they begin with one content area. This information was provided to teachers in the videotape inservice and in the book they received on curriculum compacting. Accordingly, 71% of teachers in Treatment Group 1, 72% of teachers in Treatment Group 2, and 63% of teachers in Treatment Group 3 compacted in one content area. A smaller number of teachers in each treatment group compacted in two content areas, including 23% in Treatment Group 1, 26% in Treatment Group 2 and 34% in Treatment Group 3. A small percentage of teachers compacted in three or more content areas: 6% in Treatment Group 1, 2% in Treatment Group 2 and 3% in Treatment Group 3.

Table 4

Content Areas Selected for Curriculum Compacting With Mean Percent of Curriculum Compacted

Subject	Treatment Group	No. of Teachers	Mean % Compacted
Mathematics	1	37	39
	2	50	41
	3	46	49
Language Arts	1	24	52
	2	28	36
	3	34	54
Spelling	1	31	46
	2	27	54
	3	32	66
Social Studies	1	5	40
	2	4	40
	3	4	24
Science	1	6	47
	2	5	26
	3	1	40
Other	1	1	70
	2	1	25

2. What are the strategies used by teachers to determine the curricular strength areas of students and student mastery of the regular curriculum?

While teachers across treatment groups listed strength areas on the first column of the curriculum compactors for selected students, teachers differed with regard to the method by which they organized the curriculum compacting process and in the degree of specificity with which they described content material identified for compacting. Less than 5% of teachers compacted the students' curriculum by time. Specifically, these teachers compacted the content by weeks, a marking quarter or over two or three marking quarters. Approximately 95% of the teachers compacted content by units or chapters of material and documented that they would compact, for example, parts of speech, math units on decimals, two science chapters on matter, or four units in social studies, including: the first Americans, the discovery, exploration and settlement of the colonies, life in the colonies, and the American Revolution.

Additionally, participating teachers varied in the degree of specificity with which they documented the material to be compacted. Five percent of teachers did not list the

subject(s) to be compacted. Approximately 15% of teachers just listed the subject area in the first column of the compactor, such as math or spelling. Approximately 75% of teachers listed specific units. In science, such units included the solar system, electricity and magnetism, plants, air and weather, and the human body. In mathematics these units included factors, equivalent fractions, whole numbers, and mixed numbers. Nouns, capitalization, abbreviations, and verbs were examples of units listed in language arts. Approximately 5% of teachers were very specific and listed objectives under each unit in content areas, such as in the following column one of a *Compactor Form*:

Math:

Measurement
- Equivalent units of time
- Metric system/length
- American system/length to 1", 1/2", 1/4", 1/8"
- Units of weight, mass, capacity
- Two-step problems

Fractions
- As a whole or mixed number
- Find equivalent fractions
- Lowest terms
- Comparison of fractions
- Addition and subtraction

Decimals
- Writing to the thousandths
- Identifying place value
- Comparison and order
- Addition and subtraction
- Word problems
- Multiplication
- Division
- Word problems
- Graphing

Geometry /Measurement
- Identifying parallel, perpendicular, intersecting lines
- Measuring angles
- Identifying congruent figures
- Identifying lines of symmetry
- Perimeter, area, and volume
- (Grade 5 student)

Two differences emerged from the data in column two (procedures for compacting material) of the compactor form: the types of strategies used by teachers to measure proficiency and the standard which teachers used to define mastery of regular curriculum. The most frequently mentioned assessment strategy across all treatment groups was tests (unit, chapter, and review tests). Other strategies included: reading comprehension questions, reinforcement dittos, check-up pages, weekly tests with the class, teacher-selected problems, cooperative learning, and individual work at the board with the teacher.

Approximately 20% of teachers did not document any proficiency standard by which to evaluate the mastery of regular curriculum by students. The remaining 80% of

teachers identified specific evaluative criteria, and the criteria for proficiency ranged from 80-100%. The most frequently used criterion to document student proficiency was 85%.

3. What types of replacement activities were used by teachers, and does a significant difference exist among treatment groups with respect to the replacement strategies?

A content analysis of teachers' comments on the third column (acceleration and/or enrichment activities) of the curriculum compactor was used to address this question. Several analyses were subsequently applied to the replacement strategies utilized by all participating teachers. First, the frequencies of the different instructional strategies, as documented on the curriculum compactors in each of the treatment groups, were calculated. Three different categories of instructional strategies emerged from the data and each will be discussed individually: enrichment, acceleration, and other. Twenty-four different enrichment sub-strategies, displayed in Table 5, were used across treatment groups. Four different strategies were included in the category called "other," including: peer tutoring, cooperative learning, making up work sheets for the class, and correcting class papers. The acceleration category contained no sub-strategies; teachers either accelerated curriculum for students or they did not.

Enrichment. Each of the three broad categories of instructional strategies was examined subsequently to determine if a difference existed among treatment groups with respect to the frequency with which they were used. Descriptive statistics were used to examine the strategies used in the enrichment category for two reasons: teachers selected multiple strategies and self-report data were used. The average number of enrichment strategies used by teachers in Treatment Group 1 was 2.5, for teachers in Treatment Group 2 the average was 2.8, and the average number of enrichment strategies used by teachers in Treatment Group 3 was 4.7. Thus, the data suggest that teachers in Treatment Group 3 used more enrichment strategies than did teachers in Treatment Group 1 or 2. The following pair of representative comments from column three of the curriculum compactors illustrate the difference in the number of instructional strategies utilized by teachers for students who had a strength in language arts and whose work was compacted in this one content area in Treatment Groups 1 and 3.

> Treatment Group 1
>
> Expand the student's vocabulary by introducing new words from our weekly newspaper or monthly magazine. I will also include new words from such areas as math, science, and art.
> (Grade 5 teacher)
>
> Treatment Group 3
>
> The student will read several books about drug abuse. He will use this research to write a play about drug abuse. He will also create costumes and puppets. This play will be presented to an audience of 1st-3rd graders. He will also discover more about the Spanish language. This interest started with an investigation of the country and its culture. He will familiarize himself with various words and phrases. Joel may also use the computer.
> (Grade 4 teacher)

The teacher for the fourth grade student used one enrichment strategy, more challenging words. The teacher for the fifth grade student used three strategies: projects, free reading, and computer time.

Table 5

Frequency of Enrichment Strategies by Treatment Group

Strategy	Treatment group		
	Treatment Group # 1 Teachers=93 (Total strategies=236)	Treatment Group # 2 Teachers=93 (Total strategies=258)	Treatment Group # 3 Teachers=94 (Total strategies= 440)
	% of all responses*	% of all responses*	% of all responses*
1. Math puzzles, word problems	11	18	7
2. Projects	10	19	24
3. Free reading	10	4	9
4. Computer time/games	10	15	10
5. Creative writing	9	9	15
6. Critical thinking activities	7	6	3
7. Resource room time	3	4	6
8. Crossword puzzles	3	0.7	3
9. Individualized kits	3	4	3
10. Field trips	3	1	0
11. More challenging words	2	4	6
12. Research	2	2	2
13. Utilization of reference material	2	0	.2
14. Creative thinking activities	2	2	0
15. Practice in research skills	2	0.3	0.9
16. Reports	1	11	8
17. Game creation	1	0	0.6
18. Entering games/contests	1	0	0
19. Learning centers	0.4	5	0.9
20. Public speaking	0.4	0	0
21. Bulletin boards	0.4	0	0
22. Journal keeping	0	0	0.9
23. Science experiments	0	0	0.4
24. Mentor-guided investigations	0	0	0.6

*Percentages do not total 100 because multiple strategies could be selected

Other. The second instructional category to be analyzed for differences among treatment groups was called "other." Descriptive statistics were also used in this examination because teachers could use multiple strategies and self-report data were used. The data reported in Table 6 represent responses from approximately 15% of teachers in the study, and indicate that teachers in Treatment Groups 2 and 3 used more strategies labeled "other" than did teachers in Treatment Group 1.

Table 6

Frequency of "Other" Strategies

	Treatment Group		
Strategy	1	2	3
1. Peer tutoring	5	10	16
2. Cooperative learning	2	8	0
3. Making worksheets for the class to use	0	4	5
4. Correcting class papers	0	0	2
Total	7	22	23

Acceleration. There was also a substantial difference among treatment groups with respect to the frequency with which they selected acceleration as a strategy. Twenty-two percent of teachers in Treatment Group 1, 20% of teachers in Treatment Group 2, and 7% of teachers in Treatment Group 3 used acceleration. Treatment Group 3 teachers used acceleration less than did teachers in Treatment Groups 1 and 2. Anecdotal records suggest that Treatment Group 3 teachers had more opportunity to discuss and exchange enrichment strategies and this factor may have resulted in their use of enrichment strategies over acceleration. Viewed in another way, 18% of participating teachers, across all treatment groups, used acceleration as a strategy, while close to 95% used enrichment as a strategy. This limited use of acceleration was often due to district policies that do not allow the use of acceleration to next grade material.

Although no sub-strategies were identified with acceleration as an instructional strategy, the data indicate that teachers differed with respect to how they accelerated students. Seventy-six percent of teachers who utilized acceleration as an instructional strategy did not accelerate students beyond the prescribed year's content, as illustrated by the following documentation prepared for a 5th grade student from Treatment Group 2 who had demonstrated 96% proficiency on the chapters which comprised the 5th grade math curriculum: "Student went ahead in the 5th grade text until she completed the objectives for grade five. She was then removed from the classroom and did enrichment activities with the resource teacher. Student also worked in learning centers with special interest

activities, including a math game." Twelve teachers (24% of teachers who accelerated students) allowed students to accelerate beyond grade level, as indicated by columns one through three of the following compactor for a third grade student:

Column one:	The student came to us having mastered the entire 3rd grade math curriculum.
Column two:	The student worked exclusively in a 4th grade mathematics program, went at his own pace, and checked his own work using a teacher's edition.
Column three:	He added fractions, prime numbers, multiplied by 2 and 3 digits, divided with remainders and completed two and three step word problems.

Enrichment strategies and content areas. To investigate possible reasons for the substantially larger number of enrichment strategies utilized by Treatment 3 teachers, two additional analyses were performed on compactors across all treatment groups. First, each compactor was analyzed for the number of content areas compacted, and the average number of content areas, by treatment group, was calculated. Teachers in Treatment Groups 1 and 2 compacted in 1.3 content areas, and teachers in Treatment Group 3 compacted in 1.6 content areas. That is, Treatment Group 3 teachers compacted in slightly more content areas, on average, than did teachers in Treatment Groups 1 or 2.

To determine whether the larger number of instructional strategies was related to the nature of the content areas in which Treatment Group 3 teachers compacted, a second analysis was performed across treatment groups on compactors in which mathematics and language arts were identified as content areas for curriculum compacting. Fifty percent of teachers in Treatment Group 1, 65% of teachers in Treatment Group 2, and 53% of teachers in Treatment Group 3 compacted in mathematics. In mathematics, teachers in Treatment Group 3 used more enrichment strategies than teachers in Treatment Groups 1 and 2. Teachers in Treatment Group 1 used, on average, 1.7 strategies, while teachers in Treatment Group 2 and 3 used 2.2 and 2.9 strategies, respectively. Teachers in Treatment Group 3 used more enrichment strategies when they compacted in mathematics than did teachers in Treatment Groups 1 or 2.

Twenty-eight percent of teachers in Treatment Group 1 compacted in language arts as did 36% and 38% of teachers in Treatment Groups 2 and 3, respectively. Teachers in Treatment Group 1 used 1.9 strategies teachers in Treatment Group 2 used 2.3 strategies, and teachers in Treatment Group 3 used 3.5 strategies. Once again, teachers in Treatment Group 3 used more enrichment strategies to compact in language arts than did teachers in Treatment Groups 1 or 2. To summarize, Treatment Group 3 teachers compacted in more content areas than did teachers in Treatment Groups 1 and 2, they used more enrichment strategies in each content area than did teachers in Treatment Groups 1 or 2, and they compacted significantly more material for their high ability students than did teachers in Treatment Groups 1 or 2.

A final analysis of column three of the curriculum compactors examined the extent to which replacement activities of the compactors reflected student interests and preferences. Replacement strategies were analyzed across treatment groups to determine whether the documentation reflected attention to students' individual interests and needs. Documentation such as "the student preferred to work on," "the student expressed an interest in," or "the student selected," for example, was used to categorize compactors as based upon students' interests. Compactors which did not reflect documentation of this nature were categorized as not based on students' interests. A one-way Chi square analysis, weighted to equalize group size differences, was applied to these dichotomous

data, and the obtained X^2 (2)=13.08, $p < .001$. Teachers in Treatment Group 3 were more likely to take individual student interests and preferences into consideration when providing alternative curricular experiences.

Viewed across treatment groups, approximately 60% (250) of the compactors reflected replacement activities documenting students' interests and preferences. Further analysis of column three of the compactors indicated that teachers provided for student interests, needs, and preferences through replacement strategies that presented well-defined choices for the students and/or reflected collaboration with the students to refine their prior interest into a focused activity. Documentation from the following column three of a compactor, which was prepared for a student who was compacted in spelling, reflects well-defined choices:

> The student elected to participate in science experiments and activities. She chose them from a file box and made electromagnets, using batteries, motors and wires. She also chose art projects to do and helped with bulletin boards for science and health. She developed a brand of toothpaste and produced a commercial.
> (Grade 4 student)

Documentation from the following compactor indicates that student had a specific interest prior to compacting and that the student and teacher focused the identified interest into a project. The student's curriculum was compacted in spelling.

> First, the student is delighted to have a chance to do individual work. He is doing research on earthquakes and is planning to share his project with the rest of the class. His science teacher has offered him much information on the subject. In March he presented his research to the class and his work was displayed in the main hall of the school.
>
> He chose World War II as his next student project. He will present this research to the fifth grade since they are studying the twentieth century.
> (Grade 6 student)

The data indicate three explanations for 40% (171) of the compactors that did not reflect student interests, needs, and preferences in the replacement strategies. Most frequently, these compactors included lists of enrichment strategies that were not well-defined and/or were unconnected to content areas, other columns on the compactor, and the student's interests and preferences, such as the following list in column three by a teacher in Treatment Group 1:

> 1. Creative writing
> 2. Critical thinking
> 3. Process writing
> 4. Research skills using encyclopedias
> 5. Time for independent study projects
> 6. Reading for pleasure
> 7. Weekly book reports
> 8. SRA reading kit
> (Grade 3 student)

A smaller number of these compactors (13%) were highly structured by the teacher, offering little student input, such as the one which follows:

1. Student will be provided with a smaller group of words.
2. Dictionary exercises will be provided for those words.
3. Crossword puzzles will be provided.
4. Student will read *Tuck Everlasting* by Natalie Babbitt.
5. Group discussions will be held to discuss story and guide questions.
6. Journal assignments will be given. Student will write using character's viewpoints.
7. Prediction writing will be assigned.

(Grade 4 student)

A small percentage (5%) of these 150 compactors did not reflect the care and attention to detail that was necessary to the compacting process and included documentation such as "Student went ahead in her workbook, doing part of a lesson" (Grade 4 student), and "Small group cooperative activities to achieve goal. A long-term project, such as the fair, where student can be more creative may be undertaken" (Grade 5 student).

4. Is there a significant difference among the treatment groups with regard to teachers' decisions about whether they will compact curriculum in the future?

To address Research Question 4, answers to the final, open-ended question on the *Classroom Practices Questionnaire* were coded. This question asked if teachers would continue to use curriculum compacting in the future, and why they would make this decision. The responses to this question for all three treatment groups were placed into three categories: positive, negative, and uncertain. A high percentage of teachers indicated that they would use curriculum compacting in the future, and those who expressed some concern about doing so were usually eager to obtain more help or more classroom materials. A 3 by 3 contingency table was produced to investigate the association between treatment groups and responses about future use of compacting. The frequencies and percentages of these responses within each group are summarized in Table 7. The calculated Chi square for this analysis was not significant at the 0.05 alpha level, indicating the lack of a relationship between group membership and future use of curriculum compacting.

As indicated on Table 7, more than two thirds of all teachers who responded to this item on the *Classroom Practices Questionnaire* indicated that they would continue to use the curriculum compacting procedure in the future, and most of those who responded positively wrote comments about their experiences when using this procedure. A representative comment from each treatment group is included below:

> Yes. I feel their time can be better spent than doing assignments on material they already know. When they share projects and reports with the class, it also enriches their [other students'] learning experiences.
> (Treatment Group 1 Teacher)

> Yes, I will continue this method because it has shown me a very meaningful strategy to use with students who already know grade level material. In turn this enables students to become interested in independent learning they would like to pursue. The capable students are less likely to be turned off by this approach. This was a strategy that kept all students challenged in my class. I will use this next year in Math and hopefully other areas as well.
> (Treatment Group 2 Teacher)

> Definitely! This is such an exciting way to teach! I feel the students involved in the compacting program had the opportunity to become such active, independent learners. They had a taste of learning through their own actions not just the material spooned out through limited textbooks. It was amazing to watch this learning process in action! Sparks flew in my classroom this year!!! Now that I'm familiar with the program, I can't wait for next year to begin!
> (Treatment Group 3 Teacher)

The teachers' responses in the uncertain category included comments about available planning time, a need to learn more about compacting, and students' independent study skills. The reasons cited by the small number of teachers who gave negative responses about the future use of compacting included comments about large class sizes and a preference for their own method of meeting students' needs.

Table 7

Teachers' Responses About Future Use of Curriculum Compacting

	Responses						
	Positive		Negative		Unsure		
Treatment Group	Frequency	Row Percent	Frequency	Row Percent	Frequency	Row Percent	Total # of Responses
Treatment 1	63	77.8	1	1.2	17	21	81
Treatment 2	62	72.1	5	5.8	19	22.1	86
Treatment 3	56	66.7	8	9.5	20	23.8	84
Total	181	72.1	14	5.6	56	22.3	251

The obtained $X^2 = 5.949$ (2), not significant at .05 alpha level.

5. Is there a significant difference among treatment groups with regard to the quality of the compactor forms completed by teachers?

To address Research Question 5, the differences among the treatment groups with regard to the characteristics reflected on teachers' *Curriculum Compactor Forms* were examined. A total of 428 compactors were returned by teachers in the three treatment groups. The majority were completed for one student, however, some compactors were completed on more than one student. Each completed compactor was assessed by two raters using the *Curriculum Compacting Assessment Form.* The mean ratings of the compactors from each district, as assessed by the *Curriculum Compacting Assessment Forms*, are shown in Table 8.

Table 8

Results From Assessment of Compactor Forms

District Location	No. of Compactors	Rater 1 x Ratings	Rater 2 x Ratings	Both Raters' x Ratings
Treatment Group One				
RI	16	5.5	5.4	5.5
MI	25	7.0	7.0	7.0
AR	34	6.0	7.0	6.5
VA	14	6.4	6.6	6.5
CA	7	4.7	4.7	4.7
CT	27	7.5	7.9	7.7
	123	6.2	6.3	6.3
Treatment Group Two				
IA	34	6.8	6.7	6.8
CT	12	6.4	6.6	6.5
NH	18	6.9	7.0	6.9
LA	35	7.1	7.7	7.4
MN	4	5.0	5.3	5.1
CT	9	5.9	6.2	6.1
CT	18	7.2	7.4	7.3
	130	6.5	6.7	6.6
Treatment Group Three				
UT	52	7.2	7.4	7.3
MT	25	7.2	7.7	7.5
MS	56	6.2	6.8	6.5
MN	12	7.8	8.0	7.9
NY	7	6.0	5.6	5.8
WY	7	7.7	8.0	7.9
OK	16	6.6	6.9	6.8
	175	7.0	7.2	7.1

Note. All percentages of ratings have been rounded.

As indicated on the table, the mean ratings of the compactors are higher for each successive treatment group. The mean assessment of compactors in Treatment Group 1 was 6.3, Treatment Group 2 was 6.6, and Treatment Group 3 was 7.1. A one way analysis of variance indicated there were no significant differences in the ratings of compactors among the groups, $F(2,427) = 2.06$, $p < .13$.

6a. Do students whose curriculum was compacted perform differently on measures of achievement than students whose curriculum was not compacted?

A series of univariate analyses of covariance were performed to determine whether there were significant differences on measures of achievement between students whose curriculum was compacted and students whose curriculum was not compacted. In these statistical analyses, standardized subscales of the *Iowa Tests of Basic Skills* (i.e., reading, mathematical concepts, mathematical computation, science, spelling, and social studies) served as dependent variables while treatment group (i.e., the three treatment groups with increasing levels of compacting and the control group) served as the independent variable. In all analyses, pretest performance on the related standardized subscale served as a covariate. Because the norming for the *Iowa Tests of Basic Skills* changes with grade level, the variance associated with grade level was removed by treating grade level as a blocking variable and investigating its mean effect as well as its interaction with treatment. Thus, a purer indicator of treatment effects was obtained (Freund, Little, & Spector, 1986). The analysis of covariance procedure was selected to account for the variation in posttest performance attributable to prior knowledge (i.e., pretest performance) while examining treatment effects, thus providing a more powerful statistical analysis (Freund et al., 1986; Marascuilo & Serlin, 1988). All assumptions regarding the use of analysis of covariance models (e.g., normality of distributions, homogeneity of slopes) were tested prior to running the procedure and were satisfied.

With respect to student performance on the science subscale of the *Iowa Tests of Basic Skills*, the data of 658 students were analyzed for Form J of the instrument. This sample of 658 students represented those who had completed data for both the J pretest and J posttest administrations. Two districts were not included in the present analyses because they used a different form of the *Iowa Tests of Basic Skills* at either the pretest or posttest administration. Results showed a significant main effect for treatment, $F(3, 637) = 3.17$, $p < .03$, $MSe = 160.44$. The pretest was a significant covariate, $F(1, 637) = 2498.35$, $p < .0001$. As anticipated, the mean effect for grade was also significant, $F(4, 637) = 14.03$, $p < .0001$, however, the interaction between grade and treatment was not, $F < 1.02$, $p > .44$. Again, variance was accounted for due to grade because of scaling differences that arise when examining scores across the grade levels. That is, a standardized score at the fifteenth percentile for a second-grade student is not the same as a standardized score at the fifteenth percentile for a sixth-grade student.

Pretest means, posttest means, and adjusted means and standard deviations are presented in Table 9. As indicated on this table, students whose curriculum was compacted in Treatment Group 1 had higher adjusted posttest means than students in the other two treatment groups and the control group. A series of planned contrasts on the adjusted means were run to detect the source of the significant difference. The planned contrast on adjusted mean performance of Treatment Group 1 versus the control group was significant, $F(1, 637) = 8.76$, $p < .004$, while a planned contrast on adjusted mean performance of Treatment Group 2 versus control approached significance, $F(1, 637) = 3.06$, $p < .09$. No other significant differences among the treatment groups were found when comparing the adjusted means. To determine if the statistically significant finding on Treatment Group 1 versus the control group in science also had practical significance, the effect size (d) was

calculated by computing the difference between the gain scores (using adjusted means) of Treatment Group 1 and the control group and dividing this by the standard deviation of the control group. Cohen (1977) defined effect sizes of .80 as "large," .50 as "medium," .20 as "small," and below .20 as "unimportant." In this case, the observed difference, although statistically significant, had little practical significance because the effect size was $d = 0.15$.

For all remaining achievement subscales (i.e., reading, spelling, mathematical concepts, mathematical computation, and social studies), results of the analyses of covariance models showed no significant main effects for treatment, F's < 1.05, p's > 0.37.

Table 9

Pretest Means (SDs) and Adjusted Posttest Means (SDs) on Standardized Science Achievement Scores by Levels of Treatment

	Pretest		Posttest
Treatment	M (SD)	Unadj. M	Adj. M (SD)
Treatment 1 (n = 127)	150.07 (28.08)	158.83	153.55 (27.43)
Treatment 2 (n = 103)	146.62 (25.75)	154.43	152.02 (23.88)
Treatment 3 (n = 171)	149.02 (26.53)	154.09	150.04 (26.85)
Control (n = 257)	134.85 (29.46)	142.14	149.27 (28.60)

Total N = 658
Significant Covariate (Pretest)--F (1,637) = 2498.15, $p < .0001$
Significant Main Effect (Treatment)--F (3,637), $p < .03$

6b. Do those students whose curriculum was compacted in mathematics significantly out-perform their control counterparts on measures of achievement?

Achievement results were more closely examined to determine whether the content area in which one's curriculum was compacted affected performance. Thus, the scores of those students whose curriculum was specifically compacted in mathematics was compared with their control counterparts. As in the overall treatment analyses for achievement, the

data were analyzed using univariate analyses of covariance. The dependent variables were standardized scores on the various subscales of the *Iowa Tests of Basic Skills* and the covariates were the respective pretest scores. The collapsed scores across the three treatment groups were based on the fact that there was no significant difference among the three treatment groups in previous analyses. Thus, the independent variable in these analyses had two levels: compacting within mathematics (n = 213) versus control (n = 256). Additionally, the variance attributed to grade and the interaction of grade and level of compacting due to the differences in scaling on the *Iowa Tests of Basic Skills* was removed.

Results of this analysis indicated a significant difference between treatment and control group students on the mathematical concepts subscale, $F(1, 458) = 6.36$, $p < .02$, $MSe = 86.39$. The pretest covariate was also significant, $F(1, 458) = 2462.75$, $p < .0001$. Additionally, the main effect for grade, $F(4, 458) = 12.28$, $p < .0001$, and the interaction between grade level of compacting, $F(4, 458) = 2.61$, $p < .04$, were also significant. (We again wish to caution the reader in the interpretation of the significant effects associated with grade due to the scaling differences associated with performance as grade level increases. See Appendix B for adjusted means of grade by level of compacting interaction.) The pretest, posttest, and adjusted mean performance for those whose mathematics curriculum was compacted versus the control group is presented in Table 10. As this table indicates, students whose curriculum was compacted in mathematics out-performed their control counterparts. To determine if this statistical difference was of practical significance, the effect size was calculated by computing the difference between the gain scores (using adjusted means) of the group who received compacting in mathematics and the control group and dividing this by the standard deviation of the control group. The effect size was $d = .18$, an effect size considered by Cohen (1977) to have little practical significance. For all other achievement subscales, there were no significant differences between those students whose mathematical curriculum was compacted and the control group.

6c. Do those students whose curriculum was compacted in language arts significantly out-perform their counterparts on measures of achievement?

The third set of analyses on the achievement data examined whether students whose curriculum was specifically compacted in language arts out-performed the control group with respect to subscale scores on the *Iowa Tests of Basic Skills*. Again, a separate univariate analysis of covariance was used with each subscale score serving as the dependent variable. As before, pretest scores were covariates while level of compacting (language arts versus control) was the independent variable. Additionally, the variability due to grade level was accounted. Results for these analyses revealed no significant main effects in favor of the students whose curriculum was compacted in language arts versus the control group. (Means related to questions 6a - 6c are presented in Appendix B).

Table 10

Pretest Means (SDs) and Adjusted Posttest Means (SDs) on Standardized Mathematics Concepts Scores by Mathematics Compacted and Control Groups

	Pretest	Posttest	
Treatment	M (SD)	Unadj. M	Adj. M (SD)
Group w/ Mathematics Compacting (n = 213)	130.85 (23.12)	141.07	138.86 (24.23)
Control (n = 256)	122.87 (21.56)	131.41	134.81 (23.12)

Total N = 469
Significant Covariate (Pretest)--F (1,458) = 2462.75, $p < .0001$
Significant Main Effect (Treatment)--F (1,458) = 6.36, $p < .02$

7a. Do students whose curriculum was compacted perform differently on measures of content area preference than students whose curriculum was not compacted?

To determine whether there were significant differences on content-area preference scores between students whose curriculum was compacted and students whose curriculum was not compacted, a series of univariate analyses of covariance was performed as had been done for the achievement data. In these statistical analyses, subscales of the *Content Area Preference Scale, CAPS*, (reading, mathematical, science, and social studies preferences) served as dependent variables while group (the three increasing levels of compacting and the control group) served as the independent variable. In these analyses, variance attributed to grade was not extracted for responses were scored the same for all academic levels. (Note: Grade as an independent variable will be examined more closely in a series of LISREL models that follow.) In all analyses, post-treatment preference scores were adjusted with pretest performance. Analyses for all subscales of the *CAPS* indicated no significant differences in content area preference between those students whose curriculum was compacted and their control counterparts, $F's < 2.37$, $p's > .08$.

7b. Do those students whose curriculum was compacted in mathematics perform differently than their control counterparts on measures of content area preference?

Similar to the analyses performed for the achievement data, content area preference scores for those students whose curriculum was compacted specifically in mathematics were analyzed. Thus, the *CAPS* scores of students whose curriculum was compacted in

mathematics were compared with those scores of students in the control group. As in our overall treatment analyses, the data were analyzed using univariate analyses of covariance. The dependent variables were scores on the various subscales of the *CAPS*, and the covariates were the respective pretest scores. The independent variable in these analyses had two levels: compacting within mathematics versus control.

Results of these statistical tests indicated that those students whose curriculum was compacted in mathematics showed significantly higher preferences for mathematics than did students in the control group, $F(1, 475) = 5.00$, $p < .03$, $MSe = 2.29$. Pretest scores on the CAPS was a significant covariate, thus we adjusted the means of the dependent variable. The adjusted means for those whose mathematics curriculum was compacted was 5.41 (standard deviation = 1.63) as compared to 5.73 (standard deviation = 2.09) for the control group. (Note: A score of 3 is assigned to the "disagree" category of each item on the *Content Area Preference Scale*, thus a lower score indicates greater agreement to each statement than does a higher score.) The effect size for this difference was calculated by dividing the difference between the adjusted mean scores of the treatment groups and control group by the standard deviation of the control group. The effect size was $d = .15$, indicating that the observed difference in scores on the mathematics items on the *CAPS* was statistically significant, but of little practical significance. For all other subscales, there were no significant differences between those students whose mathematical curriculum was compacted and the control group, $F's < .10$, $p's > .74$.

7c. Do those students whose curriculum was compacted in language arts perform differently on measures of content area preference than those students in control groups whose curriculum was not compacted in language arts?

The third set of analyses for the *Content Area Preference Scale* data investigated whether those students whose curriculum was specifically compacted in language arts showed higher interest in reading, mathematics, science, and social studies than the control group. Again, univariate analyses of covariance were employed with each subscale score serving as the dependent variable. As before, pretest scores were covariates while level of compacting (language arts versus control) was the independent variable. Results for these analyses revealed no significant main effect for level of curriculum compacting. (Means related to questions 7a - 7c are presented in Appendix B).

8a. Do students whose curriculum was compacted have significantly different attitudes toward learning than those students whose curriculum was not compacted?

To determine whether there were significant differences in attitudes toward learning between students whose curriculum was compacted and students whose curriculum was not compacted, an analysis of covariance on scores from the *Arlin-Hills Attitudes Toward Learning Processes* was performed. As with the previous analyses of the content-area preference scores, posttest responses served as the dependent variable adjusted by pretest score performance. The group variable (i.e., the three treatment groups and the control group) represented the independent variable. Results showed no significant main effect for treatment, $F = 1.00$, $p = .40$.

8b. Do those students whose curriculum was compacted in mathematics have better attitudes toward learning than students whose curriculum was not compacted?

Similar to the analyses performed for the achievement data and content area preference data, attitudes toward learning for those students whose curriculum was compacted specifically in mathematics were further analyzed. Thus, the scores of students whose curriculum was compacted in mathematics were compared to students' scores in the control group. As in our overall treatment analyses, the data were analyzed using a univariate analysis of covariance with posttest performance on the *Arlin-Hills Attitudes Survey Toward School Learning Processes* as the dependent variable for students in all treatment groups whose curriculum was compacted in mathematics versus the control group as the independent variable.

Results of this statistical analysis demonstrated that those students whose curriculum was compacted in mathematics had significantly better attitudes toward learning than did students in the control group, $E(1, 371) = 3.94$, $p < .05$, $MSe = 27.17$. Pretest scores represented a significant covariate, thus the means of the dependent variable were adjusted. The adjusted means for those students whose mathematics curriculum was compacted was 42.25 (standard deviation = 6.88) as compared to 41.18 (standard deviation = 6.04) for the control group. The effect size for this difference was calculated by dividing the difference between the adjusted mean scores of the treatment groups and control group by the standard deviation of the control group. The effect size was $d = .18$, indicating that the observed difference in attitudes toward learning was statistically significant, but of little practical significance.

8c. Do those students whose curriculum was compacted in language arts show significantly better attitudes toward learning than students whose curriculum was not compacted?

The attitudes toward learning for those students whose curriculum was compacted specifically in language arts were further analyzed. Thus, the scores of students whose curriculum was compacted in language arts was compared with students' scores in the control group. The data were analyzed using a univariate analysis of covariance with posttest performance on the Arlin-Hills survey as the dependent variable and curriculum compacting in language arts versus the control group as the independent variable. Results showed no significant differences in attitudes toward learning between those students whose curriculum was compacted and their control counterparts, $E = .00$, $p = .95$. (Means related to questions 8a - 8c are presented in Appendix B).

9. How do the specific (measured) indicators, such as gender and grade, reflect the research (latent) variables (student achievement in mathematics and reading, other student characteristics)?

10. What is the impact of each research (latent) variable on math and reading achievement post tests?

11. Does the proposed model of students' attitudes toward learning and achievement adequately explain the observed covariance among the specific (measured) indicators?

For questions 6a through 8c, the curriculum compacting was examined to see whether it had significant impact on students' achievement scores, content area performance scores, or attitudes toward learning scores. While the analysis of covariance

procedures employed to analyze the data examined whether there was support of significant differences between treatment and control for each of the aforementioned variables (i.e., achievement, content area preference, and attitudes toward learning), questions 9 through 11 were raised to address how other student indicators in addition to treatment (e.g., grade, gender) influenced the performance variables. Additionally, we sought to examine how the dependent variables (e.g., achievement, content area preference, and attitude toward learning) affected one another.

In order to address questions 9-13 and to interpret the multivariate relations among the variables, a series of structural equation models were tested using LISREL VII (Joreskog & Sorbom, 1979). Structural equation modeling embodies a series of statistical techniques designed to examine the functional relations among variables with respect to theoretical expectations as to how these variables should interact. The basic components of a theoretical model that can be tested statistically specify so-called casual connections among the variables. As James, Mulaik, and Brett (1982) indicated:

> A casual connection refers to the hypothesized casual association between one cause and one effect (e.g., x1 to y1). The total pattern or structure of casual connections among ordered variables, where order reflects the natural sequence of occurrences of events represented by the variables, is the essence of a theoretical model. It is this structure of casual connections that provides the basis for the development of functional relations and functional equations, which relate each effect to all of its presumed causes. (p. 27)

Questions 9-13 examined the functional relations that level of compacting, gender, grade, and pretest performance had on posttest performance of achievement, preference, and attitudes toward learning. To test the various theoretical models, LISREL, a statistical program designed specifically for structural equation modeling and factor analysis (James et al., 1982) was used.

The model parameters were estimated using maximum likelihood confirmatory factor analysis (Sorbom & Joreskog, 1989). A total of eight models were examined. Models were created to determine the relationships between gender, grade, compacting, subject area targeted, pre and post achievement, pre and post subject area preferences and post attitudes toward learning. For simplification, separate models were tested for each compacted subject area. Numerous alternative hierarchical models were tested and rejected based on fit. The subject areas of mathematics and language arts proved to be the most popular for compacting and, thus, were selected for LISREL. Tables 11 and 12 show the fit statistics of the final achievement models and the *Content Area Preference Scale* (*CAPS*) models. The final models themselves are shown in Figures 5-12 with model parameters tabulated in Tables 13-34.

Research questions 9, 10, and 11 are addressed as a group below. Table 11 shows the fit statistics of the final achievement models; the final models themselves are depicted in Figures 5 - 8. These four models are: math achievement by area compacted - math, math achievement by area compacted - language arts, reading achievement by area compacted - math, and reading achievement by area compacted - language arts. In all four models, the latent variables (compacting, gender, grade, target, and interaction 1 and 2) are single indicator variables. The compacting variable compares the control group students to those in the treatment groups. The target variable (math or language arts) compares the students whose curriculum was compacted in that specific area to the students whose curriculum was compacted in other areas (science or social studies). The target variable in models 5 and 6 (area in which students' curriculum was compacted) was mathematics. The target variable in models 7 and 8 (area in which students' curriculum was compacted) was reading. To

determine if the different levels of staff development (amount of compacting training the teachers received) affected the students whose curriculum was compacted, two interactions were inspected. Interaction 1 examined the effects on students whose classroom teachers were in Treatment Group 2 as compared to Treatment Group 1. Interaction 2 examined the effects in Treatment Group 3 as compared to Treatment Group 1.

Table 11

Achievement Model Information

Model	Chi-square	df	p	χ^2/df
Math Achievement by Area Compacted - Math	58.93	28	.001	2.105
Math Achievement by Area Compacted - Language Arts	41.10	28	.053	1.468
Reading Achievement by Area Compacted - Language Arts	10.09	9	.343	1.121
Reading Achievement by Area Compacted - Math	8.07	9	.527	0.897

Achievement Models

The latent variables, pre and post achievement, each have two indicators. They are the math concepts and math computation subtests from the *Iowa Tests of Basic Skills* (*ITBS*). Models were first tested using the standard scores from these two subtests. However, these standard scores change drastically with grade. For example, a level 9 (grade 3) standard score on math concepts would be 108.6 (standard deviation = 14.17). This score would inflate to 156.2 (SD=18.83) on the level 13 (grade 7) test (*ITBS Manual*, 1990). These first models had extremely poor fits as grade level was highly correlated with the indicators. To remove this grade dependency, the grade equivalent scores with grade subtracted were used in the final achievement models.

The latent variable, post attitudes, also has two indicators. These two factors from the *Arlin-Hills Attitudes Survey Toward School Learning Processes* (Arlin, 1976) are labeled "learning" and "teacher dominance." The learning factor consists of 9 items accounting for 28% of the variance. The items are intended to measure students' attitudes about what they learn in school. The teacher dominance factor consists of 6 items (reverse scored) accounting for an additional 18% of the variance. These items focus on students' attitudes about the amount of control the teacher has over students' learning environment.

Figure 5 depicts the final model for math achievement for students whose curriculum was compacted in math. Tables 12, 13, and 14 depict the model parameters. The target variable in this model is math. As Figure 5 indicates, the largest causal path is from pre to post achievement (.861). In this model, paths from grade (.106) and interaction 2 (.085) to post achievement were also significant, as were the paths to post attitudes from grade (-.194), gender (.161), and interaction 2 (.222). It would appear from this model that the students whose curriculum was compacted in math and were in Treatment Group 3 (teachers receiving the most training and support) had significantly higher post achievement scores in math and had better post attitudes toward learning. Further, the females had better post attitudes than males, and students in the lower grades had better post attitudes than those in higher grades.

Table 12

Math Achievement Measurement Model - Curriculum Compacted in Math

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
PreAchievement				0.815
Math Concepts	0.803		0.355	0.645
Math Computation	0.720	9.652	0.482	0.518
PostAchievements				0.732
Math Concepts	0.856		0.268	
Math Computation	0.673	9.350	0.547	0.453
PostAttitude				0.443
Learning	0.666		0.557	
Teacher Dominance	-0.359	-2.634	0.872	0.128

Table 13

Correlated Measurement Error - Math Achievement Model - Curriculum Compacted in Math

	Math Concepts	Math Computation
Post math concepts	0.113	
z-score	2.045	
Post math computation		0.232
z-score		4.921

Figure 5. Math Achievement by Area Compacted - Math.

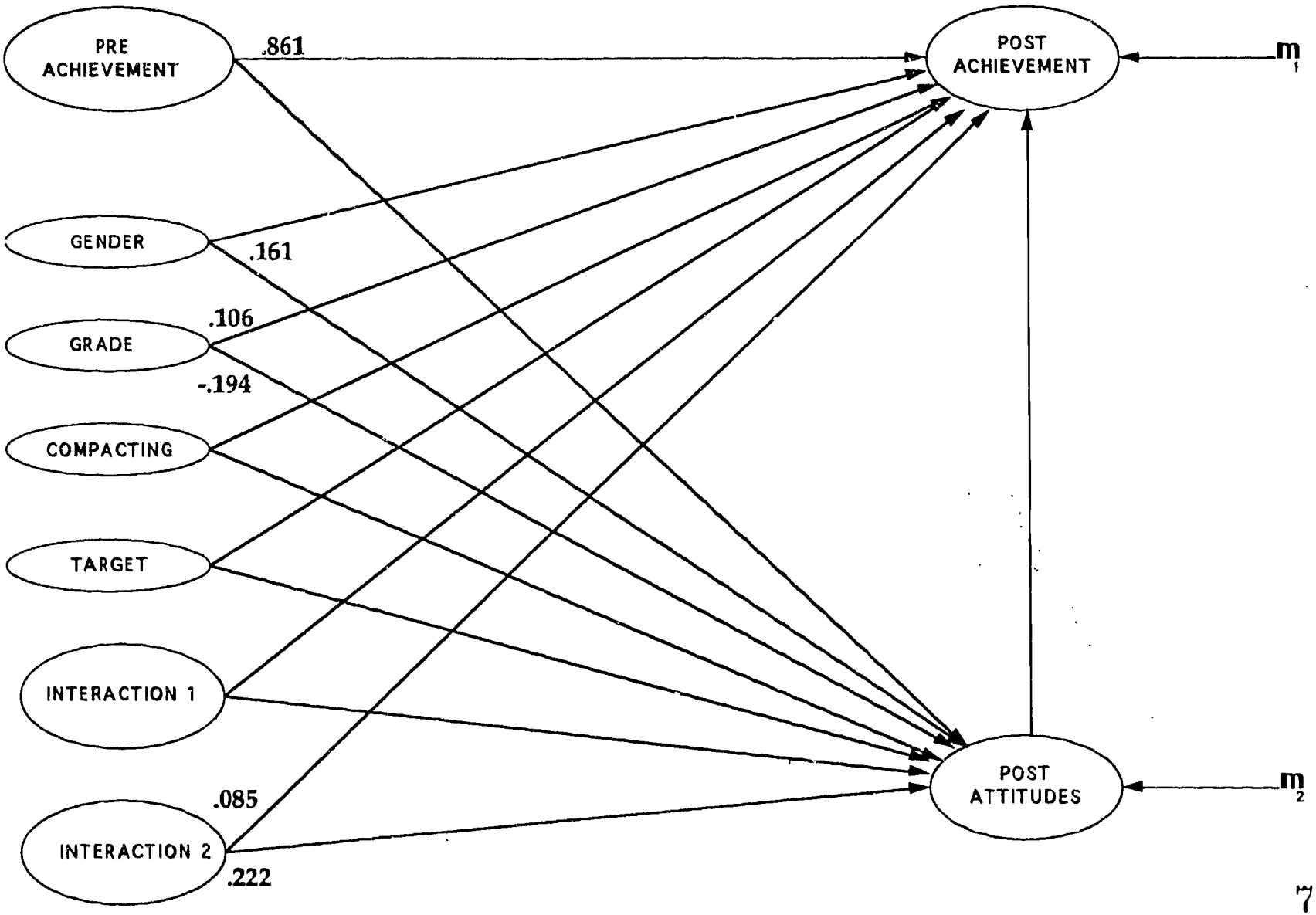


Table 14

Beta (Causal Paths) - Math Achievement Model - Curriculum Compacted in Math

	Causes							
Effects	Pre Ach	Gender	Grade	Compact	Target Treat1	Target Treat2	Achieve	Post Att
Post Attitude	0.090	0.161	-0.194	0.111	0.044	-0.089	0.222	
z-score	0.846	2.154	-2.409	1.478	0.525	-1.115	2.767	
Post Achievement	0.861	0.011	0.106	-0.019	-0.026	0.023	0.085	0.064
z-score	11.860	0.281	2.373	-0.480	-0.560	0.545	1.959	0.995

Figure 6 depicts the same math achievement model with the students whose curriculum was compacted in language arts (model parameters are shown in Tables 15 - 17). Again, the largest causal path (0.880) is from pre to post achievement. The only other significant path to post achievement in this model is the path from interaction 2 (0.085). This would seem to indicate that those students whose curriculum was compacted in language arts and who were in Treatment Group 3 also had significant post math achievement scores. As with the previous model (Figure 5), the paths from gender (0.147) and grade (-0.223) to post attitudes were significant.

Table 15

Math Achievement Measurement Model - Curriculum Compacted in Language Arts

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
Pre Achievement				
Math Concepts	0.811		0.343	0.657
Math Computation	0.710	9.562	0.495	0.505
Post Achievements				0.806
Math Concepts	0.891		0.206	0.794
Math Computation	0.650	8.898	0.577	0.423
Post Attitude				0.098
Learning	0.694		0.518	0.482
Teacher Dominance	-0.344	-2.209	0.882	0.118

Figure 6. Math Achievement by Area Compacted - Language Arts.

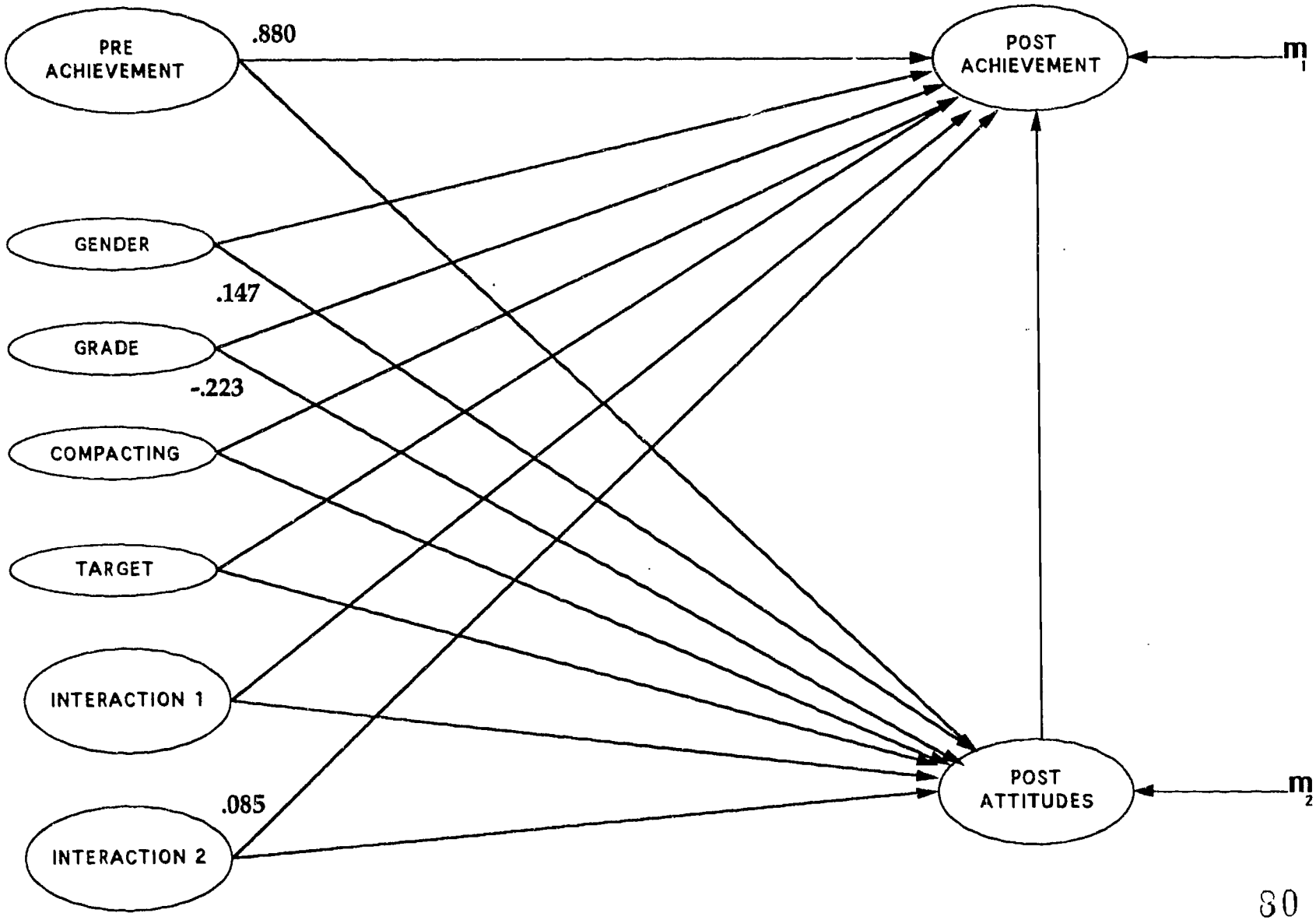


Table 16

Correlated Measurement Error - Math Achievement Model - Curriculum Compacted in Language Arts

	Math Concepts	Math Computation
Post Math Concepts	0.080	
z-score	1.370	
Post Math Computation		0.255
z-score		5.354

Table 17

Beta (Causal Paths) - Math Achievement Model - Curriculum Compacted in Language Arts

	Causes							
Effects	Pre Ach	Gender	Grade	Compact	Target Treat1	Target Treat2	Achieve	Post Att
Post Attitude	0.106	0.147	-0.223	0.106	0.037	0.048	-0.091	
z-score	1.015	1.976	-2.789	-1.425	0.445	0.601	-1.191	
PostAchievement	0.880	-0.011	0.080	-0.027	-0.041	-0.053	0.085	0.080
z-score	11.797	-0.279	1.757	-0.672	-0.888	-1.266	2.088	1.220

The reading achievement models are shown in Figures 7 and 8 (Tables 18, 19, 20, and 21). In the reading models, the post attitudes latent variable is the same as with the math models. However, the pre and post achievement variables are now single indicator variables. The indicator is the *ITBS* reading subtest (corrected grade equivalents scores as explained earlier).

Figure 7 is the reading achievement model for students whose curriculum was compacted in math. Here, the only significant causal path to post achievement is pre achievement (0.745). There were two significant causal paths to post attitudes. Again the students in the lower grades had better post attitudes (-0.174). There was also a significant path from interaction 2 to post attitudes (0.234). Students in Treatment Group 3 whose curriculum was compacted in math, showed more positive attitudes toward learning after participating in the study.

Figure 7. Reading Achievement by Area Compacted - Math.

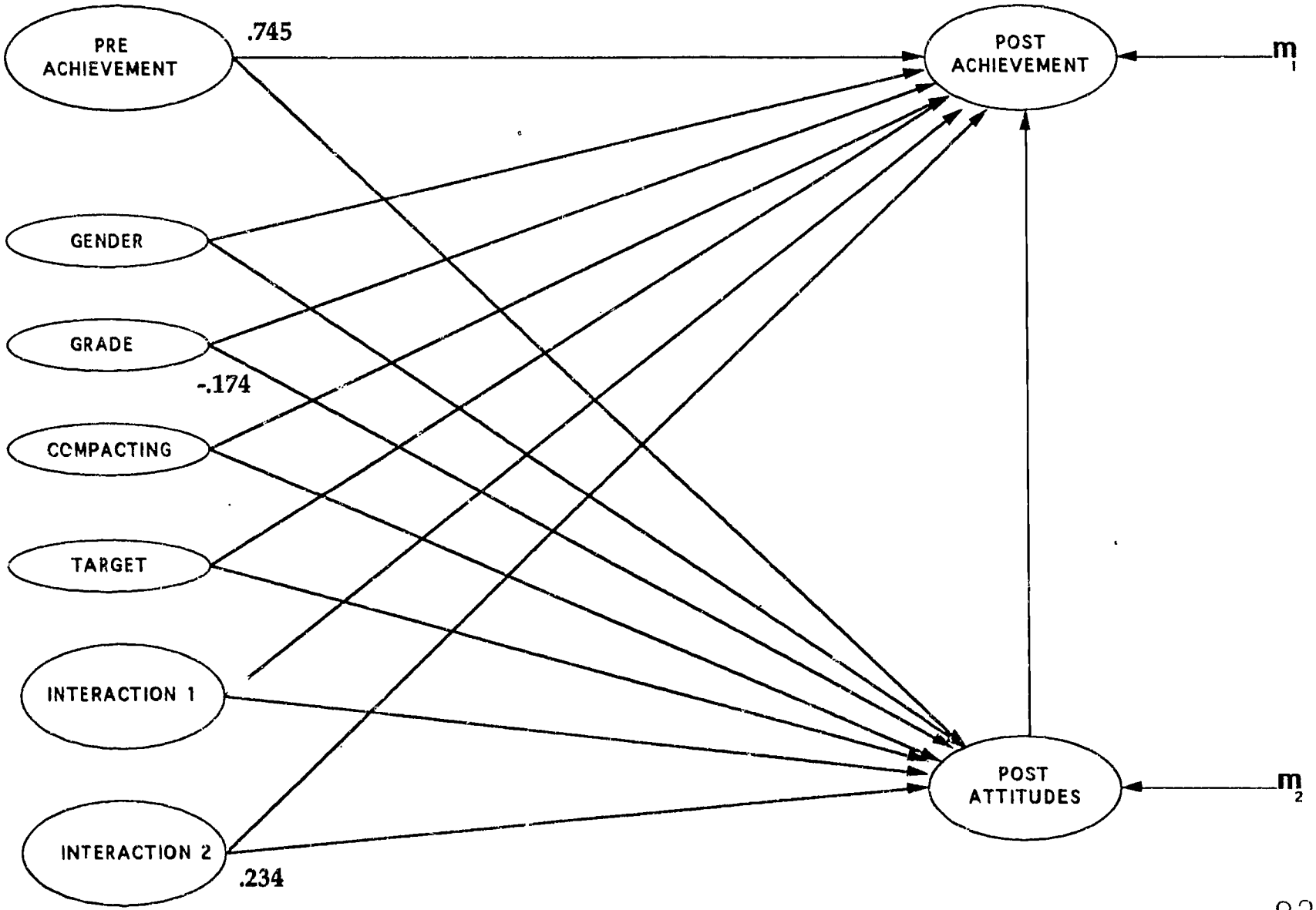


Figure 8 shows the reading achievement model for students whose curriculum was compacted in language arts. As with all the other models, the strongest causal path is from pre to post achievement (0.745). The only other significant path in this model is grade to post attitudes (-0.210), with the students in the lower grades again showing the more positive attitudes.

Table 18

Reading Achievement Measurement Model - Curriculum Compacted in Math

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
Post Attitude				0.136
Learning	0.669		0.552	0.448
Teacher Dominance	-0.342	-2.414	0.883	0.117

Table 19

Beta (Causal Paths) - Reading Achievement - Curriculum Compacted in Math

	Causes							
Effects	Pre Ach	Gender	Grade	Compact	Target Treat1	Target Treat2	Achieve	Post Att
Post Attitude	0.022	0.142	-0.174	0.120	0.073	-0.082	0.234	
z-score	0.275	1.954	-2.278	-1.626	0.966	-1.026	2.943	
Post Achievement	0.745	0.014	0.020	0.048	0.030	-0.031	0.048	0.000
z-score	20.407	0.399	0.537	1.381	0.848	-0.841	1.249	-0.006

Figure 8. Reading Achievement by Area Compacted - Language Arts.

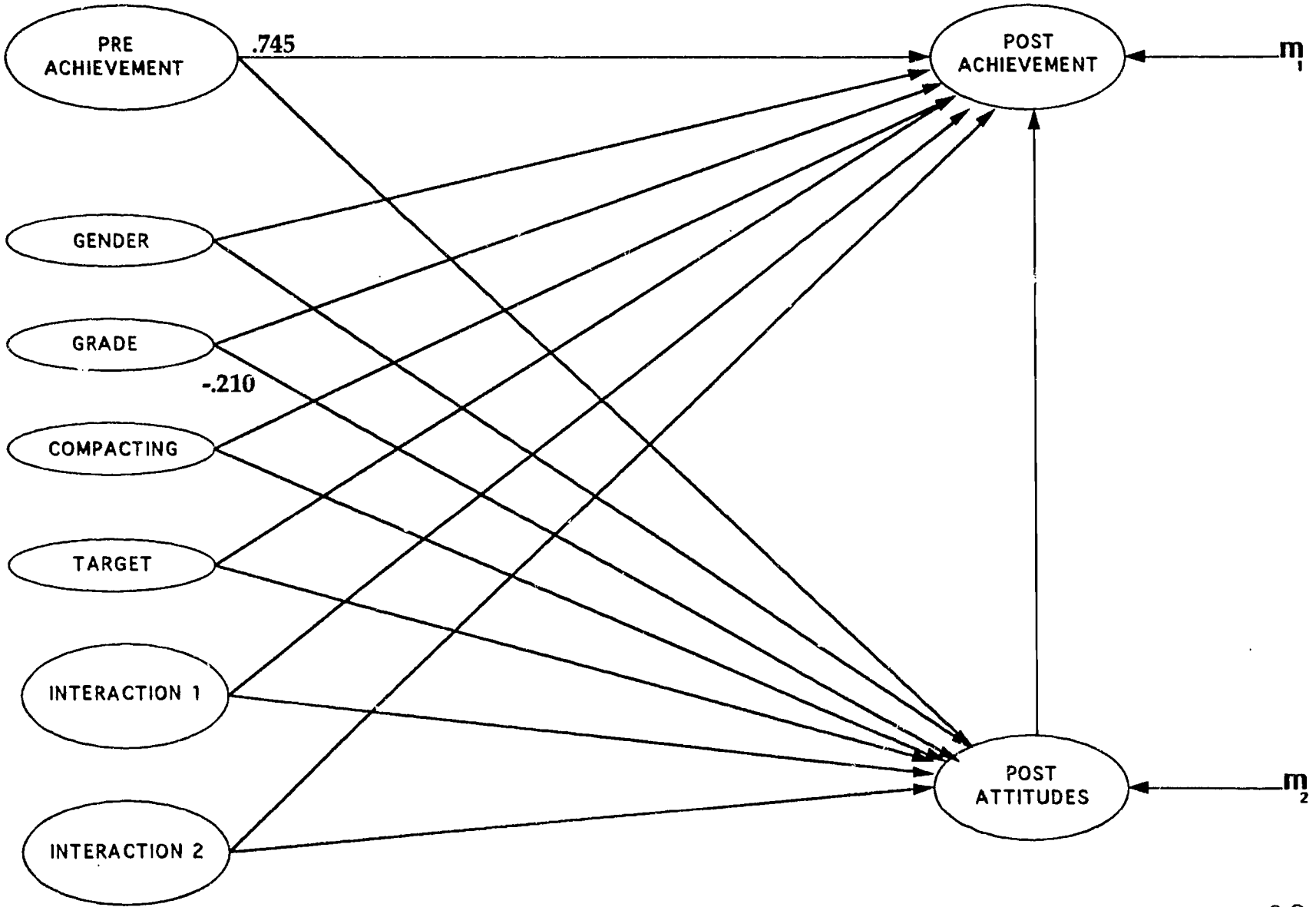


Table 20

Reading Achievement Measurement Model - Curriculum Compacted in Language Arts

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
Post Attitude				0.109
Learning	0.606		0.663	0.367
Teacher Dominance	-0.378	-2.301	0.857	0.143

Table 21

Beta (Causal Paths) - Reading Achievement Model - Curriculum Compacted in Language Arts

	Causes							
Effects	Pre Ach	Gender	Grade	Compact	Target Treat1	Target Treat2	Achieve	Post Att
Post Attitude	0.040	0.139	-0.210	0.130	0.087	-0.108	0.000	
z-score	0.475	1.757	-2.454	1.623	1.060	0.780	-1.271	
Post Achievement	0.745	0.009	0.017	0.048	0.030	-0.015	0.012	0.012
z-score	20.076	0.249	0.436	1.360	0.847	0.441	0.408	0.215

12. What is the impact of each research (latent) variable on student content area preference?

13. Does the proposed model of content area preference adequately explain the observed covariance among the specific (measured) indicators?

Table 22 shows the fit statistics of the final *Content Area Preference Scale* Model. The final models are depicted in Figures 9 - 12. The latent variables, pre and post preference, each have four indicators. They are the *CAPS* items 2, 6, 15, and 19 for mathematics and items 1,4, 8, and 18 for reading (see Table 3 for item stems). The *CAPS* items were scored 1 for agree to 3 for disagree.

Table 22

Content Area Preference Model Information

Model	Chi-square	df	p	χ^2/df
Math Achievement by Area Compacted - Math	148.34	136	0.222	1.090
Math Achievement by Area Compacted - Language Arts	143.89	136	0.305	1.057
Reading Achievement by Area Compacted - Language Arts	119.98	136	0.834	0.887
Reading Achievement by Area Compacted - Math	116.08	136	0.891	0.852

In addition to the preference latent variables, the subject area preference models contain an achievement latent variable. The indicators are the raw difference scores from five *ITBS* sub-tests: reading, math concepts, math computation, science, and social studies. The measurement error for math concepts and math computation is correlated. The target, Treatment Group 2, and Treatment Group 3 variables were centered to remove any effects of multicollinearity.

Figure 9 depicts the final model for math preference for students whose curriculum was compacted in math. Tables 23, 24, and 25 show the model parameters. The path from preCAPS to postCAPS is the only significant one (0.710). Figure 10, the math preference model with students compacted in language arts, shows that there is a significant path from preCAPS to postCAPS (0.710). There is also a significant path from grade to postCAPS (0.093). This path indicates that younger students (grades 2 and 3) tend to have a higher preference for mathematics when their curriculum was compacted in language arts (see Tables 26, 27, and 28).

Figure 9. Math Preference by Area Compacted - Math.

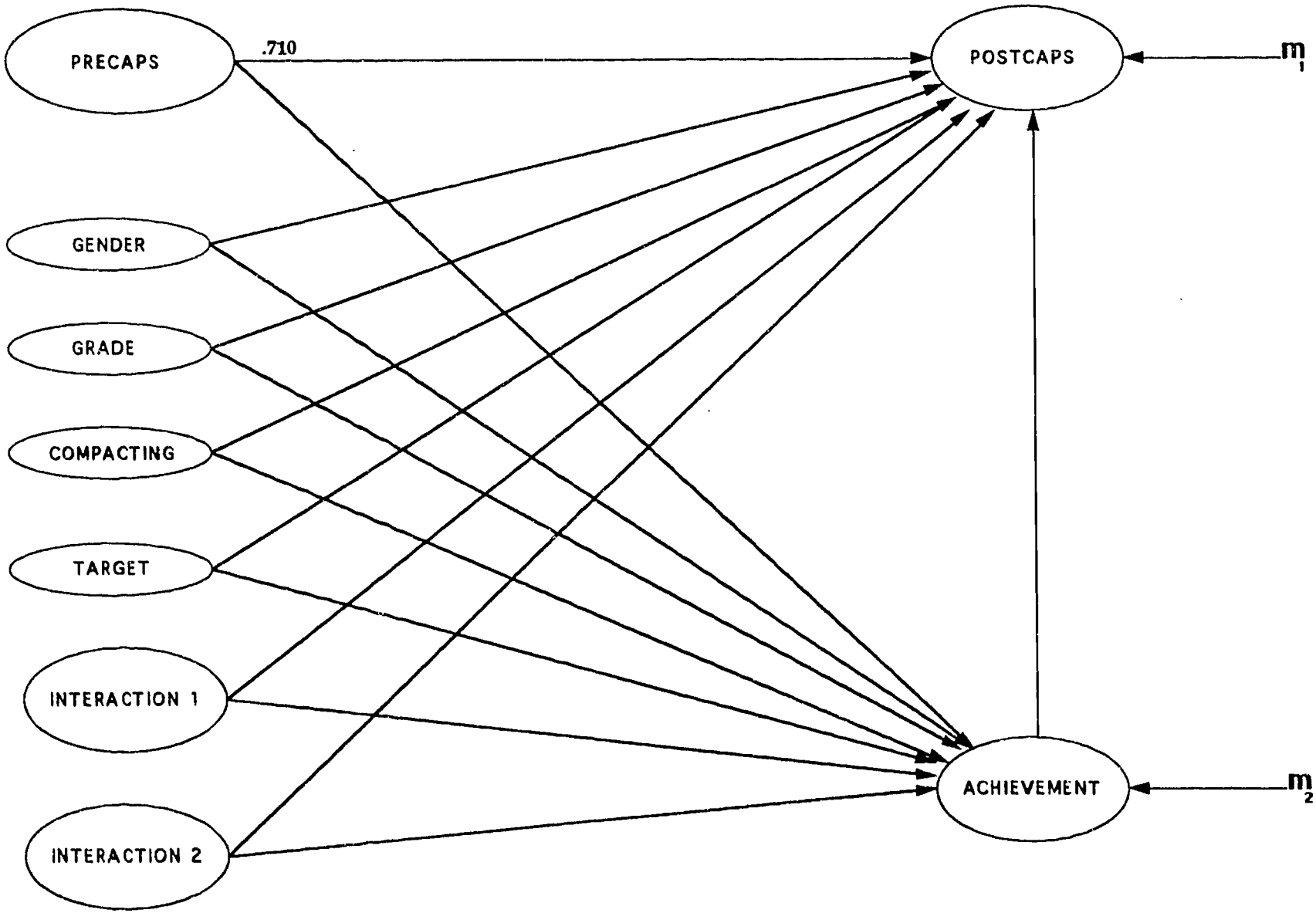


Table 23

Math Preference Measurement Model - Curriculum Compacted in Math

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
PreCAPS				
PreCAPS 2	0.832		0.308	0.692
PreCAPS 6	0.474	9.251	0.775	0.225
PreCAPS 15	0.883	16.596	0.220	0.780
PreCAPS 19	0.588	11.685	0.654	0.346
PostCAPS				0.529
PostCAPS 2	0.835		0.303	0.697
PostCAPS 6	0.463	8.845	0.786	0.214
PostCAPS 15	0.843	15.103	0.289	0.711
PostCAPS 19	0.529	10.135	0.720	0.280
Achievement				0.075
Reading	0.429		0.816	0.184
Math Concepts	0.387	3.253	0.850	0.150
Math Computation	0.237	2.400	0.944	0.056
Social Studies	0.342	3.171	0.883	0.117
Science	0.390	3.327	0.848	0.152

Table 24

Correlated Errors - Math Preference Model - Curriculum Compacted in Math

	CAPS 2	CAPS 6	CAPS 15	CAPS 19	Math Concepts
PostCAPS 2	0.072				
z-score	2.638				
PostCAPS 6		0.285			
z-score		6.367			
PostCAPS 15			-0.036		
z-score			-1.343		
PostCAPS 19				0.185	
z-score				4.716	
Math Computation					0.120
z-score					2.093

Figure 10. Math Preference by Area Compacted - Language Arts.

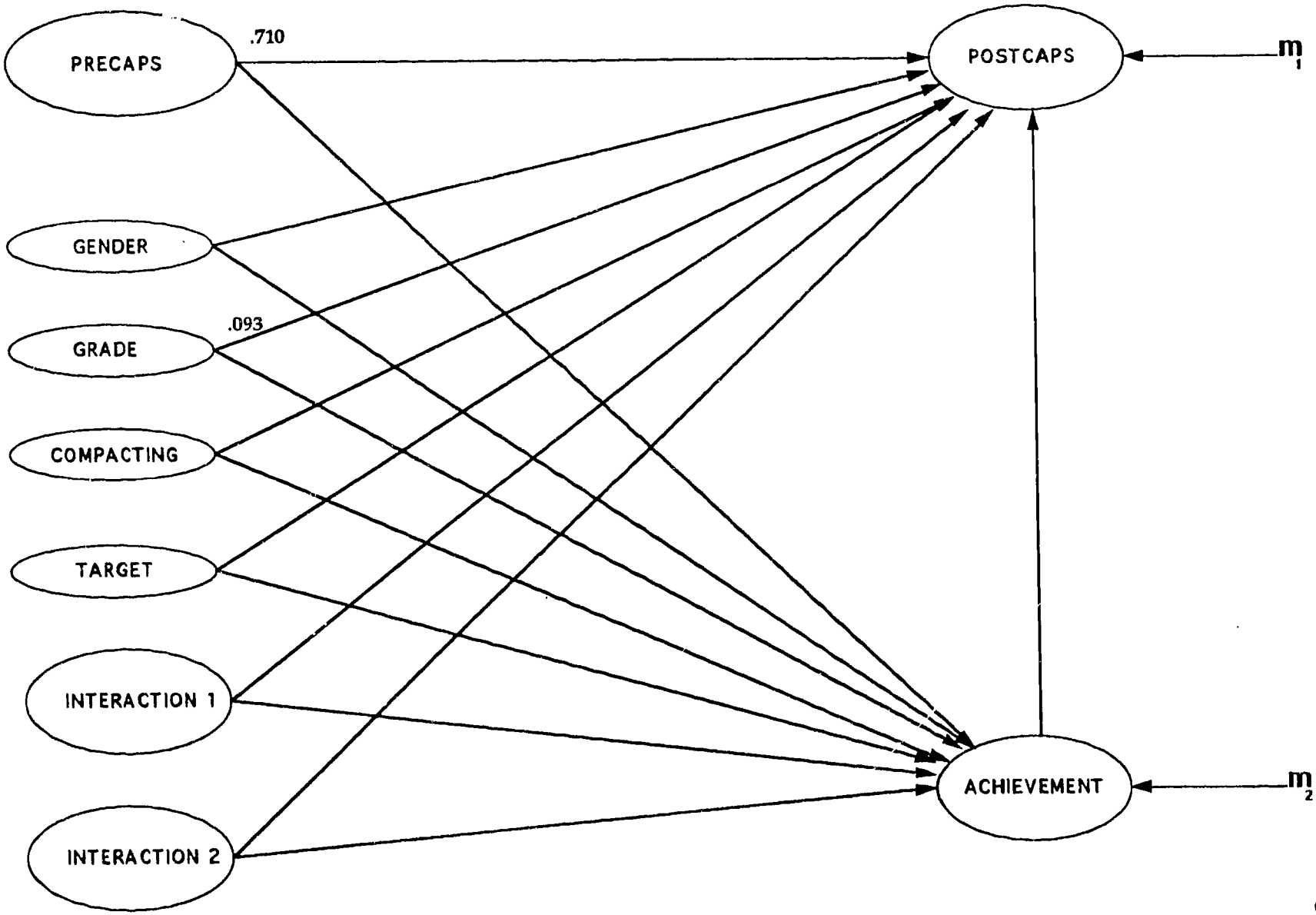


Table 25

Beta (Causal Paths) - Math Preference Model - Curriculum Compacted in Math

	Causes							
Effects	Pre CAPS	Gender	Grade	Compact	Target	Target Treat1	Target Treat2	Achieve
Achieve	-0.113	0.091	-0.093	-0.074	0.106	-0.055	-0.035	
z-score	-1.275	1.135	-1.149	-1.441	1.237	-0.674	-0.427	
PostCAPS	0.710	0.000	0.077	-0.012	-0.039	0.057	0.015	-0.011
z-score	12.401	-0.009	1.702	0.821	-0.812	1.247	0.334	-0.155

Table 26

Math Preference Measurement Model - Curriculum Compacted in Language Arts

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
PreCAPS				
PreCAPS 2	0.833		0.306	0.694
PreCAPS 6	0.473	9.190	0.777	0.223
PreCAPS 15	0.883	16.567	0.221	0.779
PreCAPS 19	0.589	11.676	0.653	0.347
PostCAPS				0.530
PostCAPS 2	0.835		0.302	0.698
PostCAPS 6	0.462	8.797	0.787	0.213
PostCAPS 15	0.843	15.069	0.289	0.711
PostCAPS 19	0.530	10.126	0.719	0.281
Achievement				0.067
Reading	0.406		0.835	0.165
Math Concepts	0.369	3.120	0.864	0.136
Math Computation	0.243	2.417	0.941	0.059
Social Studies	0.376	3.203	0.859	0.141
Science	0.393	3.243	0.846	0.154

Table 27

Correlated Errors - Math Preference Model - Curriculum Compacted in Language Arts

	CAPS 2	CAPS 6	CAPS 15	CAPS 19	Math Concepts
PostCAPS 2	0.071				
z-score	2.614				
PostCAPS 6		0.286			
z-score		6.356			
PostCAPS 15			-0.036		
z-score			-1.356		
PostCAPS 19				0.186	
z-score				4.728	
Math Computation					0.122
z-score					2.125

Table 28

Beta (Causal Paths) - Math Preference Model - Curriculum Compacted in Language Arts

	Causes							
Effects	Pre CAPS	Gender	Grade	Compact	Target	Target Treat1	Target Treat2	Achieve
Achieve	-0.143	0.082	-0.122	-0.077	0.054	0.002	-0.046	
z-score	-1.570	1.014	-1.431	-0.911	0.654	0.024	-0.548	
PostCAPS	0.710	0.000	0.093	-0.013	0.058	-0.055	0.008	-0.022
z-score	12.329	0.000	1.988	-0.276	1.268	-1.180	0.167	-0.308

The reading preference models are shown in Figures 11 and 12. Figure 11 is the reading preference model for students whose curriculum was compacted in math. The path from preCAPS to postCAPS is significant (0.617). However, unlike the previous two models, the path from preCAPS to achievement is significant (-0.210), indicating that a high preference for reading is correlated with high achievement scores when students are compacted in math. The path from gender to postCAPS is also significant (-0.118), indicating that females have a higher preference for reading when their curriculum is compacted in math (See Tables 29, 30 and 31).

Figure 11. Reading Preference by Area Compacted - Math.

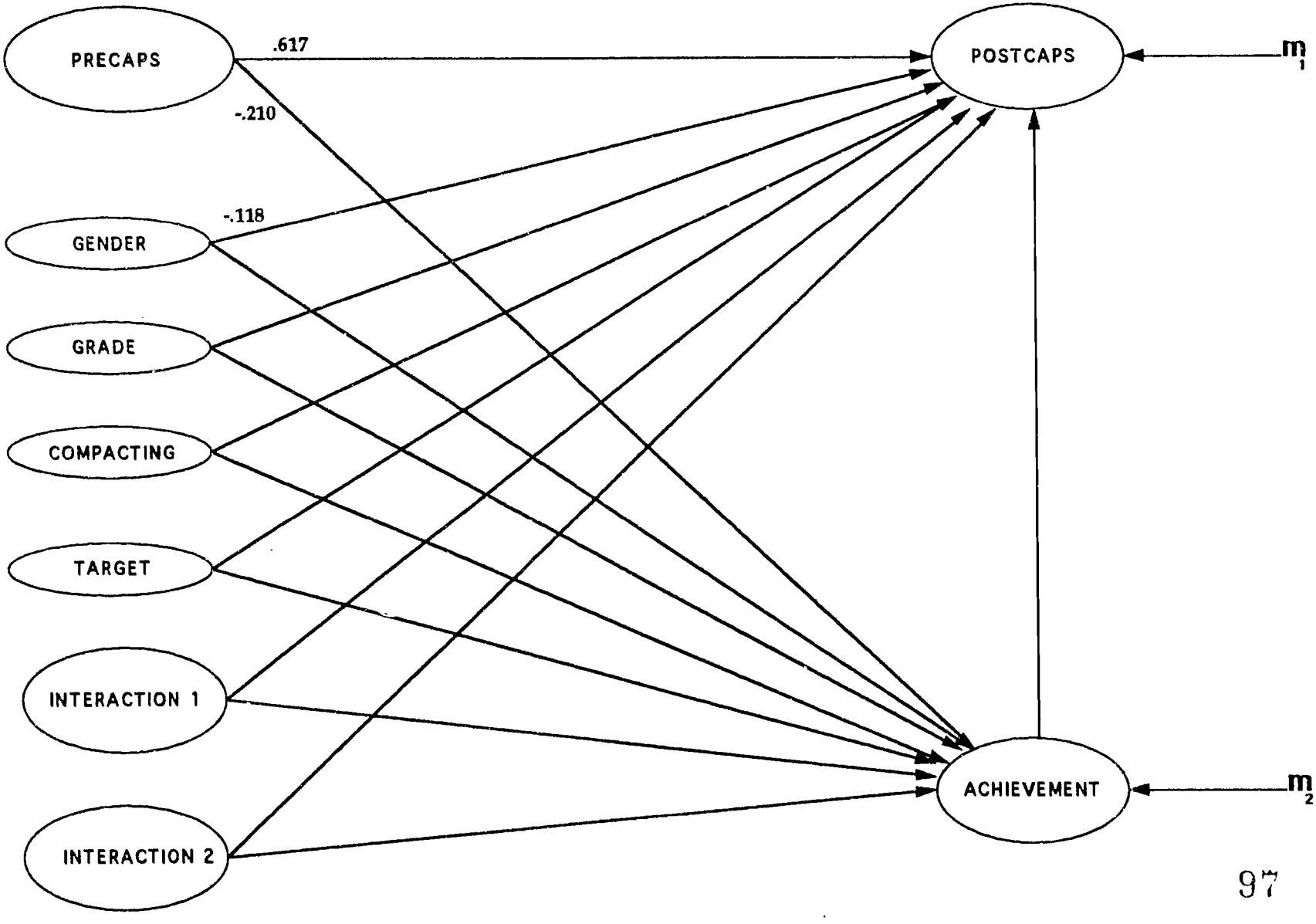


Table 29

Reading Preference Measurement Model - Curriculum Compacted in Math

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
PreCAPS				
PreCAPS 1	0.547		0.701	0.299
PreCAPS 4	0.751	9.347	0.436	0.564
PreCAPS 8	0.638	8.670	0.593	0.407
PreCAPS 18	0.742	9.293	0.449	0.551
PostCAPS				0.439
PostCAPS 1	0.517		0.733	0.267
PostCAPS 4	0.798	9.267	0.363	0.637
PostCAPS 8	0.645	8.491	0.584	0.416
PostCAPS 18	0.776	9.183	0.398	0.602
Achievement				0.098
Reading	0.448		0.799	0.201
Math Concepts	0.404	3.389	0.837	0.163
Math Computation	0.217	2.278	0.953	0.047
Social Studies	0.32[illegible]	3.158	0.896	0.104
Science	0.378	3.376	0.857	0.143

Table 30

Correlated Errors - Reading Preference - Curriculum Compacted in Math

	CAPS 1	CAPS 4	CAPS 8	CAPS 18	Math Concepts
PostCAPS 1	0.164				
z-score	3.956				
PostCAPS 4		0.063			
z-score		2.008			
PostCAPS 8			0.154		
z-score			4.182		
PostCAPS 18				0.048	
z-score				1.518	
Math Computation					0.124
z-score					2.720

Table 31

Beta (Causal Paths) - Reading Preference - Curriculum Compacted in Math

	Causes							
Effects	Pre CAPS	Gender	Grade	Compact	Target	Target Treat1	Target Treat2	Achieve
Achieve	-0.201	0.034	-0.042	-0.054	0.127	-0.034	-0.042	
	-1.974	0.421	-0.512	-0.648	1.515	-0.421	0.509	
PostCAPS	0.617	-0.118	0.025	-0.016	-0.006	-0.017	0.056	-0.003
	6.560	-2.299	0.490	-0.323	-0.111	-0.339	1.112	-0.041

Figure 12 shows the reading preference model for students compacted in language arts. As with all the other models, the strongest causal path is from pre to post preference (0.628). As with the previous model, the path from PreCAPS to achievement is significant (-0.208) as is the path from gender to PostCAPS (-0.122). This may be interpreted to mean that younger students whose curriculum was compacted in language arts tend to show an increase in achievement. Females tend to have a higher preference towards reading after their curriculum is compacted in language arts (see Tables 32-34).

Figure 12. Reading Preference by Area Compacted - Language Arts.

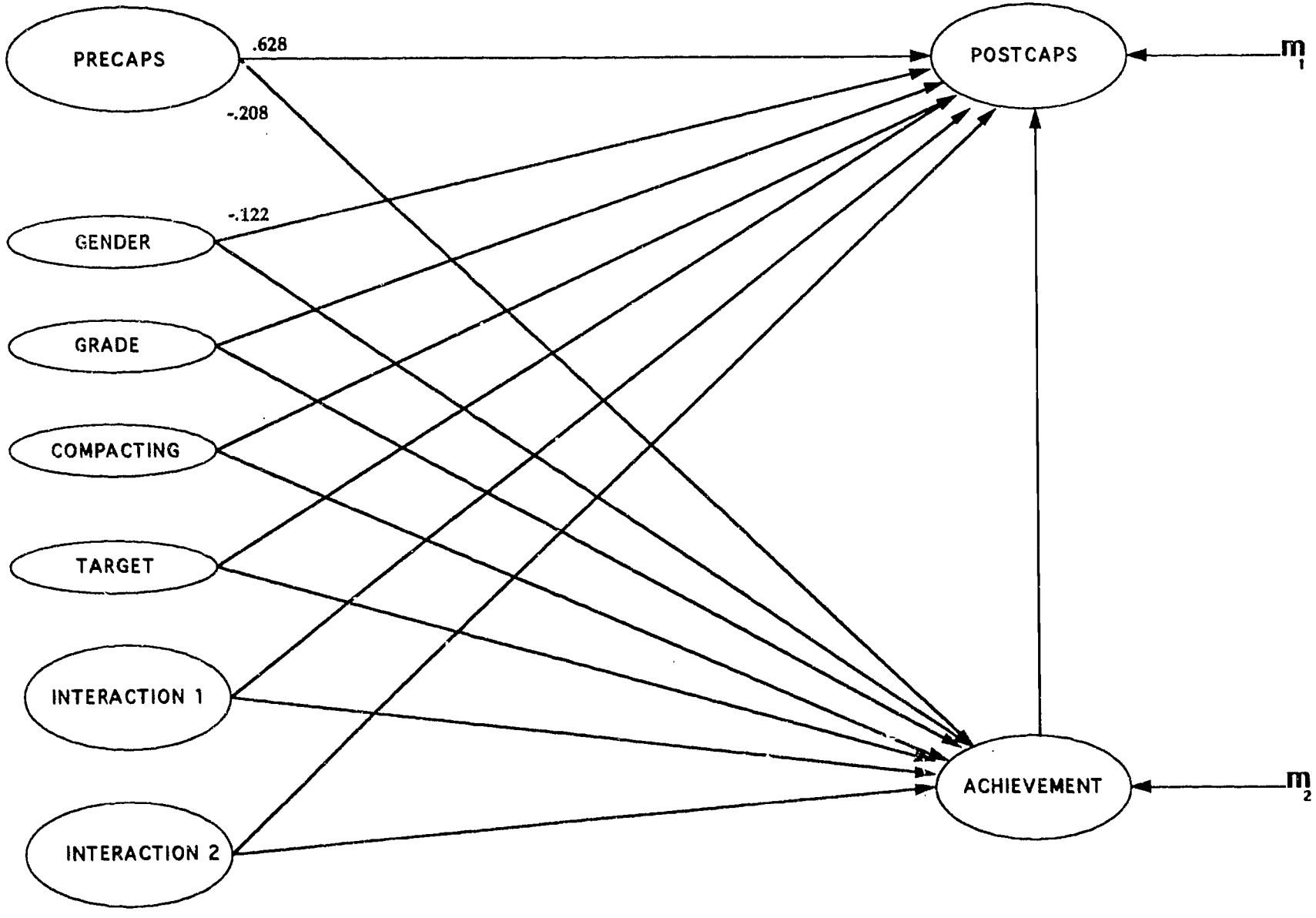


Table 32

Reading Preference Measurement Model - Curriculum Compacted in Language Arts

FACTOR (indicator)	Factor Loading	Z-values	Error Variance	R-Square
PreCAPS				
PreCAPS 1	0.544		0.704	0.296
PreCAPS 4	0.759	9.344	0.424	0.576
PreCAPS 8	0.635	8.610	0.597	0.403
PreCAPS 18	0.738	9.238	0.455	0.545
PostCAPS				0.441
PostCAPS 1	0.516		0.734	0.266
PostCAPS 4	0.800	9.239	0.360	0.640
PostCAPS 8	0.643	8.452	0.586	0.414
PostCAPS 18	0.775	9.150	0.399	0.601
Achievement				0.082
Reading	0.442		0.805	0.195
Math Concepts	0.372	3.235	0.861	0.139
Math Computation	0.212	2.238	0.955	0.045
Social Studies	0.353	3.216	0.875	0.125
Science	0.390	3.325	0.848	0.152

Table 33

Correlated Errors - Reading Preference - Curriculum Compacted in Language Arts

	CAPS 1	CAPS 4	CAPS 8	CAPS 18	Math Concepts
PostCAPS 1	0.167				
z-score	3.997				
PostCAPS 4		0.062			
z-score		1.998			
PostCAPS 8			0.151		
z-score			4.090		
PostCAPS 18				0.049	
z-score				1.568	
Math Computation					0.133
z-score					2.344

Table 34

Beta (Causal Paths) - Reading Preference - Curriculum Compacted in Language Arts

	Causes							
Effects	Pre CAPS	Gender	Grade	Compact	Target	Target Treat1	Target Treat2	Achieve
Achieve	-0.208	0.026	-0.073	-0.055	-0.018	-0.016	-0.041	
	-1.979	0.324	-0.841	-0.658	-0.222	-0.193	-0.484	
PostCAPS	0.628	-0.122	0.008	-0.018	0.055	0.032	-0.068	-0.008
	6.575	-2.383	0.148	-0.352	1.084	0.634	-1.320	-0.100

14. What are the background characteristics of the teachers in the sample as indicated on the *Teacher Data Form*?

Prior to the implementation of the study, teachers in all groups completed the *Teacher Data Form* which provided information about the background characteristics of the teachers in the study. Eighty-eight percent of the teachers in the study were female, and were almost equally split between second, third, fourth, or fifth grade assignments. Because some of the elementary schools did not provide services to s th grade students, a smaller number of teachers in the sample (fourteen percent) taught sixth grade. The mean years of teaching experience for all teachers was 14.5. The mean years of teaching experience for the individual groups were: Treatment Group 1 = 14.7, Treatment Group 2 = 16.7, Treatment Group 3 = 13.4, and the Control Group = 13.8 years. A one-way analysis of variance procedure indicated that there were significant differences among the groups in the number of years taught ($F = 2.92$, $df = 3/421$, $p < 0.05$); however, a Scheffé' post hoc procedure indicated no significant differences between the pairs of means at the .01 alpha level.

The majority of the teachers had taken some coursework beyond the Bachelor's level. The mean year in which they received their Bachelor's Degree was 1972. Thirty-six percent of the teachers had Master's Degrees.

In addition to questions on graduate coursework, teachers were asked to indicate the number of graduate courses in gifted education that they had taken. The mean number of graduate courses by teachers in all four groups was .67. The means for each group were Treatment Group 1 = .67, Treatment Group 2 = .78, Treatment Group 3 = .85, and Control Group = .50. A one-way analysis of variance procedure indicated that there were no significant differences among the groups in the number of graduate courses in gifted education ($F = 1.77$, $df = 3/424$, $p > .05$).

In addition to courses in gifted education, teachers were asked to indicate the number of inservice sessions in gifted education that they had attended. The mean number for all four groups was 1.63 sessions. The means for each group were: Treatment Group 1 = 2.11, Treatment Group 2 = 2.28, Treatment Group 3 = 1.75, and the Control Group =

.88 sessions. A one-way analysis of variance procedure indicated that there was a significant difference among the four groups on this variable ($F = 20.59$, $df = 3/424$, $p < .01$), and a Scheffé' post hoc analysis found that Treatment Groups 1, 2, and 3 were significantly different than Group 4. However, upon examination of the titles of inservice sessions listed by teachers in all four groups, it became apparent that classroom teachers in the treatment group, had listed many staff development sessions not only related to gifted education. These sessions include areas such as computers and technology, thinking skills, and creative problem solving, all of which are designed to be used not only with gifted students, but with all students.

15. What types of support services are available to classroom teachers as indicated on the *Teacher Data Form*?

The second section of the *Teacher Data Form* asked teachers to provide information about the support system they had in their individual schools. The first item on this portion of the form asked about the availability of a gifted education teacher/consultant in their schools. To answer this question, teachers selected from the following responses:

1=no
2=no, but I know where I can find help for bright students
3=yes, on a limited basis
4=yes, on a consistent basis
5=yes, all the time.

The mean response for all four groups on this item was 3.62 (yes, on a limited basis). A one-way analysis of variance procedure indicated no significant differences among the groups with regard to the availability of a gifted education teacher/consultant ($F = 2.50$, $df = 3/422$, $p > .05$).

Teachers were asked to indicate the degree to which enrichment and/or acceleration materials were available to teachers for use with bright students in the classroom. The responses were:

1 = no
2 = not in my classroom, but in my school
3 = yes, but very limited
4 = yes I have some materials
5 = yes, I have many materials.

The mean response for all four groups was 3.17 (yes, but very limited). A one-way analysis of procedure indicated no significant differences among the groups on responses to this question ($F = 2.44$, $df = 3/423$, $p > .05$).

In addition to the availability of enrichment materials, teachers were asked to indicate the amount of planning time they had available each week (0, 1, 2, 3, or more than 3 hours). The mean number of hours per week that teachers in all groups had for planning was 2.16. There were no significant differences among the groups with regard to the planning time available to them ($F = 2.44$, $df = 3/423$, $p > .05$).

The fourth item on this section of the *Teacher Data Form* asked if teachers "teach in a homogeneously grouped classroom." If teachers answered no to this question, they were instructed to respond to the final three questions. Twenty-five percent of the teachers said yes to this item, 70% said no, and 5% of the teachers left this item blank. Because of the high number of yes responses and the significant number of missing responses to this

item, it appears that some of the teachers were uncertain about how to interpret or respond to this item.

The fifth question asked "If your classroom is heterogeneously grouped, do you provide cluster grouping for high ability students in language arts, mathematics, social studies, and science." When reflecting upon this question now, the researchers believe that the teachers may have interpreted this question in different ways. Some may have answered yes because they group students according to achievement or ability *within their classroom*, and others may have answered yes because they group students according to achievement or ability *within their grade level*. Thus, the results of the responses to this question may be inaccurate. The percentage of teachers who indicated that they do provide cluster grouping in the various subject areas were: 50.49% in language arts; 55.87% in mathematics; 14.49% in social studies; and 15% in science.

The sixth item asked if teachers have district curriculum guides available to them that include goals and objectives in language arts, mathematics, social studies, and science. The percentage of teachers who indicated that they do have these guides available for the various subject areas are: 93.39% in language arts, 94.17% in mathematics, 89.05% in social studies, 88.96% in science.

The final item asked if teachers had pretests available for assessing students' prior knowledge of the curriculum in language arts, mathematics, social studies, and science. Teachers responded yes or no to this item; however, several left this item blank for one or more subject areas. Apparently, some of the teachers were unsure about the availability of pretests. Of those who responded to this item, the percentage of teachers who said that they do have pretests available were 56.43% in language arts, 81.95% in mathematics, 21.40% in social studies, and 24.58% in science.

16. Is there a difference among the treatment groups with respect to classroom teachers' practices as measured by the *Classroom Practices Questionnaire* (*CPQ*)?

Following implementation of the study, teachers in all groups completed the *Classroom Practice Questionnaire* (*CPQ*) which was developed to ascertain the classroom practices and procedures used by teachers when providing compacting services to students. This self report instrument included 17 questions answered on 8-point response scale and three open-ended questions. The version of the instrument used for the control groups did not include the last three questions because curriculum compacting had not been implemented in the control group classrooms. The alpha reliability coefficient for the first 17 questions was .85.

To determine whether there were significant differences between the treatment groups and the control group, a one-way analysis of variance indicated that significant differences existed favoring treatment groups with respect to the classroom practices used by teachers ($F = 16.35$, $df = 285/1$, $p < .001$).

17. What are the concerns of treatment group teachers regarding curriculum compacting before and after treatment as indicated by the *Stages of Concerns Questionnaire* (*SoCQ*) profiles?

The process of adopting innovations in education was investigated by Hord, Rutherford, Huling-Austin, and Hall (1987) through their research on the identification of the specific phases that teachers experience when implementing an innovation. They labeled these phases as *Stages of Concern* and defined a concern to be "an aroused state of

personal feelings and thoughts about a demand as it is perceived" (Hall, George, & Rutherford, 1977, p. 5). Concerns are most influenced by the kinds of support and assistance that participants receive as they attempt to implement a new practice (Hord et al., 1987).

To investigate the specific concerns of teachers within the different groups, the *Stages of Concern Questionnaire* (Hall et al., 1977) was administered before and after the treatment. Mean scores for each of the seven stages for each treatment group were computed. Only the data from teachers who had completed both the pretest and posttest were included in the data analyses. The mean scores for each scale, which were transformed to percentiles on the profile sheets, indicate the relative intensity of respondents' concerns when adopting curriculum compacting. For example, it is expected that most teachers would be concerned with personal issues during the beginning phase of an innovation. Questions like, "How will this innovation affect me?" would be common. The pretreatment results for the sample of teachers can be found in Figure 13 and the post-treatment results in Figure 14.

The pretest results of the profile data indicate that the Informational, Personal, and Management stages received the highest mean scores for all groups. The next highest stage of concern by teachers prior to training was Collaboration. The Collaboration stage of concern is defined as the "focus is on increasing impact on clients through collaboration with others regarding use of the innovation" (Hall et al., 1977). This finding would indicate a willingness by teachers to implement the new practice by having an opportunity to work with others about the use of the innovation. However, the authors of the Concerns-Based Adoption Model state that people are not able to reach this stage until the personal concerns and the specific skills needed to implement the tasks have been fulfilled (Hall et al., 1977).

The results of the *SoCQ* posttest profile for all treatment groups indicate that the Informational, Personal, and Management stages have decreased in their intensity when compared to the pretest results. An interesting finding emerged on the Awareness stage of concern. Before treatment, the three groups indicated a low awareness concern for the topic of curriculum compacting, as expected. It would appear that this concern increased after more information about curriculum compacting was shared with teachers. The informational stage of concern increased for each treatment group. Teachers in Treatment Group 1 were provided with two instructional videotapes about the compacting process, a book, and related articles. Teachers in Treatment Group 2 received everything that Treatment Group 1 received, as well as 2 hours of group simulations on compacting. Teachers in Treatment Group 3 received the same as Treatment Group 2 with the addition of local consultant services and further involvement in peer coaching experiences. The teachers may have found that *after* they had received training and had tried the procedure, they become more aware of the tasks, time, schedule, and additional information necessary to become proficient in compacting the curriculum for their high ability students. This conclusion is supported by the slightly higher posttreatment means with respect to Management. It may also indicate that teachers became more comfortable and confident in using the innovation and shifted their concerns to other areas. They, therefore, indicated that other areas became a greater concern than the compacting process, thereby raising their awareness score (Hall et al., 1977). By examining the profiles, little change occurred for Treatment Groups 1 and 2. However, the next highest stage of concern of teachers in Treatment Group 3 after training (group which had the most extensive staff training) was Refocusing. This may indicate that after these teachers used compacting, they were concerned about how to make it better or adapt it to their needs.

Figure 13. Stages of Concern Profile by Groups Before Treatment.

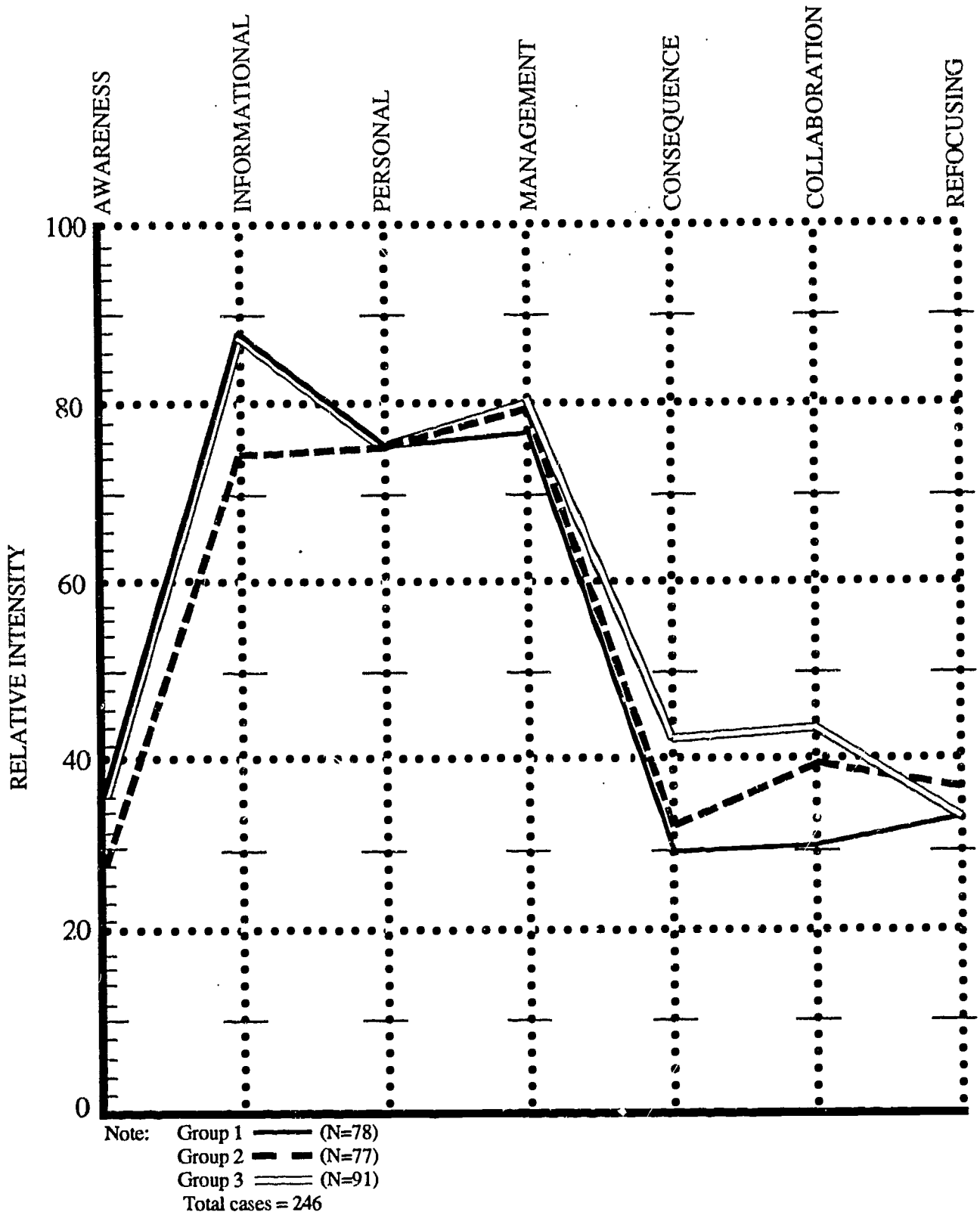
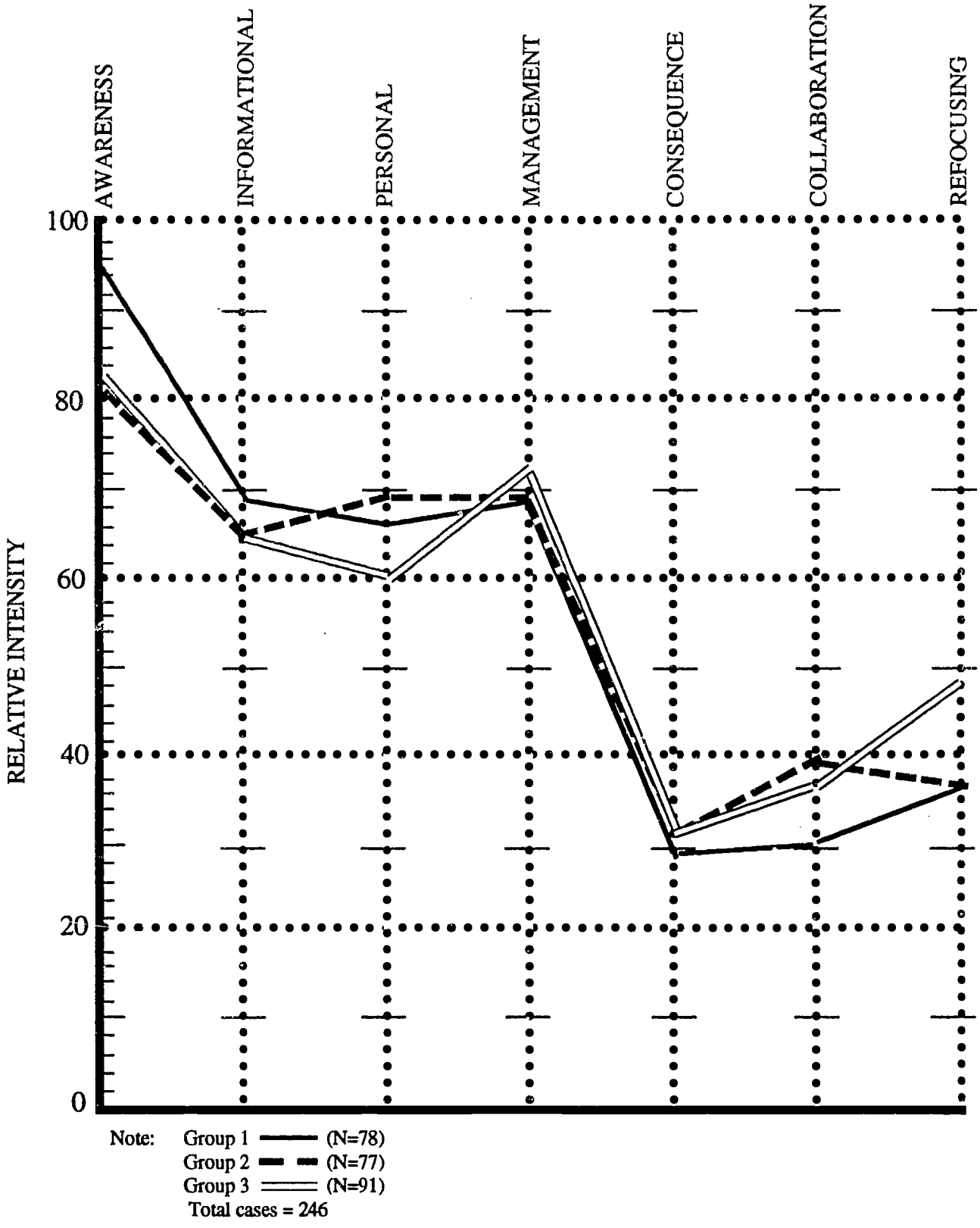


Figure 14. Stages of Concern Profile by Groups After Treatment.



CHAPTER 5: Discussion, Implications, and Significance

This chapter discusses and extends the findings concerning the percentage of teachers who were able to implement the compacting procedure, the amount of content eliminated, the quality of the compacting procedures used by teachers, and the impact of curriculum compacting on students' achievement, content area preferences, attitudes toward learning, and the impact on classroom teachers. Implications will be drawn from the results of the study.

Teachers Completing the Process

Ninety-five percent of all teachers who participated in this study completed the compacting form and identified students who were eligible for curriculum compacting. This finding suggests that teachers were able to accurately select high-achieving students whose curriculum needed to be adjusted even when current achievement test scores were not available to them. The selection of students occurred early in the school year (October and November) and, in many cases, teachers made the selection without assistance from specialists. Many districts did not have teachers of the gifted to assist in the identification process and, in other districts, gifted programs began in later grades than the ones targeted for the study. This high percentage of teachers who were able to accurately identify students takes on greater significance given the minimum amount of inservice that was provided prior to selection. Treatment Group 1, for example, received only one hour of staff development and a guidebook about how to provide this service. While prior research has indicated that teachers cannot reliably identify students for participation in gifted programs (Gear, 1976), the data from this study suggest that the teachers involved in this study had no problems identifying high achieving students whose curriculum needed modification.

Elimination of Content

The large amount of material that participating teachers eliminated from their regular curriculum for targeted students is also important. As documented by the compactors and the *CPQ*, teachers compacted an average of 40-50% of material in five subject areas, (see Table 2). Targeted students had mastered some material in all content areas prior to instruction; at a minimum, they demonstrated mastery of one-fourth of the curriculum for the year before it was taught and some students had mastered as much as three-fourths of the intended curriculum.

As early as 1937, Leta Hollingworth, who started a school for gifted children in New York City, concluded that these students need only half of the time traditionally spent on regular school work. Fifty years later, it is clear that a similar situation still exists for our most able students in school. The process of compacting curriculum in this study did not begin until November, after the students had been identified and the first level of staff development had been completed. Accordingly, many teachers indicated that if they had been able to begin the process in September, the percentage of curriculum eliminated would have been even higher. The large amount of content that could be eliminated for these students suggests that many of our most able students spend a great deal of time in school doing work that they already know. Mathematics was the most frequently compacted content area by teachers in each of the three treatment groups. The next most frequently compacted subject area was Language Arts, which did not incorporate spelling, the third most frequently compacted area.

The finding concerning the amount of mathematics content high ability students know before it is taught is supported by recent studies by Usiskin (1987) and Flanders (1987), who found that textbooks have decreased in difficulty *and* that a large percentage of repetition is incorporated in the texts. Because so much content can be eliminated, we must assume that the textbooks and materials are not providing the type of challenge that gifted students need. It also seems safe to conclude that many able students spend a great deal of their school year reviewing material that they have already mastered and that alternative instructional materials and instructional techniques should be used with these students. Flanders (1987) investigated three separate mathematics textbook series to examine just how much new content is presented each year. His primary finding was that a relatively steady decrease occurs in the amount of new content over the years up through eighth grade, where less than one-third of the material taught is new to students. Flanders' study shows that the mathematical content of some textbooks is primarily a review of previous topics.

Usiskin (1987) uses similar findings from his study to argue that even average eighth grade students should study algebra because only 25% of the pages in typical seventh and eighth grade mathematics texts contain new content. Usiskin points out that the current practice of spending a great deal of time reviewing work taught in earlier grades is counterproductive. The results of the present study would appear to indicate that teachers who have received staff development can certainly eliminate large percentages of content for high ability students. Anecdotal information also indicated that curriculum compacting was often provided to a broader range of students beyond those targeted for this study. Accordingly, it would seem that curriculum compacting is a viable way for dealing with the amount of repetition currently used in so many textbooks. More challenging textbooks would also help to address this problem.

The Quality of Replacement Activities

Teachers in Treatment Group 3, who received an additional staff development session and the benefit of peer coaching throughout the study, compacted curriculum in more content areas and utilized more enrichment strategies within content areas than did teachers in the other treatment groups. The data suggest that Treatment Group 3 teachers were able to use the curriculum compacting procedure successfully and, accordingly, adjust the regular curriculum of participating students in more content areas. The additional opportunities to learn about and practice curriculum compacting through simulations and peer coaching may have increased teachers' confidence with the process as an instructional strategy.

Although peer coaching helped to improve the quality of compactors in Treatment Group 3, the overall quality of compactors across treatment groups reflected a lack of appropriately challenging work for high ability students. The data suggest that the third column of the compactor, finding appropriate replacement activities, provided the most difficulty for the classroom teacher who often did not know what to assign or did not have the time to design these activities. The analysis of compactors indicated that many teachers used alternative and challenging strategies that were unrelated to the students' needs and interests and less challenging assignments that were extensions of the regular curriculum. As indicated in Table 3, teachers often replaced previously mastered work with extra problems, reading assignments, more difficult math activities or alternative assignments suggested in the textbook. A small number of teachers included peer teaching, cooperative learning, correcting class papers and making up work for other class members in the third column of the compactor. Thus, a large number of the replacement strategies did not reflect the types of advanced content that was suggested in the videotapes and the compacting

book. This finding corroborates the results of the research by Westberg, Archambault, Dobyns, and Salvin (1992) and Archambault, Westberg, Brown, Hallmark, and Zhang (1992) regarding the difficulty faced by elementary teachers to provide differentiated content to more able students.

It should be noted that in many districts, classroom teachers were not *able* to allow students to use regular curricular materials from the next grade level because of local district policies that did not permit any acceleration beyond grade level material. It should also be noted, however, that for many students in this study whose language arts or mathematics curriculum was compacted by 60 or 70%, to merely advance them into the next chronological grade level material would not provide the challenge needed to create an appropriate match between ability and instruction.

Impact on District Staff

District research liaisons indicated that they received many requests for assistance by classroom teachers who had begun the curriculum compacting process. Since so much previously mastered curriculum was eliminated, the requests to research liaisons focused upon three areas. First, and most important, in districts in which a gifted program existed, classroom teachers requested that targeted students be given additional time in a resource room or with a gifted program specialist. This practice was implemented in approximately half of the districts, resulting in more appropriate experiences, as documented by our analysis of the *Curriculum Compactor Assessment Form*, than in the districts where these services did not exist. As indicated by notations on the compactor forms, students who had the opportunity to work in a resource room frequently preferred to work on projects there.

Classroom teachers also requested additional materials with which to replace their eliminated curriculum. These materials were requested because so few teachers had appropriately challenging materials available. Trade books, kits, games, enrichment materials, and puzzles were requested by teachers as they became more involved in the curriculum compacting process. Research liaisons indicated that they had to request additional funds for these materials because teachers needed more materials for targeted students.

The third request that classroom teachers made was for consultant assistance in this process. Reading consultants, math consultants, instructional assistants and gifted program teachers and coordinators were all asked for help in this process, and disillusionment occurred in a few cases when it was not possible to provide the help quickly. Many teachers needed help in assessment, correcting pretests, classroom management strategies and discipline when groups of students were allowed to work on alternative assignments. Teachers also needed assistance in designing alternatives for compacted work. While the replacement activities teachers provided for students were *clearly* better than the regular curriculum they had already mastered, the completed compactors demonstrate that teachers need help in replacing previously mastered work with appropriately challenging material.

The Impact of Staff Development on the Compacting Process

The compactor forms completed by teachers in Treatment Group 3 were not of significantly higher quality than those in Groups 1 and 2, although teachers in Group 3 used more replacement strategies and more diverse options for targeted students. This

would seem to lend support to the work of both Joyce and Showers (1982, 1983) and Guskey (1986, 1990). The staff development opportunities provided to Group 3 teachers included peer coaching, as suggested by Joyce and Showers.

Guskey's model provides insight into this study as teachers' practices seemed to change and develop as they observed their students' positive responses to the elimination of previously mastered work and substitution of more appropriately challenging material. This, in turn, affe..ted teachers' beliefs and attitudes. The anecdotal records and responses to questions on the *Classroom Practices Questionnaire* indicated that as classroom teachers observed students benefiting from compacting, they become more committed to implementing the procedure. This confirms Guskey's findings about teaching practices that are sustained.

> A key factor in the endurance of any change in instructional practices is demonstrable results in terms of the learning success of a teacher's students. Activities that are successful tend to be repeated while those that are not successful, or for which there is not tangible evidence of success, are generally avoided. (Guskey, 1986, p. 7)

What remains to be seen is how much time and effort teachers will expend in implementing compacting if considerable obstacles exist, such as larger class sizes and the inclusion of more students with a wide range of abilities and special needs in the classroom. However, the positive response of teachers in this study and their ability to eliminate content and replace it with various activities and more advanced content provides an optimistic view of the impact of appropriately designed staff development on teachers' ability to modify curriculum for students who need and can benefit from this service.

Intentions About Future Use of Compacting

Although the majority of teachers in this study indicated that they would continue to use curriculum compacting in the future, it is clear that many classroom teachers throughout the country do not make the modifications necessary to ensure an appropriate challenge level for gifted students (Archambault et al., 1992; Westberg et al., 1992). With the current movement in our country to eliminate most forms of tracking and ability grouping (Oakes & Lipton, 1992) and the practice of mainstreaming students with various handicapping conditions into regular classrooms, the skills needed by a classroom teacher to modify instruction to meet the needs of a diverse population become more demanding. This study indicates that the most difficult task in the compacting process is the replacement of what has been eliminated with appropriately challenging content and activities. Although the vast majority of teachers in this study were able to imple nent curriculum compacting for the student(s) they selected, many indicated frustration o er the following issues: lack of expertise in knowing what to substitute for high ability students, lack of time needed to plan to meet individual differences, the logistics of teaching different topics to different groups of students, the lack of support staff needed to implement replacement activities (reading and math specialists, gifted and talented program staff), and other concerns relating to classroom management. While curriculum compacting seems to be a viable process for meeting the needs of high ability students in the regular classroom, it does take time, effort, and planning on the part of classroom teachers.

A follow-up with the research liaisons involved in the compacting study has been conducted to determine if any changes occurred in the district and whether teachers continue to use curriculum compacting in their classrooms (see Chapter Six). Presumably,

many factors contribute to this decision, including administrative support, encouragement, availability of materials and resources for substitution of the regular curriculum, and teachers' continued ease with compacting. It is interesting to note that an increasing, though not statistically significant, number of teachers in each treatment group expressed unsure or negative responses about the future use of compacting. As teachers learn more about the compacting process and work with each other to learn how to compact curriculum, they may doubt their own success in being able to implement compacting effectively. In any event, the very high percentage of teachers who expressed positive reactions about their future use of compacting is certainly an encouraging indication that this process may be useful in addressing the needs of able students in the classroom.

In addition to implementing curriculum compacting for the targeted students in their classrooms, a substantial number of teachers involved in the study indicated in anecdotal records that they were able to extend the service to other students, many of whom were not identified and involved in the gifted program. This finding may indicate the usefulness of extending the types of technology so often reserved for high ability students to a larger segment of the population, as has been previously suggested by researchers (Renzulli & Reis, 1991). The compacting process has been recommended as a service that should be provided to any student who mastered or is capable of mastering regular curriculum at a differential pace than his/her peers (Reis, Burns, & Renzulli, 1992; Renzulli, Smith, & Reis, 1982).

Impact on Student Achievement, Content Preference, and Attitude Learning

During staff development sessions on curriculum compacting conducted in recent years, teachers have increasingly expressed their concerns about the effect of eliminating content on student performance on statewide mastery tests and standardized achievement tests administered by local districts. It has not been an uncommon practice to have a teacher ask the question, "Even if she got 100 on the pre-test, the posttest, and the chapter test, how do I know she can demonstrate high scores on the district achievement test?" Accordingly, standardized achievement tests were administered in this study to find out if compacting was detrimental to students' achievement, as measured by standardized tests. Results indicated that in reading, mathematical concepts and computation, spelling, and social studies, there were no significant differences among all treatment groups and the control group in pre/post achievement. This indicates that when 40-50% of content is eliminated in the regular curriculum, achievement test scores are not affected -- their scores, relative to their peers, do not go down! In fact, for science achievement and mathematical concepts performance on out-of-level achievement tests, compacting the curriculum resulted in more positive outcomes for treatment group students than for the control group.

Students in the treatment groups whose curriculum was compacted in mathematics had higher scores on mathematical concepts than the control group students. Perhaps less reliance on computational-oriented worksheets and practice in mathematics gave gifted students more time to explore how mathematics is applied in various kinds of experiences. Perhaps involvement in self-selected projects would be more likely to promote acquisition of mathematical concepts than solving textbook problems. Indeed, the developers of the mathematical concepts subscale of the *Iowa Tests of Basic Skills* see real-life application of mathematics as an important objective. They suggest that teachers:

> strive always to develop understanding of concepts, processes, and relationships. Introduce concepts through program situations in which pupils are encouraged to

> discover solutions for themselves rather than depend on explanations and demonstration. (Further, to) ... create a climate in which the importance of mathematics is recognized, not only in the solution of school problems, but also as a means of solving problems in the pupils' daily lives. (*Iowa Tests of Basic Skills*, 1986, p. 89)

If gifted students are better able to meet these objectives (as evidenced by their test scores) because of curriculum compacting in mathematics, perhaps it is due to the fact they have more time to explore mathematics in self-selected ways rather than the ways structured by traditional curricula (e.g., worksheets, textbook exercises). However, it is important to note that this gain in mathematics was found when many students in the group selected other interest-based content pursuits instead of "doing more math." Acceleration to higher grade level material was forbidden by district policy in many of the districts participating in this study as noted in the background material they submitted to the NRC/GT. Accordingly, many students were able to choose activities that they liked, and many of these activities were unrelated to their content strength area.

When analyzing the results related to scores on the *Content Area Preference Scale* (*CAPS*) and the *Arlin-Hills Attitudes Toward Learning Process*, it is clear that when students' curriculum was compacted in mathematics, these targeted students were more likely to show interest in mathematics and expressed more favorable attitudes towards learning than the control group. It may be that releasing students from computation-oriented, textbook mathematics and providing alternative work in mathematics or in other content areas that is more project-oriented and/or conceptual not only results in no decrease in achievement performance, but also results in a stronger preference for the content area and a motivation to learn. This finding was also confirmed by the LISREL analyses which indicated that females had better post-treatment attitudes toward learning than males, and younger students had better post attitudes toward learning than students in upper elementary grades. The LISREL analyses also suggest that treatment group students whose curriculum was compacted in math scored higher in achievement tests and had better post-treatment attitudes toward learning than their control counterparts. Treatment Group 3 teachers used significantly more replacement strategies and produced higher quality compactors than teachers in Treatment Groups 1 or 2 as well. Therefore, it would seem that the additional staff development provided to this treatment group produced tangible results in several areas.

The content area preferences of students whose curriculum was compacted in one area (e.g., language arts) and who preferred another content area (e.g., mathematics) is interesting. A student's personal preference may explain this, as well as a classroom teacher's zest and style for teaching a particular content area. An analysis of the compactors indicated that most replacement activities were interdisciplinary, and, therefore, it is not possible to draw connections between what was substituted for the regular curriculum that was compacted and a subsequent change in content area preference. One LISREL model also suggested that females whose curriculum is compacted in language arts have a higher preference for reading when their curriculum is compacted in both math and language arts. As females have traditionally preferred reading (Callahan, 1979; Reis, 1987), this finding was not surprising.

Differences in Classroom Teachers' Practices

Another positive finding in this study was the difference on the *Classroom Practices Questionnaire* (*CPQ*) between teachers in the three treatment groups as compared to the

control group. When asked to evaluate the degree to which 17 different classroom strategies were used by teachers who had implemented curriculum compacting, it was clear that teachers were using more strategies than their control counterparts. Individual items on the *CPQ* provided additional insight on the effects of the staff development and subsequent experience with curriculum compacting. For example, when teachers were asked how often, on an eight point scale from "never" to "always," they "eliminated parts of instructional units or complete units for students who had demonstrated mastery of the classroom curriculum," 47.2% of the three treatment group teachers responded "always." Only 14.3% of the control group teachers responded "always" to this item. Of the entire sample of treatment group teachers, 94.8% indicated that they "sometimes" to "always" eliminated parts of a unit or a complete unit, as compared to 70.3% of the control group teachers.

The Need for Acceleration Alternatives and More Appropriate Challenge

During the last five years, various educational reform movement practices have had an impact upon high ability students. For example, the elimination of tracking (Oakes, 1985) has often resulted in a widespread effort in many schools to use no ability grouping whatsoever. Also, the economic crises in some geographic sections of our country have resulted in the elimination of programs for our most able youth.

The attempt by some districts to use mastery tests as a method for demonstrating both student proficiency and teacher competency has resulted in less challenging curriculum and a tendency on the part of some teachers to "teach to the test." In the national debate that currently exists relating to standards and a national curriculum and achievement test, some attention must be paid to high ability students. Teachers involved in compacting could eliminate 40-50% of content in mathematics and language arts with little staff development and no loss in students' achievement test scores. In some districts, however, this caused a great deal of work for teachers because of the time required for more appropriate and challenging substitution activities.

If appropriate and effective instruction is to be provided to high ability students, what other alternatives exist besides relying on classroom teachers to locate alternatives that are both enriching and challenging? The policies that currently exist regarding content acceleration must be questioned. As stated earlier, most of the districts in this study had school policies that did not allow students to use out-of-grade level textbooks. These policies would seem to be arbitrary and perhaps prejudicial against above average students, *if effective* instruction is to be provided. (One may wonder if any school district in the country has a policy against using below grade level textbooks for students who need remediation!) It is true that for some very able third grade students, simply accelerating the curriculum one chronological grade level into a fourth grade math book may not provide a very challenging alternative, but it may be a step in the right direction. And to *forbid* the use of content acceleration may deny appropriate instruction to some students.

Perhaps these policies were enacted because it became difficult for the teacher at the next grade to use whole group instruction for students if one student had already read the book or completed the problems. This simple fact alone should convince concerned educators, parents, and board members to promote content acceleration -- as it will help us to meet individual needs of children.

This study also demonstrates the need for more challenging textbooks for all students. As noted in Chapter Two, the amount of drill, review, repetitiveness, and tedium involved in textbooks in all content areas is shocking. Why have we not been able to break this cycle? Some recent attempts in language arts programs to use literature as a basis for teaching reading seem to be an improvement, but there are still countless skills to be completed before the next story or selection can be read. The idea of compacting 50-60% of workbook skills cannot be very appealing to basal marketing experts when so much of the income derived on series such as these comes from "consumables." And how many school districts will continue to re-order workbooks in which students complete only one-half or one-third of the pages?

A concerted effort must be made to create more challenging textbooks and to provide appropriate, effective instruction. Curriculum compacting can help as can the use of a wide range of instructional materials and methods. District policies which negatively affect high ability students must be questioned and changes sought that will provide more flexibility in the ways in which we meet needs of this group.

Implications

This study has implications for administrators, educators, parents, and publishers. This research suggests that the regular curricular practices used in our schools are often too easy for the nation's most able learners. Accordingly, the textbooks currently used for this population must be improved, and higher standards and expectations must be set for high ability and, quite possibly, all students.

Because efforts to obtain more challenging textbooks will take time, we must continue to train teachers to deal more effectively with students who have high abilities in all content areas. Thus, this study has implications for those who are responsible for providing staff development and preservice training to elementary classroom teachers. Teachers need to be able to identify students' strength areas, identify content that can be eliminated or modified, and provide appropriately differentiated instructional strategies and content to challenge all learners, especially the more able. This training requires teacher time, administrative support and the expenditure of funds to provide consultant services, if necessary. However, these costs must be weighted against the possible results. If we cannot provide more effectively for the most able learners who exist in our classrooms, we take the risk of developing underachieving students who understand that, for them, learning requires no effort and involves no rigor.

District policies that prohibit students from using out-of-level textbooks should be reconsidered, since it is clear that high ability students are capable of working at higher levels of instruction. Parents should investigate what they can do to facilitate a process such as compacting for their children. The hundreds of calls from parents to The National Research Center on the Gifted and Talented each year are testimony to the frustration parents feel when their child spends year after year relearning what they already know. Many of the parents who call the center claim that school personnel suggest that these parents investigate private school alternatives for their children. Surely, alternatives can be provided within the public school setting.

It is important to note that few gifted students from special populations (i.e., minority, ESL, physically handicapped, learning disabled) were identified by classroom teachers during the selection process. Even though teachers were encouraged to select the aforementioned students, 87% of identified students were Caucasian, 6% were Asian-

American, 4% were African-American, and 2% were Native American. More effective identification instruments and techniques need to be developed to identify underrepresentated gifted students, and preservice and inservice education needs to be provided to ensure that teachers are better able to identify all highly able students.

The current study also indicates that additional research needs to be conducted on the effect of curriculum compacting on the attitudes of elementary students toward learning. The present research suggests that younger treatment group students had more positive attitudes toward learning than did their older counterparts. This result may suggest that curriculum compacting, used as an intervention in the early elementary grades, may enhance students' attitude toward learning. To determine more accurately the efficacy of curriculum compacting as an intervention for young, highly able students, additional research needs to be conducted.

It is clear that without the administrative support provided by administrators in participating schools in the study, widespread implementation of curriculum compacting would not have occurred. Other field tests (Reis, 1989) have not resulted in such a remarkably high percentage of participating classroom teachers. Accordingly, administrative support for practices such as curriculum compacting should be sought and more should be done to acquaint both district level and school administrators with methods for meeting the needs of this population of students.

Internal and External Validity

Several threats exist to both internal and external validity in a quasi-experimental study. Internal validity may be threatened by history, maturation, testing, instrumentation, statistical regression, and mortality (Huck, Cormier, & Bounds, 1974. Random assignment and a pretest posttest group design control most threats to internal validity. In this study, history was a threat as one district randomly assigned to posttest Treatment Group 1 was affected by "work-to-rule" contract negotiations and had to drop out of the study. Another school participating as a large group in Treatment Group 2 constituted a threat to history as the school principal, a favorite of all teachers, was transferred to a new school in the middle of the treatment. His transfer had a demoralizing effect on the majority of the faculty who were not selected to accompany him. This school had the lowest return rate of all participating schools, probably due to this event. Random assignment to treatment and control group addressed all the other threats to internal validity, except statistical regression. To address this threat, out-of-level forms of the *Iowa Tests of Basic Skills* were used.

Threats to external validity include population validity and ecological validity. Because the districts volunteered to be an NRC/GT Collaborative School District and further volunteered to be involved in the compacting study, caution should be taken before generalizing the results to other districts. Also, when districts volunteered to be involved in the compacting study, one or two specific schools within the districts were often targeted or volunteered themselves to be the ones in which compacting was implemented. Random assignment was done by district, but sometimes the NRC/GT was given the school within the district that would participate. One other threat to external validity may exist in this study. The novelty effect may have been a threat in the treatment groups. Classroom teachers in the twenty school districts involved in the treatment may have been influenced by the innovativeness of compacting. This was investigated in our follow-up to the original study which is included in Chapter Six.

Significance

The importance of what happens to high ability students every day in classrooms across our nation is a concern to everyone. Teachers must use diverse strategies to challenge and meet the individual needs of students in their classrooms. Given the elimination of gifted programs due to economic problems in our country, and the reduced use of various types of ability groups, teachers will be called upon to provide even more modifications for high ability students if regular textbooks do not improve and the challenge level of regular classroom curriculum does not increase. Curriculum compacting is one strategy that can be effectively used by classroom teachers.

This study examined how teachers acquire the skills necessary to implement curriculum compacting in the classroom and provides school personnel with information regarding successful staff development procedures for adopting this innovation for the bright students in their district. Teachers who received the most help in implementing compacting (Treatment Group 3) were most successful in carrying out the various steps in the process. Implementing the process, however, means that teachers will need materials and assistance if they are to substitute appropriately challenging material for targeted students. This assistance must be provided in several ways: locating and/or developing pretest instruments and finding and/or creating appropriately challenging and rigorous replacement strategies. Teachers cannot be encouraged to eliminate up to 40-50% of content if alternative materials for students are not provided. Accordingly, district policies that do not allow classroom teachers to use out-of-grade level textbooks need to be eliminated to enable classroom teachers to use resources at hand to provide effective instruction, even if it is at an accelerated rate.

The amount of content that was eliminated should indicate that more challenging textbooks, curricular materials, and homework can be provided to high ability students. Most teachers involved in this study also indicated that they were able to extend the compacting process to students who would not have been identified for a gifted program. Instead of providing compacting to 1-2 students originally targeted for the study, some teachers targeted 10-12 students to receive the service. This certainly would indicate that many other students can benefit from compacting, and that if teachers are provided with staff development in compacting, they will eventually use this practice for other students. Compacting may then have significance for many other students.

It also is clear from test results that compacting a certain percentage of a student's curriculum did not result in any detrimental changes in achievement test scores of targeted students, and in fact, in some content areas, slight gains were realized. This information should provide both encouragement and reassurance to administrators, teachers, and parents about the use of this procedure and the elimination of large amount of content that is often unnecessary for high ability students.

Conclusion

Clearly, the curriculum of the elementary students in this study could be modified. A high percentage of curriculum in all content areas was eliminated for these students. Curriculum compacting can be implemented in the regular classroom to meet the needs of academically able elementary students, and the findings of this study indicate that staff development and peer coaching can improve teachers' use of the compacting process. This study also indicates that teachers will need more help and staff development if they are to substitute appropriately challenging advanced work.

CHAPTER 6: A Follow-up to the Curriculum Compacting Study

A follow-up study was conducted by The National Research Center on the Gifted and Talented to determine the impact of the Curriculum Compacting Research Study, in the academic year following the study, on personnel and policy in the twenty-seven districts that participated in the initial research. (After the study was completed in June 1991, all staff development materials were mailed to the control group liaisons.) In March - April of 1992, questionnaires, designed by the researchers, were sent to the control and treatment group research liaisons and the response rate was 96%. The questionnaire sent to control groups contained four questions and the questionnaire sent to treatment groups contained six questions. The results, which follow, are arranged by group and question. Data were analyzed using descriptive statistics.

Results

Control Group Questions (N=7)

1. Have you conducted staff development using the materials sent to you? If yes, go to question 3. (Question 2 asked when the staff development would be held.)

3. What was the result of the staff development sessions?

Two of the control group liaisons (29%) had already conducted inservices with staff members and two others (29%) had scheduled an inservice for later in the year. The remaining districts (42%) had not conducted inservices due to:

changes in leadership personnel
the elimination of a gifted program in the 1990-1991 school year
new initiatives (ODDM, Outcome-Driven Developmental Model) which supplanted efforts to use compacting

The two liaisons who conducted an inservice reported that teachers seemed "interested in the concept." One of the two believed that compacting requires a "paradigm shift" for classroom teachers; they need to rethink how they plan for the needs of all students. The other liaison wanted more full-time personnel to assist teachers as they implemented compacting. Although they already have two full-time people (past graduates of the University of Connecticut graduate program) assisting in the implementation, she related that the staff want someone in each building "all the time."

4. Any questions or comments you would like to add?

Comments by control group liaisons focused on four areas: expressions of gratitude for being included in the study, concern regarding the length and daunting appearance of the How-To Compacting book, concern related to the increasing number of gifted programs that are being eliminated, and expressions of appreciation for the useful follow-up packets mailed to liaisons this year.

Treatment Group Questions

1. Has there been any noticeable response to your district's participation in the compacting study on the part of the administration?

Treatment Group 1 (N=6)

Liaisons reported that principals from three districts (50%) expressed no interest in the results. Principals in the remaining districts (3) were interested in the research findings. In two of these districts, however, the emphasis on the compacting process had been supplanted by restructuring efforts in one district and a ten-year evaluation in the other. In the third district, administrators had been "tugged" in so many directions that no leadership, with respect to the continuation of compacting, had been provided. Thus, although administrators in 50% of the participating districts expressed interest in compacting and the results of the study, administrators had been unable to encourage the use of compacting by staff members.

Treatment Group 2 (N=6)

Fifty percent of liaisons (3) reported that principals had followed the progress of the study in 1990-1991 and remained interested in the research findings a year later. The remaining liaisons from this treatment group indicated that there had been no administrative follow-up to the study.

Treatment Group 3 (N=7)

Principals and superintendents from 57% of the districts (4) expressed interest in the compacting study and its results. In two of these districts, the principals remained supportive and interested in the study. One of the principals from these two districts was new and didn't find out about the Curriculum Compacting Study until October, 1992. He hadn't given much thought to mastery learning and curriculum compacting. He believed both strategies were "the first step toward the personalization of education for students." In the remaining two districts from this group, liaisons indicated that central office staff followed the progress of the study. One superintendent personally acknowledged teachers and students who participated in the research and the board of education honored participating teachers. Liaisons from the 57% of districts whose administration remained interested in compacting reported that their administrators asked for the following:

information regarding the study
presentations on compacting for teachers and parents
press releases
strategies for making compacting a district policy

Forty-three percent of the research liaisons from Treatment Group 3 indicated that there had been no noticeable reaction from their administrators regarding last year's study. Two of these liaisons indicated no reason as to why there had been no reaction. The other liaison indicated that the gifted and talented program had been eliminated during the 1990-1991 school year and, as a result, there was not much interest in the study.

2. What kind of responses have you encountered from the classroom teachers who participated in the study about their continued use of compacting?

Treatment Group 1 (N=6)

All of the participating districts in this treatment group are continuing with pretesting. Likewise, teachers in all districts in Treatment Group 1 were reported to have some degree of difficulty completing column three of the compactor and working through the independent study process. One liaison (17%) was surprised to see classroom teachers continue with the strategy because they had traditionally been less than supportive of the program for the gifted. Another liaison (17%) reported that she had taken over the projects of students. Two other liaisons (34%) indicated that classroom teachers continue to need guidance and support from trained personnel as they work through the compacting process.

Reasons for the difficulty with the compacting process are not necessarily related to the process itself. One reason cited for the difficulty with implementation concerned the mainstreaming of all special needs students. A liaison from one district reported that teachers were "overwhelmed" with expanding enrollments in their classes and that, increasingly, the enrollment was made up of students with special needs. This liaison also reported the following: "One teacher has a new student from Japan in her class. The child speaks virtually no English and the teacher is beside herself. She knows she's not doing justice to either the child or the rest of the class."

Treatment Group 2 (N=6)

All liaisons reported that teachers in this treatment group continue with some parts of the compacting process. A variety of practices were used by liaisons to encourage the continued use of the strategy, including:

- assisting classroom teachers to incorporate compacting into their yearly goals
- encouraging the use of compacting in only one area or with only a few students
- reserving special time at selected faculty meetings to discuss progress with the compacting process
- teacher use of the strategy and to exchange and "piggy-back" on ideas

Liaisons reported that some of the teachers still get frustrated with the process. Those teachers who were reluctant in the beginning, remain hesitant. Those who have developed more mastery are reported to feel that compacting "has freed them to do more enjoyable activities with their students."

Treatment Group 3 (N=7)

Eighty-six percent of liaisons reported that their teachers continue with the compacting process. Comments documented by these liaisons included: "Classroom teachers have concluded that compacting is worthwhile," "Teachers have come to value the compacting process," "Many use the process to help alleviate poor achievement and/or attitudinal problems," and "Some really liked it."

The one district from this group that did not continue with the process lost key personnel. The principal and resource teacher, under whom the study had been completed, moved into different jobs within the school system.

3. Did the experience of participating in the study have an impact on schools or teachers who did not participate?

Treatment Group 1 (N=6)

Only one liaison (17%) reported that she had presented a workshop outside her school to gifted and talented coordinators in another district.

Treatment Group 2 (N=6)

Thirty-three percent of liaisons (2 districts) reported that participation in the study had an impact on schools or teachers who did not participate. These liaisons had presented workshops to other schools in their district. Another liaison (17%) reported that although she had seen no impact on schools or teachers who had not participated, she had heard many parents from the community talk about the compacting process.

The remaining liaisons (50%) indicated that there had been no noticeable effect on teachers and administrators who had not participated and the reasons, listed below, were not necessarily related to the efficacy of curriculum compacting as an instructional strategy:

> No reaction because so little was known about it [the research] outside the study group.

> We only have one school, so this question is hard to answer.

Treatment Group 3 (N=7)

Four liaisons (57%) from this treatment group reported that participation in the study had an impact on other teachers. One liaison reported that other teachers were affected, but "to a limited extent." Another liaison reported that nonparticipating teachers in the building were curious about the process being implemented by participating teachers. A third liaison reported that teachers in her building "took such an interest in the process [compacting] that they are all now using compacting procedures."

Reasons, unrelated to the efficacy of the curriculum compacting, were given by liaisons to explain why the study had little impact on nonparticipants. These reasons include:

> Some teachers compact, but there is no state mandate for an IEP for [high ability] students and so this issue gets less attention because there is no money attached to it.

> All of our teachers make allowances for individual differences in a variety of ways.

4. Have any policy decisions occurred in your district as a result of your participation in the compacting study?

Treatment Group 1 (N=6)

No policy decisions were made in Treatment Group 1.

Treatment Group 2 (N=5)

One liaison (17%) from Treatment Group 2 reported that compacting is being endorsed for all schools within her district by the assistant superintendent in charge of curriculum and instruction.

Treatment Group 3 (N=7)

Two liaisons (29%) report that compacting is being considered for adoption.

5. Do you have any comments or questions you would like to have addressed?

Treatment Group 1 (N=6)

Teachers need more help if they are to be successful with compacting.
The follow-up packets have been very helpful.
Participation in your study helped all our teachers learn and grow.
Teachers need the assistance of an enrichment specialist if they are to be successful with the compacting process.

Treatment Group 2 (N=6)

Concern about the inattention to the needs of all gifted students.
The staff at the university was helpful and encouraging during the study.
The two questions most frequently asked of liaisons:
What to do with students once they are compacted?
Will elementary students retain skills once they are compacted?
Financial constraints are beginning to hurt our programs for the gifted and talented. Some programs are being reduced so much that they can hardly serve students. I'd like to see more being done in terms of advocacy for programs for the gifted.

Treatment Group 3 (N=7)

Please relate compacting to OBE (outcome-based education) studies.
Put research results in ASCD publications. More people need to hear the results.
Teachers, originally reticent, were enthusiastic about compacting at the end of the study.

Summary

Control Group

More than half (58%) of the liaisons in the control groups had conducted or planned to conduct inservices about curriculum compacting in the year following the research. Liaisons who had conducted inservices reported that teachers "seemed interested" in the concept and "wanted full-time help from specialists as they implemented the strategy." Liaisons who had not conducted inservices indicated a variety of reasons for the lack of

follow-up, including: changes in school leadership, the elimination of the gifted program, and new district initiatives.

When asked about what comments they would add, research liaisons' responses focused on four areas: expressions of gratitude for being included in the study, concern regarding the length of the How-To Compacting book, concern related to the increasing number of gifted programs that were being eliminated, and expressions of appreciation for the useful follow-up packets mailed to liaisons containing a summary of study's results and examples of ways to put the research to use.

Treatment Group

At least 50% of research liaisons from all three treatment groups reported that their administrators remained interested in the results of the study in the year following the research. Those administrators who remained interested asked for a variety of information, including, for example, information regarding the study, presentations on compacting for teachers and parents, press releases, and strategies for making compacting a district policy. A variety of reasons, unrelated to the efficacy of curriculum compacting, existed for the lack of interest in the study, including, for example, changes in administrative leadership, new district initiatives, and the elimination of gifted and talented programs.

Differences existed in the degree of interest and personal commitment of the administrators to curriculum compacting in the schools selected as Treatment Group 1 and Treatment Group 3. Research liaisons in Treatment Group 1 indicated that although their principals verbally supported curriculum compacting, they had been "tugged" in so many directions (i.e., ten-year review, restructuring efforts) that they had been unable to personally encourage the use of the instructional strategy. The responses from research liaisons in Treatment Group 3 indicated that more levels of administrators (i.e., assistant superintendents, superintendents, members of the board of education) remained committed to and supportive of compacting than those in Treatment Group 1. One liaison reported that her superintendent personally acknowledged the teachers and the students who participated in the research. The board of education from the same district honored the teachers who participated in the study. Another liaison reported that administrators had requested that she provide inservice training for other faculty from the district on the use of curriculum compacting. Finally, another liaison reported that she felt comfortable because she knew her administrators now had a "better understanding of how the curriculum compacting process works."

One hundred percent of liaisons reported that their teachers continued with some parts of the curriculum compacting process. Liaisons from Treatment Group 1 indicated that most of the teachers continued with pretesting, but that many of the teachers experienced difficulty and frustration with the development and implementation of replacement strategies. Treatment Group 2 liaisons indicated greater success with the implementation of compacting and several listed strategies that they used to encourage teachers' use of the strategy, for example: assisting classroom teachers to incorporate compacting into their yearly goals, encouraging the use of compacting in only one area or with only a few students, and reserving special time at selected faculty meetings to discuss progress with teacher use of the strategy and to exchange and "piggy-back" on ideas. Treatment Group 3 liaisons reported the most success with the implementation of the strategy and reported comments such as, "Classroom teachers have concluded that compacting is worthwhile," "Teachers have come to value the compacting process," "Many use the process to help alleviate poor achievement and/or attitudinal problems," and "Some really liked it." The continued use of the strategy by districts within all treatment

groups one year after the study suggests that novelty was not a contributing factor to the effectiveness of curriculum compacting, as documented in the initial research.

Responses from Treatment Group 3 liaisons indicated the largest number of other teachers from other schools who were influenced by last year's study on curriculum compacting. Only one liaison (17%) from Treatment Group 1 reported that she had presented information to nonparticipating teachers. Thirty-three percent of liaisons (two districts) from Treatment Group 2 reported comments and inquiries from nonparticipating teachers and parents. Fifty-seven percent of liaisons (four districts) from Treatment Group 3 reported that nonparticipating teachers were affected by the study and many were curious about the instructional strategy being implemented by colleagues in their district. One liaison from Treatment Group 3 reported that teachers in her building "took such an interest in the process [compacting] that they are all now using compacting procedures."

Research liaisons' reports indicated that policy decisions regarding curriculum compacting were more likely to occur in districts that were selected to be in Treatment Group 3. No policy decisions regarding the use of curriculum compacting were made in Treatment Group 1. One liaison (17%) from Treatment Group 2 reported policy decisions regarding the use of the strategy were being considered and two liaisons (29%) from Treatment Group 3 reported such deliberations were occurring.

Conclusion

To summarize, two important findings emerged from The Follow Up Study to the Curriculum Compacting Study. First, research liaisons indicated that teachers in the control and treatment groups continued with the compacting process. Over 50% of control liaisons indicated that teachers in their district expressed a desire to learn more about curriculum compacting, and all the research liaisons from the treatment groups indicated that teachers continued with the instructional strategy. The continued use of the strategy by teachers in all the treatment groups and teachers' interest in the strategy in over half of the control groups, suggest that the novelty was not a contributing factor to the effectiveness of curriculum compacting during the original research.

Second, the data suggest that increasing levels of staff development were associated with more successful implementation of the strategy. Specifically, the peer coaching provided to Treatment Group 3 encouraged teachers to determine the optimal uses of curriculum compacting. Research liaisons in Treatment Group 3 reported that some teachers continued to experience difficulty designing replacement activities that were challenging and rigorous for replacement of content that was eliminated; however, Treatment Group 3 liaisons reported that a larger percentage of teachers continued to use the instructional strategy with satisfaction than was reported by Treatment Group 1 and 2 liaisons.

References

Altbach, P. G., Kelly, G. P., Petrie, H. G., & Weis, L. (1991). *Textbooks in American society.* Albany, NY: State University of New York Press.

Archambault, F. X., Jr., Westberg, K. L., Brown, S., Hallmark, B. W., Emmons, C., & Zhang, W. (1992). *Regular classroom practices with gifted students: Results of a national survey of classroom teachers.* Storrs, CT: The National Research Center on the Gifted and Talented.

Arlin, M. (1976). *Manual for Arlin-Hills Attitude Surveys.* Jacksonville, IL: Psychologists & Educators, Inc.

Armbruster, B. B., Osborn, J., & Davison, A. L. (1985). Readability formulas may be dangerous to your textbooks. *Educational Leadership, 47*(2),18-20.

Armbruster, B. B., & Anderson, T. H. (1984). Structures of explanation in history textbooks, or so what if Governor Stanford missed the spike and hit the rail? *Journal of Curriculum Studies, 16,* 181-194.

Armbruster, B. B. (1984). The problem of inconsiderate text. In G. Duffy, L. Roehler, & J. Mason (Eds.), *Comprehension instruction* (pp. 202-217). New York: Longman.

Bacharach, N. (1986). Are basal reading manuals providing for the gifted reader? *Roeper Review, 9,* 134-135.

Bagley, W. (1931). The textbook and methods of instruction. In G. Whipple (Ed.), *The textbook in American education, Thirtieth yearbook of the National Society for the Study of Education, Part 2* (pp. 7-26). Bloomington, IL: Public School Publishing Company.

Baker, J., & Showers, B. (1984). *The effects of a coaching strategy on teachers' transfer of training to classroom practice: A six-month follow-up study.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

Barr, R., & Dreeban, R. (1983). A sociological perspective on school time. In C.W. Fisher & D. C. Berliner (Eds.), *Perspectives on instructional time.* New York: Longman.

Barton, A., & Wilder, D. (1966). Research and practice in the teaching of reading: A progress report. In M. Miles (Ed.), *Innovation in education.* New York: Teachers College Press.

Begle, E. G. (1973). Some lessons learned by SMSG. *Mathematics Teacher, 66,* 207-214.

Bernstein, H. T. (1985). The new politics of textbook adoption. *Phi Delta Kappan, 66,* 463-466.

Betts, G. T. (1986). The autonomous learner model. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 27-56). Mansfield Center, CT: Creative Learning Press.

Bowen, E. (1984). *A debate over dumbing down.* Time, *124*(23), 68.

Brandwein, P. F. (1981). *Memorandum: On reviewing schooling and education.* New York: Harcourt, Brace and Jovanovich.

Brophy, J. E. (1979). Teacher behavior and student learning. *Educational Leadership, 37*, 33-38.

Brown, J. S., & Burton, R. R. (1989). Review of the Iowa Tests of Basic Skills. In J. C. Conoley & J. J. Kramer (Eds.), *The tenth mental measurements yearbook.* Lincoln, NE: The Buros Institute of Mental Measurements.

Brown, W., & Rogan, J. (1983). Reading and young gifted children. *Roeper Review, 5*(3) 6-9.

Bruce, B. (1984). A new point of view on children's stories. In R.C. Anderson, J. Osborn,& R.J. Tierney (Eds.), *Learning to read in American schools: Basal readers and content texts.* Hillsdale, New Jersey: Erlbaum.

Callahan, C. M. (1979). The gifted and talented woman. In A. H. Passow (Ed.), *The gifted and talented* (pp. 401-423). Chicago: National Society for the Study of Education.

Carus, M. B. (1986). *Introductory remarks at the symposium on state initiatives for textbook reform.* Paper presented at the Annual Meeting of the American Educational Research Association (67th, San Francisco, CA, April 16-20, 1986).

Chall, J. S., & Conrad, S. S. (1991). *Should textbooks challenge students?: The case for easier or harder textbooks.* New York: Teachers College Press.

Chall, J. S., Conrad, S. S., & Harris, S. H. (1977). *An analysis of textbooks in relation to declining SAT scores.* New York: College Entrance Examination Board.

Chall, J. S. (1967). *Learning to read: The great debate.* New York: McGraw-Hill.

Chall, J. S. (1983). *Learning to read: The great debate* (2nd ed.). New York: McGraw-Hill.

Clifford, J. A., Runions, T., & Smyth, E. (1986). The learning enrichment service (LES): A participatory model for gifted adolescents. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 92-125). Mansfield Center, CT: Creative Learning Press.

Cohen, J. (1969). *Statistical power analysis for the behavioral sciences.* New York: Academic Press.

Commission on Excellence in Education. (1983, May 4). A nation at risk: The imperative for educational reform. *The Chronicle of Higher Education*, 11-15.

Cubberly, E. (1913). Textbooks. In P. Monroe (Ed.), *Cyclopedia of education*. New York: Macmillan.

Downey, M. T. (1980). Speaking of textbooks: Putting pressure on the publishers. *History Teacher, 14*, 61-72.

Durkin, D. (1984). Reading comprehension instruction in five basal reader series. *Reading Research Quarterly, 16*, 515-544.

Educational Products Information Exchange Institute (1980-1981). *Educational Research and Development Report, 3*(4).

Elliott, D.L., & Nagel, K.C. (1987). School science and the pursuit of knowledge - deadends and all. *Science and Children,* 24(8), 9-12.

Elliott, D. L., & Woodward, A. (Eds.). (1990). *Textbooks and schooling in the United States, 89th Yearbook of the National Society for the Study of Education, Part I.* Chicago: University of Chicago Press.

Elliott, D. L., Nagel, K. C., & Woodward, A. (1986). Scientific illiteracy in elementary school science textbook programmes. *Journal of Curriculum Studies, 19*(1), 73-76.

Elliott, D. L., Nagel, K. C., & Woodward, A. (1985). Do textbooks belong in elementary social studies? *Educational Leadership, 42*(7), 22-25.

Farr, R., & Tulley, M. (1985). Do adoption committees perpetuate mediocre textbooks? *Phi Delta Kappan, 66*(7), 467-471.

Feldhusen, J. F. (1989). Why the public schools will continue to neglect the gifted. *The Gifted Child Today, 67*(13), 55-59.

Feldhusen, J. F., & Kollof, M. B. (1986). The Purdue three-stage enrichment model for gifted education at the elementary level. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 126-152). Mansfield Center, CT: Creative Learning Press.

Fey, J. (1980). Mathematics education research on curriculum and instruction. In R. Shumway (Ed.), *Research in mathematics education* (pp. 388-432). Reston, VA: National Council of Teachers of Mathematics.

Flanders, J. R. (1987). How much of the content in mathematics textbooks is new? *Arithmetic Teacher, 35*, 18-23.

Fox, L. H. (1980). *Research on basic methods of instruction for the gifted.* (ERIC document No. ED 192 514)

Freund, R. J., Littell, R. C., & Spector, P. C. (1986). *SAS system for linear models.* Cary, NC: SAS Institute Inc.

Gagnon, P. (1988). Why study history? *Atlantic Monthly, 262*, 43-66.

Gallagher, J. J. (1976). Needed: A partnership for the gifted. In T. Gibson & P. Channells (Eds.), *Gifted children looking for their future*. London: Latimer New Dimensions Ltd.

Gates, A. I. (1961). Vocabulary control in basal reading material. *Reading Teacher, 15*, 81-85.

Gear, G. H. (1976). Accuracy of teacher judgment in identifying gifted children: A review of the literature. *Gifted Child Quarterly, 22*, 478-490.

Glaser, R. (1970). Evaluation of instruction and changing educational models. In M. C. Wittrock & D. E. Wiley (Eds.), *The evaluation of instruction*. New York: Holt, Rinehart and Winstone.

Glaser, R. (1968). Adapting the elementary school curriculum to individual performances. In *Proceedings of the 1967 Invitational Conference on Testing Problems*. Princeton, NJ: Educational Testing Service.

Good, T., & Brophy, J. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.) (pp. 328-375). New York: Macmillan Publishing Company.

Guskey, T. R. (1986). *Staff development and the process of teacher change. Educational Researcher*. Volume, No. (May) 5-12.

Hall, G. E., George, A. A., & Rutherford, W. L. (1977). *Measuring stages of concern about the innovation: A manual for use of the SOC questionnaire*. Austin, Texas: The University of Texas.

Hall, G. E., & Hord, S. M. (1987). *Change in schools: Facilitating the process*. Albany, NY: State University of New York Press.

Harms, N. C., & Yager, R. E. (1981). *What research says to the science teacher*. (Report No. 471-14776). Washington, DC: National Science Teachers Association. (ERIC Document Reproduction Service No. ED 205 367)

Ho, K. (1990). Parents must act to change schools. *Education Week, 9*(35), 20.

Hockett, J. A. (1983). The vocabularies of recent primers and first readers. In J. Chall (Ed.), *Learning to read: The great debate. An update*. New York: McGraw-Hill.

Hockett, J. A. (1938). The vocabularies of recent primers and first readers. *Elementary School Journal, 39*, 112-115.

Horn, E. (1937). *Methods of instruction in the social studies*. New York: Charles Scribner's Sons.

Imbeau, M. B. (1991). *Teachers' attitudes toward curriculum compacting: A comparison of different inservice strategies*. Unpublished doctoral dissertation, University of Connecticut, Storrs, Connecticut.

Iowa Tests of Basic Skills, Form J. (1986). *Manual for school administrators supplement*. Chicago: Riverside Publishing Company.

James, L. R., Mulaik, S. A., & Brett, J. M. (1982). *Casual analysis: Assumptions, models, and data.* Beverly Hills: SAGE Publications.

Jeter, J., & Chauvin, J. (1982). Individualized instruction: Implications for the gifted. *Roeper Review, 5*(1), 2-3.

Joreskog, K. G., & Sorbom, D. (1979). *Advances in factor analysis and structural equation models.* Cambridge, MA: Abt Associates.

Joyce, R. B., & Showers, B. (1982). The coaching of teaching. *Educational Leadership, 40*, 4-10.

Joyce, R. B., & Showers, B. (1983). *Power in staff development through research in training.* Alexandria, VA: ASCD.

Joyce, R. B., & Showers, B. (1987). *Student achievement through staff development.* New York: Longman, Inc.

Kantor, R. N., Anderson, T. H., & Armbruster, B. B. (1983). How inconsiderate are children's textbooks? *Journal of Curriculum Studies, 15*, 61-72.

Kaplan, S. (1986). The grid: A model to construct differentiated curriculum for the gifted. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted* (pp. 180-193). Mansfield Center, CT: Creative Learning Press.

Kenny, D. N. (1979). *Correlation and causality.* New York: John Wiley.

Kulikowich, J. M. (1990). *The Content Area Preference Scales (CAPS).* Storrs, CT: The National Research Center on the Gifted and Talented.

Kulikowich, J. M., Reis, S. M., Owen, S. V., & Smist, J. (1992). *The reliability and validity of scores derived from the Content Area Preference Scale (CAPS).* Manuscript in preparation.

Kirst, M. W. (1982). How to improve schools without spending more money. *Phi Delta Kappan, 64*(1), 6-8.

Klare, G. R. (1976). A second look at the validity of readability formulas. *Journal of Reading Behavior, 8*, 129-152.

Klausmeier, H. J., Rossmiller, R., & Saily, M. (1977). *Individually guided elementary education: Concepts and practices.* New York: Academic Press

Labuda, M. (Ed.). (1985). *Creative reading for the gifted: A design for excellence* (2nd ed.). Newark, DE: International Reading Association.

Larkins, A. G., Hawkins, M. L., & Gilmore, A. (1987). Textbook review: Trivial and noninformative content of elementary social studies: A review of primary texts in four series. *Theory and Research in Social Education, 15*, 299-311.

Mangieri, J. N., & Madigan, F. (1984). Reading for gifted students: What schools are doing. *Roeper Review, 7*(2), 68-70.

Marascuilo, L. A., & Serlin, R. C. (1988). *Statistical methods for the social and behavioral sciences*. New York: W. H. Freeman and Company.

Mason, J., & Osborn, J. (1983). When do children begin 'reading to learn'? In *A Survey of Practices in Grades Two Through Five* (Tech. Rep. No.261). Urbana, IL: University of Illinois, Center for the Study of Reading.

Matthews, M. K. (1991). *Gifted students and whole language: A descriptive study of four classrooms*. Unpublished doctoral dissertation, University of Connecticut, Storrs, Connecticut.

McCutcheon, G. (1981). Elementary school teachers' planning for social studies and other subjects. *Theory and Research in Social Education*, *9*, 45-66.

McCutcheon, G. (1980). How do elementary school teachers plan? The nature of planning and influences on it. *Elementary School Journal*, *81*,4-23.

McDonald, F. J., & Elias, P. (1976). The effects of teaching performance on pupil learning (Vol. 1, Final Report). *Beginning Teacher Evaluation Study, Phase 2, 1974-1976*. Princeton, NJ: Educational Testing Service.

McGinty, R. L., VanBeynen, J., & Zalewski, D. (1986). Do our mathematics textbooks reflect what we preach? *School Science and Mathematics*, *86*, 591-596.

McKnight, C. C., Crosswhite, F. J., Dossey, J. A., Kifer, E., Swafford, J. O., Travers, K. J., & Cooney, T. J. (1987). *The underachieving curriculum: Assessing the U.S. mathematics from an international perspective*. Champaign, IL: Stipes.

McMurray, F., & Cronbach, L. J. (1955). The controversial past and present of the text. In L. J. Cronbach (Ed.), *Text Materials in Modern Education*. Urbana, IL: University of Illinois Press.

Medley, D. M. (1977). *Teacher competence and teacher effectiveness: A research review of process-product research*. Washington, DC: American Association of Colleges for Teacher Education.

Mehlinger, H. (1989). American textbook reform: What can we learn from the Soviet experience? *Phi Delta Kappan*, *71*, 29-35.

National Research Council. (1989). *Everybody counts: A report to the nation on the future of mathematics education*. Washington, DC: National Academy Press.

Oakes, J. (1985). *Keeping track: How schools structure inequality*. New Haven, CT: Yale University Press.

Oakes, J., & Lipton, M. (1992). Detracking schools: Early lessons from the field. *Phi Delta Kappan*, *73*, 448-454.

Ohanian, S. (1987). Ruffles and flourishes. *Atlantic Monthly*, *260*(3), 20-22.

Porter, A. (1989). A curriculum out of balance: The case of elementary school mathematics. *Educational Researcher*, *18*(5), 9-15.

Porter, A., Floden, R., Freeman, D., Schmidt, W., & Schwille, J. (1988). Content determinants in elementary school mathematics. In D. A. Grouws & T. J. Cooney (Eds.), *Perspectives on research on effective mathematics teaching* (pp. 96 -113). Hillsdale, NJ: Erlbaum.

Ravitch, D., & Finn, C. E. (1987). *What do our 17-year-olds know? A report of the first national assessment of history and literature.* New York: Harper and Row.

Reed, S. E. (1987). *Effects of curriculum compacting on student attitudes in reading.* Unpublished specialist's thesis, College of St. Thomas, St. Paul, Minnesota.

Reis, S. M. (1987). We can't change what we don't recognize: Understanding the special needs of gifted females. *Gifted Child Quarterly, 31,*(2), 83-88.

Reis, S. M. (1991). *Curriculum compactor assessment form.* Storrs, CT: The National Research Center on the Gifted and Talented.

Reis, S. M., Burns, D. E., & Renzulli, J. S. (1992). *Curriculum compacting: The complete guide to modifying the regular curriculum for high ability students.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., & Reis, S. M. (1986). The enrichment triad/revolving door model: A schoolwide plan for the development of creative productivity. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 217-266). Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., & Reis, S. M. (1991). The reform movement and the quiet crisis in gifted education. *Gifted Child Quarterly, 35,* 26-35.

Renzulli, J. S., Smith, L. H., & Reis, S. M. (1982). Curriculum compacting: An essential strategy for working with gifted students. *Elementary School Journal, 82*(3), 185-194.

Renzulli, J. S., & Smith, L. H. (1979). *A guidebook for developing individualized educational programs for gifted and talented students.* Mansfield Center, CT: Creative Learning Press.

Robinson, A. (1986). Elementary language arts for the gifted: Assimilation and accommodation in the curriculum. *Gifted Child Quarterly, 30,* 178-181.

Rogers, K. B. (1991a). *A best-evidence synthesis of the research on the types of accelerative programs for gifted students.* Unpublished doctoral dissertation, The University of Minnesota.

Rogers, K. B. (1991b). *The relationship of grouping practices to the education of the gifted and talented learner* (Report No. 9101). Storrs, CT: The National Research Center on the Gifted and Talented.

Roper Organization. (1987). *The American chicle youth poll.* New York: Roper Organization.

Rubin, L. (1987). *The use of curriculum compacting by fourth and fifth grade teachers in the Troy School District.* Unpublished manuscript.

Savage, J. F. (1983). Reading guides: Effective tools for teaching the gifted. *Roeper Review*, *5*(3), 9-11.

Schug, M. C., Todd, R. J., & Beery, R. (1984, May). Why kids don't like social studies. *Social Education*, 382-387.

Schultz, C. B. (1991). *The Effects of curriculum compacting upon student achievement in fourth grade mathematics*. Unpublished Masters Thesis, The University of Northern Iowa.

Sewall, G. T. (1988). American history textbooks: Where do we go from here? *Phi Delta Kappan*, *69*, 553-558.

Showers, B., Joyce, B., & Bennett, B. (1987). Synthesis of research on staff development: A framework for future study and a state-of-the-art analysis. *Educational Leadership*. November 1987.

Starko, A. J. (1986). *It's about time: Inservice strategies for curriculum compacting*. Mansfield Center, CT: Creative Learning Press.

Staver, J. R. (1989). Analysis of the conceptual structure and reasoning demands of elementary science texts at the primary (K-3) level. *Journal of Research in Science Teaching*, *26*, 329-349.

Taylor, B. M., & Frye, B. J. (1988). Pretesting: Minimize time spent on skill work for intermediate readers. *The Reading Teacher*, *42*(2), 100-103.

Treffinger, D. J. (1986). Fostering effective, independent learning through individualized programming. In J. S. Renzulli (Ed.), *Systems and models for developing programs for the gifted and talented* (pp. 126-152). Mansfield Center, CT: Creative Learning Press.

Turner, R. (1988). How the basals stack up. *Learning*, *17*, 62-64.

Tyson-Bernstein, H. (1988). *A Conspiracy of Good Intentions: America's Textbook Fiasco*. Washington, DC: The Council for Basic Education.

Tyson-Bernstein, H., & Woodward, A. (1989). Nineteenth century policies for 21st century practice: The textbook reform dilemma. *Educational Policy*, *3*(2), 95-106.

Use of Arithmetic Texts. (1952). *Phi Delta Kappan*, *33*, 282.

Usiskin, Z. (1987). Why elementary algebra can, should, and must be an eighth-grade course for average students. *Mathematics Teacher*, *80*, 428-438.

Weiss, I. (1987). *Report of the 1985-86 National Survey of Science and Mathematics Education*. Research Triangle Park, NC: National Science Foundation.

Westberg, K. L., Archambault, F. X., Dobyns, S. M., & Salvin, T. J. (1992). *Technical report: An observational study of instructional and curricular practices used with gifted and talented students in regular classrooms*. Storrs, CT: The National Research Center on the Gifted and Talented.

Willows, D. M., Borwick, D., & Hayvren, M. (1981). The content of school readers. In G. E. MacKinnon & T. G. Waller (Eds.), *Reading Research: Advances in Theory and Practice* (pp. 100-175). New York: Academic Press.

Woodward, A., & Elliott, D. (1990). Textbook Use and Teacher Professionalism. In D. Elliott & A. Woodward (Eds.), *Textbooks and Schooling in the United States. Eighty-ninth Yearbook of the National Society for the Study of Education.* Chicago: University of Chicago Press.

Yager, R. E., & Stodgill, R. (1979). School science in an age of science. *Education Leadership, 35*, 439-445.

Yager, R. E. (1983). The importance of terminology in teaching K-12 science. *Journal of Research in Science Teaching, 20*, 577-588.

Appendix A

Control Group Instrumentation

National Research Center on the Gifted and Talented — University of Connecticut Site

TEACHER DATA FORM

Name_____

Gender _____M _____F Years of Teaching Experience_____

School_____School District_____

Number of Students in your Classroom_____Grade Level_____

EDUCATIONAL BACKGROUND

College/Univ.	Degree Awarded	Area of Concentration	Year Completed

Please indicate the number of graduate courses in gifted education you have taken:

_____0 _____1 _____2 _____3 _____4 _____more than 4

Please indicate the number of inservice sessions in gifted education you have attended:

_____0 _____1 _____2 _____3 _____more than 3

If you have attended 1 or more inservice sessions, briefly describe the sessions or conferences you have attended:

Teacher Data Form
Page Two

TEACHER SUPPORT SYSTEM

1. Is a teacher/consultant for gifted education available to you for assistance?
   _____ no
   _____ no, but I know where I can find help for bright students
   _____ yes, on a limited basis
   _____ yes, on a consistent basis
   _____ yes, all the time

2. Are enrichment and/or acceleration materials available to you for use with high ability students in your classroom?
   _____ no
   _____ not in my classroom, but in my school
   _____ yes, but very limited
   _____ yes, I have some materials
   _____ yes, I have many materials

3. What amount of planning time is available to you per week?
   _____ 0 hours
   _____ 1 hour
   _____ 2 hours
   _____ 3 hours
   _____ more than 3 hours

4. Do you teach in a homogeneously grouped classroom? _____Yes_____No
   If no, answer guestions 5, 6, and 7.

   5. If your classroom is heterogeneously grouped, do you provide cluster grouping for high ability students in:
      Language Arts _____Yes_____No
      Mathematics _____Yes_____No
      Social Studies _____Yes_____No
      Science _____Yes_____No

   6. Do you have district curriculum guides for each subject area that provide you with goals and objectives for:
      Language Arts _____Yes_____No
      Mathematics _____Yes_____No
      Social Studies _____Yes_____No
      Science _____Yes_____No

   7. Are any pretests available for assessing students' prior knowledge of the curriculum in individual content areas:
      Language Arts _____Yes_____No
      Mathematics _____Yes_____No
      Social Studies _____Yes_____No
      Science _____Yes_____No

BEHAVIORS WHICH MAY INDICATE HIGH CAPABILITY IN STUDENTS[1]

- Consistently finishes tasks quickly
- Finishes reading assignments first
- Appears bored during instruction time
- Consistently daydreams
- Creates own puzzles, games or diversions in class
- Brings in outside reading material
- Has consistently high performance in one or more academic areas
- Scores consistently well on tests despite average or below-average classwork
- Asks questions which indicate advanced familiarity with material
- Is sought after by other students for assistance
- Uses vocabulary and verbal expression in advance of grade level
- Expresses interest in pursuing alternate or advanced topics

A QUICK CHECK

- Is the student in the top reading group or reading at an advanced level?
- Does s/he finish tasks quickly?
- Do you think s/he would benefit from more challenging work?

[1] Starko, Alane J. (1986). It's About Time. Mansfield Center, CT: Creative Learning Press.

CLASSROOM PRACTICES QUESTIONNAIRE

During the 1990-1991 school year, the following classroom practices have occurred in my classroom **for high ability students.** Circle the most appropriate response.

		Never			Sometimes				Always
1.	I gave pretests in the following content areas to determine students' mastery of the material:								
	Language Arts	0	1	2	3	4	5	6	7
	Science	0	1	2	3	4	5	6	7
	Social Studies	0	1	2	3	4	5	6	7
	Mathematics	0	1	2	3	4	5	6	7
2.	I eliminated parts of instructional units or complete units for students who had demonstrated mastery of classroom curriculum.	0	1	2	3	4	5	6	7
3.	I gave different homework assignments.	0	1	2	3	4	5	6	7
4.	I taught a different lesson to students who were working at higher levels of instruction in my classroom.	0	1	2	3	4	5	6	7
5.	I grouped students together for a specific unit.	0	1	2	3	4	5	6	7
6.	I replaced sections of the regular curriculum with other units or lessons I designed.	0	1	2	3	4	5	6	7
7.	I replaced sections or units of the regular curriculum with alternative material selected by students.	0	1	2	3	4	5	6	7
8.	I assigned reading of more advanced level work.	0	1	2	3	4	5	6	7
9.	I gave additional creative or expository writing assignments on topics.	0	1	2	3	4	5	6	7
10.	I made time available for students to pursue self-selected interests.	0	1	2	3	4	5	6	7
11.	I encouraged them to use enrichment centers in my classroom.	0	1	2	3	4	5	6	7
12.	I provided time within the school day for students to work on independent study projects.	0	1	2	3	4	5	6	7
13.	I used contracts or management plans to help students organize independent study projects.	0	1	2	3	4	5	6	7

CLASSROOM PRACTICES QUESTIONNAIRE (continued)

14.	I allowed students to work from a higher grade level textbook.	0	1	2	3	4	5	6	7
15.	I provided a different curricular experience by using a more advanced curriculum unit on a teacher-selected topic.	0	1	2	3	4	5	6	7
16.	I established interest groups which enabled students to pursue individual or small group interests.	0	1	2	3	4	5	6	7
17.	I gave assignments that encouraged students to organize their own work schedule to complete a long range project.	0	1	2	3	4	5	6	7

CONTENT AREA PREFERENCE SCALE (CAPS)

My name is _____ My teacher's name is _____

I am a BOY____ GIRL____

I am in grade 2____ 3____ 4____ 5____ 6____

Directions: We would like to know how you feel about some of your school subjects. Please read each statement carefully and circle the face that shows how you feel about each statement. A happy face means that you agree with the statement. A face that is neither happy nor sad means that you are not sure how you feel about the statement. A sad face means that you disagree with the statement.

1. I learn a lot from reading.	 AGREE		 DISAGREE
2. Mathematics is fun to do.	 AGREE		 DISAGREE
3. Science is an interesting subject.	 AGREE		 DISAGREE
4. I think reading is fun.	 AGREE		 DISAGREE
5. Learning about other countries is interesting.	 AGREE		 DISAGREE
6. Mathematics is simple for me.	 AGREE		 DISAGREE
7. Students need social studies classes.	 AGREE		 DISAGREE
8. I like to read stories.	 AGREE		 DISAGREE
9. I want to take more science classes.	 AGREE		 DISAGREE
10. Social studies is important to me.	 AGREE		 DISAGREE

11. Students should read often.


AGREE


DISAGREE

12. Science is important to me.


AGREE


DISAGREE

13. I want to know more about the United States.


AGREE


DISAGREE

14. I read stories in my free time.


AGREE


DISAGREE

15. I think mathematics is interesting.


AGREE


DISAGREE

16. Students need science classes.


AGREE


DISAGREE

17. Schools should teach social studies.


AGREE


DISAGREE

18. Reading is important to me.


AGREE


DISAGREE

19. Schools should teach mathematics.


AGREE


DISAGREE

20. Students should know how to read.


AGREE


DISAGREE

Treatment Group Instrumentation

National Research Center on the Gifted and Talented — University of Connecticut Site

TEACHER DATA FORM

Name_____

Gender _____M _____F Years of Teaching Experience_____

School_____School District_____

Number of Students in your Classroom_____Grade Level_____

EDUCATIONAL BACKGROUND

College/Univ.	Degree Awarded	Area of Concentration	Year Completed

Please indicate the number of graduate courses in gifted education you have taken:

_____0 _____1 _____2 _____3 _____4 _____more than 4

Please indicate the number of inservice sessions in gifted education you have attended:

_____0 _____1 _____2 _____3 _____more than 3

If you have attended 1 or more inservice sessions, briefly describe the sessions or conferences you have attended:

Teacher Data Form
Page Two

TEACHER SUPPORT SYSTEM

1. Is a teacher/consultant for gifted education available to you for assistance?
   _____ no
   _____ no, but I know where I can find help for bright students
   _____ yes, on a limited basis
   _____ yes, on a consistent basis
   _____ yes, all the time

2. Are enrichment and/or acceleration materials available to you for use with high ability students in your classroom?
   _____ no
   _____ not in my classroom, but in my school
   _____ yes, but very limited
   _____ yes, I have some materials
   _____ yes, I have many materials

3. What amount of planning time is available to you per week?
   _____ 0 hours
   _____ 1 hour
   _____ 2 hours
   _____ 3 hours
   _____ more than 3 hours

4. Do you teach in a homogeneously grouped classroom? _____Yes_____No
   If no, answer guestions 5, 6, and 7.

   5. If your classroom is heterogeneously grouped, do you provide cluster grouping for high ability students in:
      Language Arts _____Yes_____No
      Mathematics _____Yes_____No
      Social Studies _____Yes_____No
      Science _____Yes_____No

   6. Do you have district curriculum guides for each subject area that provide you with goals and objectives for:
      Language Arts _____Yes_____No
      Mathematics _____Yes_____No
      Social Studies _____Yes_____No
      Science _____Yes_____No

   7. Are any pretests available for assessing students' prior knowledge of the curriculum in individual content areas:
      Language Arts _____Yes_____No
      Mathematics _____Yes_____No
      Social Studies _____Yes_____No
      Science _____Yes_____No

STAGES OF CONCERN QUESTIONNAIRE (SoC Q)
CURRICULUM COMPACTING STUDY

To: Participating faculty members in Curriculum Compacting Project, a research study conducted by the National Research Center on the Gifted and Talented (NRC/GT)

From: Sally M. Reis, Principal Investigator
National Research Center on the Gifted and Talented

As you are already aware, your school is participating in a research study conducted by the National Research Center on the Gifted and Talented. This study relates to the process of **Curriculum Compacting**.

A part of this study involves completing the enclosed questionnaire. The purpose of this questionnaire is to determine the concerns of teachers who are using or anticipate using **Curriculum Compacting** after viewing the videotapes on this topic.

Please respond to the items on this questionnaire in terms of your present concerns, or how you feel about your involvement or potential involvement with **Curriculum Compacting**. The possible responses range from irrelevant (0) to somewhat true (3) to very true (7). Please think of it in terms of your own perception of what it involves. Your responses are strictly confidential.

Thank you for your help with this research study.

Name: _____

School: _____

District: _____

STAGES OF CONCERN QUESTIONNAIRE ITEMS

0	1	2	3	4	5	6	7
Irrelevant	Not true of me now			Somewhat true of me now		Very true of me now	

1.	I am very concerned about students' attitudes toward Curriculum Compacting.	0 1 2 3 4 5 6 7
2.	I know of some other approaches that might work better than Curriculum Compacting.	0 1 2 3 4 5 6 7
3.	I don't even know what Curriculum Compacting is.	0 1 2 3 4 5 6 7
4.	I am concerned about not having enough time to organize for Curriculum Compacting each day.	0 1 2 3 4 5 6 7
5.	I would like to help other faculty in their use of Curriculum Compacting.	0 1 2 3 4 5 6 7
6.	I have very limited knowledge about Curriculum Compacting.	0 1 2 3 4 5 6 7
7.	I would like to know the effect of this reorganization on my professional status.	0 1 2 3 4 5 6 7
8.	I am concerned about conflict between my interests and my responsibilities.	0 1 2 3 4 5 6 7
9.	I am concerned about revising my use of Curriculum Compacting.	0 1 2 3 4 5 6 7
10.	I would like to develop working relationships with both our faculty and outside faculty using Curriculum Compacting.	0 1 2 3 4 5 6 7
11.	I am concerned about how Curriculum Compacting affects students.	0 1 2 3 4 5 6 7
12.	I am not concerned about Curriculum Compacting.	0 1 2 3 4 5 6 7
13.	I would like to know who will make the decisions in the new system.	0 1 2 3 4 5 6 7
14.	I would like to discuss the possibility of using Curriculum Compacting.	0 1 2 3 4 5 6 7
15.	I would like to know what resources are available if we decide to adopt Curriculum Compacting.	0 1 2 3 4 5 6 7
16.	I am concerned about my inability to manage all that Curriculum Compacting requires.	0 1 2 3 4 5 6 7
17.	I would like to know how my teaching and administration is supposed to change.	0 1 2 3 4 5 6 7

0	1	2	3	4	5	6	7
Irrelevant	Not true of me now			Somewhat true of me now		Very true of me now	

18.	I would like to familiarize other departments or persons with the progress of Curriculum Compacting.	0 1 2 3 4 5 6 7
19.	I am concerned about evaluating my impact on students.	0 1 2 3 4 5 6 7
20.	I would like to revise Curriculum Compacting's instructional approach.	0 1 2 3 4 5 6 7
21.	I am completely occupied with other things.	0 1 2 3 4 5 6 7
22.	I would like to modify our use of Curriculum Compacting based on the experiences of our students.	0 1 2 3 4 5 6 7
23.	Although I don't know about Curriculum Compacting, I am concerned about things in the area of gifted education.	0 1 2 3 4 5 6 7
24.	I would like to excite my students about their part in this approach.	0 1 2 3 4 5 6 7
25.	I am concerned about time spent working with non-academic problems related to Curriculum Compacting.	0 1 2 3 4 5 6 7
26.	I would like to know what the use of Curriculum Compacting will require in the immediate future.	0 1 2 3 4 5 6 7
27.	I would like to coordinate my effort with others to maximize Curriculum Compacting's effects.	0 1 2 3 4 5 6 7
28.	I would like to have more information on time and energy commitments required by Curriculum Compacting.	0 1 2 3 4 5 6 7
29.	I would like to know what other faculty are doing in this area.	0 1 2 3 4 5 6 7
30.	At this time, I am not interested in learning about Curriculum Compacting.	0 1 2 3 4 5 6 7
31.	I would like to determine how to supplement, enhance, or replace Curriculum Compacting.	0 1 2 3 4 5 6 7
32.	I would like to use feedback from students to change the program.	0 1 2 3 4 5 6 7
33.	I would like to know how my role will change when I am using Curriculum Compacting.	0 1 2 3 4 5 6 7
34.	Coordination of tasks and people is taking too much of my time.	0 1 2 3 4 5 6 7
35.	I would like to know how Curriculum Compacting is better than what we have now.	0 1 2 3 4 5 6 7

Adapted from
Procedures for Adopting Educational Innovations/CBAM Project
R&D Center for Teacher Education, The University of Texas at Austin

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I am a BOY____ GIRL____

I am in grade 2____ 3____ 4____ 5____ 6____

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6. Mathematics is simple for me.	 AGREE		 DISAGREE
7. Students need social studies classes.	 AGREE		 DISAGREE
8. I like to read stories.	 AGREE		 DISAGREE
9. I want to take more science classes.	 AGREE		 DISAGREE
10. Social studies is important to me.	 AGREE		 DISAGREE

11. Students should read often.


AGREE


DISAGREE

12. Science is important to me.


AGREE


DISAGREE

13. I want to know more about the United States.


AGREE


DISAGREE

14. I read stories in my free time.


AGREE


DISAGREE

15. I think mathematics is interesting.


AGREE


DISAGREE

16. Students need science classes.


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DISAGREE

17. Schools should teach social studies.


AGREE


DISAGREE

18. Reading is important to me.


AGREE


DISAGREE

19. Schools should teach mathematics.


AGREE


DISAGREE

20. Students should know how to read.


AGREE


DISAGREE

BEHAVIORS WHICH MAY INDICATE HIGH CAPABILITY IN STUDENTS[1]

- Consistently finishes tasks quickly
- Finishes reading assignments first
- Appears bored during instruction time
- Consistently daydreams
- Creates own puzzles, games or diversions in class
- Brings in outside reading material
- Has consistently high performance in one or more academic areas
- Scores consistently well on tests despite average or below-average classwork
- Asks questions which indicate advanced familiarity with material
- Is sought after by other students for assistance
- Uses vocabulary and verbal expression in advance of grade level
- Expresses interest in pursuing alternate or advanced topics

A QUICK CHECK

- Is the student in the top reading group or reading at an advanced level?
- Does s/he finish tasks quickly?
- Do you think s/he would benefit from more challenging work?

1 Starko, Alane J. (1986). It's About Time. Mansfield Center, CT: Creative Learning Press.

CLASSROOM PRACTICES QUESTIONNAIRE

During the 1990-1991 school year, the following classroom practices have occurred in my classroom **for high ability students.** Circle the most appropriate response.

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	Social Studies	0	1	2	3	4	5	6	7
	Mathematics	0	1	2	3	4	5	6	7
2.	I eliminated parts of instructional units or complete units for students who had demonstrated mastery of classroom curriculum.	0	1	2	3	4	5	6	7
3.	I gave different homework assignments.	0	1	2	3	4	5	6	7
4.	I taught a different lesson to students who were working at higher levels of instruction in my classroom.	0	1	2	3	4	5	6	7
5.	I grouped students together for a specific unit.	0	1	2	3	4	5	6	7
6.	I replaced sections of the regular curriculum with other units or lessons I designed.	0	1	2	3	4	5	6	7
7.	I replaced sections or units of the regular curriculum with alternative material selected by students.	0	1	2	3	4	5	6	7
8.	I assigned reading of more advanced level work.	0	1	2	3	4	5	6	7
9.	I gave additional creative or expository writing assignments on topics.	0	1	2	3	4	5	6	7
10.	I made time available for students to pursue self-selected interests.	0	1	2	3	4	5	6	7
11.	I encouraged them to use enrichment centers in my classroom.	0	1	2	3	4	5	6	7
12.	I provided time within the school day for students to work on independent study projects.	0	1	2	3	4	5	6	7
13.	I used contracts or management plans to help students organize independent study projects.	0	1	2	3	4	5	6	7

CLASSROOM PRACTICES QUESTIONNAIRE (continued)

14. I allowed students to work from a higher grade level textbook.	0	1	2	3	4	5	6	7
15. I provided a different curricular experience by using a more advanced curriculum unit on a teacher-selected topic.	0	1	2	3	4	5	6	7
16. I established interest groups which enabled students to pursue individual or small group interests.	0	1	2	3	4	5	6	7
17. I gave assignments that encouraged students to organize their own work schedule to complete a long range project.	0	1	2	3	4	5	6	7

18. In what content areas did you compact curriculum for the students you selected?

19. How much (percentage) of basic skills curriculum were you able to eliminate in the content area you selected? (please estimate)

20. Will you continue to use this method of adjusting curriculum to meet the needs of above average ability students in the future? Why or why not?

Appendix B

Tables for Factor Loadings of the *Content Area Preference Scale (CAPS)* and Tables of Means and Standard Deviations for Achievement, *Content Area Preference Scale*, and *Arlin Hills Attitudes Survey Toward School Learning Processes*
(Questions 6a - 8c)

Table 1.

Rotated Factor Pattern for the *Content Area Preference Scale (CAPS)*

Items	Reading	Science	Social Studies	Mathematics
1	0.45	0.08	0.14	0.02
2	0.00	0.03	0.09	0.81
3	0.09	0.72	0.12	-0.01
4	0.69	0.02	0.08	0.01
5	0.13	0.18	0.34	0.01
6	-0.06	0.00	-0.03	0.49
7	0.08	0.15	0.75	0.05
8	0.71	0.05	0.02	0.00
9	0.05	0.75	0.06	0.08
10	0.13	0.20	0.70	0.07
11	0.57	0.05	0.19	0.05
12	0.07	0.79	0.21	0.02
13	0.22	0.10	0.37	0.11
14	0.57	-0.01	-0.02	0.00
15	0.03	0.04	0.08	0.89
16	0.04	0.63	0.30	0.02
17	0.13	0.06	0.76	0.10
18	0.73	0.06	0.17	-0.01
19	0.09	0.03	0.19	0.59
20	0.18	0.02	0.05	-0.02

Table 2.

Pretest Means, Posttest Means, Adjusted Means and Standard Deviation for Standardized Science Achievement Scores by Grade Level

	Pretest	Post-test
Grade	M (SD)	M/Adj. M (SD)
2 (n = 136)	110.04(19.07)	119.42/143.57 (18.73)
3 (n = 131)	130.11(16.38)	136.52/146.19(16.81)
4 (n = 157)	150.02(18.04)	155.96/151.93(18.06)
5 (n = 136)	160.28(19.32)	166.45/154.76(19.25)
6 (n = 98)	172.84(22.61)	180.71/159.65(21.52)

Table 3.

Pretest Means, Posttest Means, Adjusted Means and Standard Deviation for Standardized Mathematical Concepts Scores by Grade Level

	Pretest	Post-test
Grade	M (SD)	M/Adj. M (SD)
2 (n = 143)	101.36(10.70)	109.00/128.61(11.83)
3 (n = 130)	114.61(11.81)	123.84/132.67(13.15)
4 (n = 157)	133.72(12.37)	142.70/137.76(13.76)
5 (n = 136)	147.79(12.74)	155.26/139.63(11.90)
6 (n = 98)	155.47(12.90)	166.28/145.50(14.26)

Table 4.

Pretest Means, Posttest Means, Adjusted Means and Standard Deviation for the Reading, Mathematics, Science, and Social Studies Subscales of the *Content Area Preference Scale (CAPS)* by Level of Treatment

		Pretest	Post-test
Treatment Level	Content Area	M (SD)	M/Adj. M (SD)
1 (n = 136)	Reading	9.31(2.80)	9.26/9.18(3.02)
	Mathematics	5.89(2.10)	5.96/5.89(1.98)
	Science	6.70(2.44)	6.95/6.87(2.73)
	Social Studies	8.32(2.46)	8.20/7.93(2.77)
2 (n = 145)	Reading	9.16(2.37)	9.33/9.34(2.69)
	Mathematics	5.41(1.61)	5.43/5.64(1.61)
	Science	6.59(2.17)	6.91/6.88(2.37)
	Social Studies	7.55(2.19)	7.88/8.06(2.40)
3 (n = 174)	Reading	9.44(2.57)	9.37/9.21(2.69)
	Mathematics	5.91.(2.16)	5.57/5.48(1.96)
	Science	6.49(2.29)	6.41/6.44(2.35)
	Social Studies	8.08(2.55)	7.83/7.71(2.53)
Control (n = 240)	Reading	8.94(2.35)	9.37/9.53(2.75)
	Mathematics	5.81(2.16)	5.85/5.83(2.09)
	Science	6.46(2.34)	6.39/6.44(2.32)
	Social Studies	7.64(2.47)	7.82/7.94(2.58)

Table 5.

Pretest Means, Posttest Means, Adjusted Means and Standard Deviation for the Reading, Mathematics, Science, and Social Studies Subscales of the *Content Area Preference Scale (CAPS)* by Area in Which the Curriculum Was Compacted (Mathematics versus Control)

		Pretest	Post-test
Area of Curriculum Compacting	Content Area	M (SD)	M/Adj. M (SD)
Mathematics (n = 238)	Reading	9.18(2.39)	9.31/9.23(2.73)
	Mathematics	5.35(1.79)	5.29/5.41(1.64)
	Science	6.40(2.22)	6.58/6.59(2.45)
	Social Studies	7.94(2.42)	7.92/7.84(2.51)
Control (n = 240)	Reading	8.95(2.35)	9.37/9.45(2.75)
	Mathematics	5.81(2.16)	5.85/5.73(2.09)
	Science	6.46(2.34)	6.40/6.38(2.32)
	Social Studies	7.64(2.47)	7.82/7.90(2.58)

Table 6.

Pretest Means, Posttest Means, Adjusted Means and Standard Deviation for the Reading, Mathematics, Science, and Social Studies Subscales of the *Content Area Preference Scale (CAPS)* by Area in Which the Curriculum Was Compacted (Language Arts versus Control)

		Pretest	Post-test
Area of Curriculum Compacting	Content Area	M (SD)	M/Adj. M (SD)
Language Arts (n = 238)	Reading	8.78(2.57)	8.90/8.96(2.47)
	Mathematics	6.16(2.20)	6.08/5.96(1.93)
	Science	6.88(2.35)	6.78/6.67(2.39)
	Social Studies	8.18(2.54)	7.93/7.74(2.50)
Control (n = 240)	Reading	8.95(2.35)	9.37/9.33(2.75)
	Mathematics	5.81(2.16)	5.85/5.93(2.09)
	Science	6.46(2.34)	6.40/6.47(2.32)
	Social Studies	7.64(2.47)	7.82/7.94(2.58)

Table 7.

Pretest Means, Posttest Means, Adjusted Means and Standard Deviation for Students' Attitudes Toward Learning by Level of Treatment

	Pretest	Post-test
Treatment	M (SD)	M/Adj. M (SD)
1 (n = 76)	41.50(6.37)	40.12/40.62(5.87)
2 (n = 116)	42.55(5.750	41.73/41.61(6.52)
3 (n = 133)	41.64(6.60)	41.13/41.56(6.94)
Control (n = 136)	43.01(6.08)	41.32/40.91(6.04)

Table 8.

Pretest Means, Post-test Means, Adjusted Means and Standard Deviation for Students' *Attitudes Survey Toward School Learning Processes* by Area in Which the Curriculum Was Compacted

	Pretest	Post-test
Area of Curriculum Compacting	M (SD)	M/Adj. M (SD)
Mathematics (n = 172)	42.53(6.14)	42.10/42.26(6.89)
Language Arts (n = 118)	42.30(6.01)	40.87/41.13(6.43)
Control (n = 202)	43.01(6.08)	41.32/41.17(6.04)

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