

SAGE Advice: Research on Teaching in Reduced-Size Classes

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Introduction

The goal of the Student Achievement Guarantee in Education (SAGE) program, established in 1995, was to improve academic achievement in kindergarten through third-grade classrooms in selected Wisconsin schools serving low-income children. This program, available for schools with at least 30 percent of their children below the poverty level and from districts with total enrollment at least 50 percent below the poverty level, consists of four interventions.

In exchange for \$2000 per student from the Wisconsin Department of Public Instruction, schools were required to (a) reduce the student-teacher ratio within a classroom to 15 students per teacher, beginning with kindergarten and first-grade in 1996-97, adding second grade in 1997-98, and third-grade in 1998-99; (b) establish “lighted schoolhouses,” open from early morning until late in the evening; (c) develop a rigorous curriculum, and (d) create a system of staff development and professional accountability. Originally, SAGE consisted of 30 schools in 21 districts throughout the state. As a result of two expansions of the program, there now are SAGE classrooms in 566 schools.

Of the four interventions, student-teacher ratio within a classroom became the primary change in participating schools. All schools immediately reduced class size to 15 students, but because most schools already had a curriculum in place that they would label “rigorous,” some form of “lighted schoolhouse” schedule, and a staff development program, changes in these areas varied considerably.

Although the class size change was immediate, it was not uniform. Four distinct class size configurations were used by schools to meet the student-teacher ratio requirement. The most commonly used configuration was the 15:1 student-teacher ratio classroom, termed the *regular* type of reduced size classroom. The other types were the *shared-space* classroom, consisting of two 15:1 student-teacher ratio classes occupying one room fitted with a temporary room divider; the *teamed* classroom, in which two teachers collaboratively taught 30 students; and the *floating teacher* classroom, where one teacher taught 30 students except during reading, language arts, and mathematics, when another teacher joined the class to reduce the ratio to 15:1.

Focus on Two Areas

A longitudinal evaluation of the SAGE program from 1996-2001 has focused on two general areas: (a) the effects of class size reduction on student academic achievement in reading, language arts, and mathematics at the first, second, and third grade levels; and (b) the effect of class size reduction on teaching that may account for any program effects on student academic achievement.

To determine the effect of SAGE class size reduction on student academic achievement, SAGE classes were compared with classes from a set of comparison

schools in SAGE participating districts that were similar in terms of race, income, and other factors, but had normal size classes. Achievement was measured using the Comprehensive Test of Basic Skills (CTBS) Complete Battery, Terra Nova edition, at each grade level.

The results from 1996-2001 show that at the first-grade level, when adjusted for pre-test scores, SAGE students scored significantly higher on post-tests in reading, language arts, and mathematic—as well as total score—than did first-grade students in comparison schools. Second and third-grade test scores show that the achievement advantage of SAGE students over comparison students was maintained and, in many cases, increased in second and third grade.¹

To determine the effect of SAGE class reduction on teaching, two sets of studies were conducted. The first set sought to describe the teaching behaviors that occur when teachers are assigned a class with 15 students. The second set had the objective of identifying the teaching behaviors that more successful reduced class size teachers use. Data collection procedures and findings regarding each of these sets of studies follow.

Reduced Class Size Teaching

Teacher practices were studied over a three-year period using observations, interviews, self reports, and questionnaires on how a class of 15 students differs from a typical class of 25. Beginning studies examined teaching in 59 randomly selected first- and second-grade classrooms. All teachers were formally observed in fall and spring, they kept periodic logs of their teaching and classroom events, they participated in end-of-the-year, in-depth, semi-structured interviews, and they completed questionnaires

about teaching practices. Subsequently, case studies of teaching in the three main kinds of class size reduction configuration schools were conducted. A first-grade class, a second-grade class, and a third-grade class in a *regular* classroom school, a *shared-space* classroom school, and a *teamed* classroom school participated. In total, 12 teachers in 9 classrooms were examined. Four formal observations were made in reading and mathematics instruction in each class—as well as many informal observations—each teacher was interviewed three times during the year concerning reading and mathematics instruction and teaching in general, and teachers completed end-of-the-year questionnaires about teaching practices.

Data analysis revealed that major changes in teaching occur when teachers teach reduced size classes. Reduced class size teachers have (a) fewer discipline problems and more instructional time, (b) more knowledge of students, (c) more satisfaction with teaching, (d) more use of individualization, and (e) more frequent use of hands-on activities. Research indicates increases in:

Instructional Time

Nearly all teachers reported, and observations confirmed, that much less time is spent in dealing with misbehavior in a small class than a large one. Some teachers say that misbehavior has all but vanished from their classrooms. Misbehavior and teacher discipline are sharply reduced because with only 15 students, teachers can get the attention of the class more easily. They can see what every student is doing. They can have direct eye contact with students and can be physically close to the students. This leads to identifying problems early and dealing with them instantly.

Further, because the class is small, a family atmosphere develops in the classroom. A different relationship emerges as students come to respect each other. In addition, in *teamed* classrooms, during those portions of classroom time when all 30 students were being taught as a group by one teacher, the other teacher was able to focus exclusively on student behavior and take action if needed.

As a result of the greatly reduced need to discipline students, teachers devoted more time to instruction. Less “paper work” associated with small class size also contributed to increased instructional time. More instructional time permitted teachers to be less rushed in their teaching. They spent more time interacting with students, reteaching when necessary, and providing more and varied learning activities. The main consequence of increased instructional time, however, was an increase in individualized instruction.

Knowledge of Students

Teachers develop a greater knowledge and understanding of each child when there are fewer students in a class. This knowledge is of two kinds: personal knowledge and task-progress knowledge. Because there is more time to interact with each child, teachers come to know the total child—his or her interests, habits, perspectives, strengths, weaknesses, and other characteristics. Longer parent-teacher conferences, with fewer meetings scheduled during conference days, further helps to develop this personal knowledge. Many teachers remarked that the class becomes a closely-knit group or family. The teacher knows the student, but students also come to know each other better and are more willing to share their thoughts and problems with the class.

Task-progress knowledge occurs because there are fewer students to monitor. Teachers are more able to make contact with, or get around to, each child on a frequent basis to identify errors and provide direction.

Teacher satisfaction

With a small class, teachers have a more positive attitude toward teaching and have more energy and motivation regarding teaching. This is because they are able to develop personal relationships with students and they can see substantial educational growth in their students. They also experienced less stress because they have fewer students to whom they must attend, fewer papers to correct, and less work to be done at home in the evening.

Individualization

Undoubtedly, the main change that occurs in teaching a smaller class is increased individualization. The individualization that occurs in small-size classes is more procedure than substance. The curriculum is generally not altered for individual students. Every student is expected to acquire the same content. Even when students complete the grade level content before the end of the year, as is the case in many reduced-size classrooms, the additional content that is provided for students is the established content for the succeeding grade.

It usually is not enrichment content based on students' expressed or perceived interests. What is altered for individual students is instruction. Instruction becomes personalized in the sense that teachers identify learning problems of individual students. They provide help to individual students in the form of explanations, analogies,

examples, demonstrations, tasks, among other ways, and they constantly check on progress of individual students. As one teacher said,

If a child is having problems you can see it right away. You can take care of it then. You don't have to wait until they turn in their papers and then you have to go back and reteach it to them. I mean, you can get around to each child. And, you know it's essential that you go around and check the work. And, if they are having a problem you can take care of it right then. Rather than have them practice the skill wrong while they finish the worksheet or whatever they are doing at their seat. I can take care of it right then before they practice it wrong. It works a lot better for the children.

The dominant mode of teaching used in individualization is explicit instruction. It is characterized by the teacher structuring, managing, and pacing all activities. The teacher gives information, asks questions, praises correct responses, and in other ways controls the encounter with students. The students are largely passive in the sense that their role is to listen and to follow the teacher's direction. Problem solving, creating, and decision-making on the part of students are secondary. The individualization that teachers use can occur in one-to-one tutoring situations, but it also occurs in other ways. Teachers individualize when they form and instruct small groups based on perceived need and during total class instruction, when they provide numerous opportunities for every student to express his or her understanding so that the teacher can extend or correct them.

Hands-on Activities

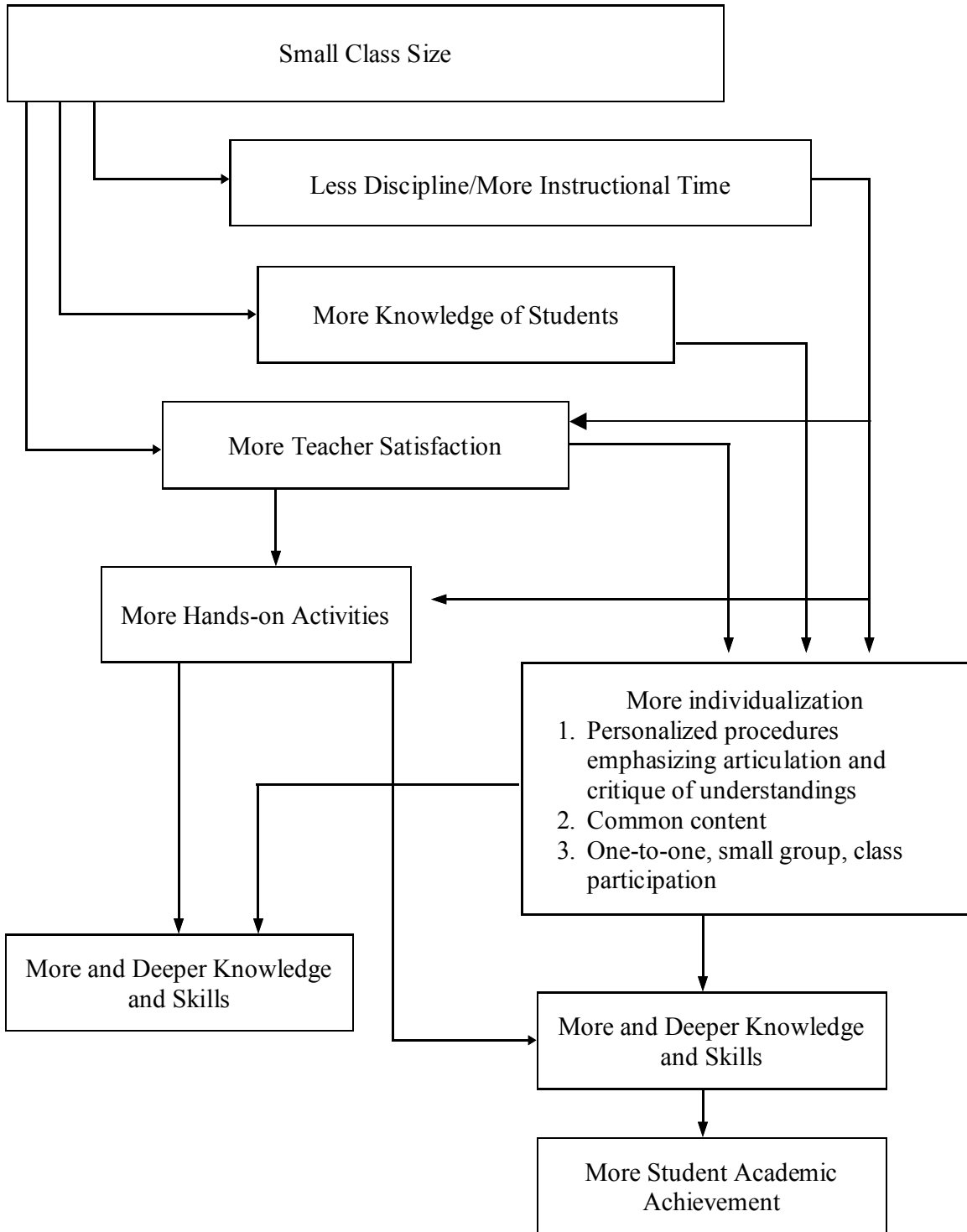
Teachers report, and classroom observations confirm that when teachers have small classes they use more hands-on activities. Their teaching is not dominated by student-centered learning, but they use more manipulatives, interest centers, cooperative groups, and project-type activities than they previously had used. The increased use of hands-on activities occurs because when the class is small teachers have more confidence in their ability to maintain control in situations where students have more freedom. There are fewer materials and resources that must be provided for these types of activities. There is increased time available for these activities that usually are more time consuming than other forms of instruction.

A Model of Reduced Class Size Teaching and Learning

The relationship of these major changes in teaching to student outcome is depicted in Figure 1. Small class size results in less discipline and, consequently, more instructional time, more knowledge of students, and more teacher satisfaction. These three elements bring about more individualization which is, the chief teaching result of reduced class size.

The individualization that occurs in all classroom contexts is individualization of *instruction* rather than individualization of *content*. Students in small classes have many more opportunities to individually articulate and display their learning and teachers in turn have many more opportunities to individually critique student learning and reteach misunderstood content or skills.

Figure 1. A Model of Reduced Class Size Teaching and Learning



A consequence of this individualization is increased and deeper content coverage which, in turn, it is speculated, accounts for more student academic achievement as measured by standardized achievement tests. In addition to more use of individualization, more hands-on activities are used because reduced class size teachers have no or few discipline concerns and greater satisfaction or enthusiasm regarding teaching. A result of greater use of hands-on activities as well as individualization is the development of thinking skills.

More Effective Reduced Class Size Teaching

The first set of studies provided a description of how teaching is affected when class size is reduced to 15 students. Although all reduced class size teachers employ the techniques that have been identified, the teachers vary in the extent to which they use the behaviors and in the emphasis they place on particular behaviors. This second set of studies sought to identify the behaviors used by the more effective teachers in contrast to those used by the less effective teachers.

Twenty-six teachers or teacher teams who taught in classes with a 15:1 student-teacher ratio for a minimum of two years participated in the study. Of these teachers or teacher teams, 17 (9 first-grade, 5 second-grade, and 3 third-grade classrooms) were labeled more effective teachers, and 9 (4 first-grade, 2 second-grade, and 3 third-grade classrooms) were labeled less effective teachers based on the achievement level of their students over a two-year period. Regression residuals, which were used to identify the two sets of teachers, averaged 21.8 points above the expected mean for the higher group and 11.0 points below the expected mean for the lower group.

In each of the two years, data were collected over a six-month period through classroom observations, teacher interviews, and teacher self-reports. Four observations were made in each classroom, two in reading and two in mathematics, and two or three interviews were conducted with each teacher or teacher team.

One of the interviews focused on reduced class size teaching in general while the others primarily dealt with reading and mathematics instruction. In addition to these more formal observations and interviews, casual classroom observations and teacher interviews also occurred. The teacher self-reports requested teachers to provide information about themselves and their classes such as past teaching experience and class composition.

The findings revealed that the higher-achieving primary teachers had an *instructional orientation* (goals sought by the teacher and methods used by the teacher to achieve the goals), *management style* (student discipline and lesson organization), and *individualization focus* that differed from that of the lower-achieving teachers.

Instructional Orientation

The goals of the higher-achieving teachers stress both foundational learning and personal learning. These higher-achieving teachers want their students to acquire basic knowledge and skill, but also to become critical thinkers and able problem solvers. In their instructional orientation and practice, these two goals are not equal, however. When allocating time for instructional purposes, foundational goals are given a higher priority. Academic foundations related to benchmarks and standards are attended to first. Attention to thinking and other personal or social goals is secondary. The teachers typically do not begin with personal goals and move to foundational goals. In some cases,

they may integrate the two kinds of goals, but they do not spend an equal amount of time developing each type of goal.

The primary teaching method of the higher-achieving teachers is explicit instruction. The teachers give clear directions, explain concepts, model procedures, require practice, provide feedback, and scaffold understanding. They also engage their students in more experiential learning consisting of authentic tasks, challenging problems, and interesting materials.

Similar to the relationship of personal goals to foundational goals, experiential learning routinely follows more teacher-centered instruction. It occurs after students have acquired a firm grasp of the targeted knowledge or skills in an effort to augment and extend learnings. Instances of a less linear relationship of the two types of methods where more direct instruction and experiential method are interspersed were not often observed. For higher-achieving teachers, explicit teaching is used first and more frequently than experiential methods.

Management Styles

Both student management and lesson management of higher-achieving teachers are characterized by structure. In student management, the higher-achieving teachers have established rules, routines, and reward systems. They are firm, decisive, consistent, and fair. Some teachers are more democratic and give students more independence than other teachers, but where more student-reliant discipline occurs, it results from a comprehensive management plan developed and administered by the teacher.

The structure found in the lesson management of higher-achieving teachers manifests itself in carefully planned activities with clear goals, logical structure, and step-by-step content progression. The lessons proceed at a brisk pace. Diversions from the goal in terms of unrelated emergent teacher or student interests are exceptions rather than a customary practice. Further, the lessons are often presented with enthusiasm, energy, and a commitment to accomplishment.

Individualization Focus

The outcome of the structured management of the higher-achieving teacher is an increase in instructional time to devote to individual students. As reported, all reduced class size teachers focus on individual students. But higher-achieving teachers give more attention to individual students than other teachers, and they give it in the form of direct instruction related to foundational learning.

Individual students constantly are encouraged to verbalize their understandings or display their skills, offered critique and encouragement, provided explanations and resources, and assigned appropriate tasks. Among higher-achieving teachers, the articulation-critique procedure is a dominant feature of their teaching whether it is in tutoring situations, small group teaching, or large group teaching. Consequently, the academic learning of individual students is monitored more frequently.

Teaching Behaviors of Lower-Achieving Teachers

Lower-achieving teachers used teaching behaviors that differed from those used by higher-achieving teachers. Two profiles of less effective reduced class size teachers emerged: the *philosophically different* and the *skill deficient*.

The philosophically different are teachers who consciously chose a style of teaching that is opposed to the style used by more effective reduced class size teachers. They emphasized personal goals such as critical thinking, creativity, and self-direction over basic knowledge acquisition. The teaching methods they valued and used emphasized experiential learning. They extensively employed problem-solving activities, hands-on tasks, and other student-centered procedures.

Consistent with these goals and instructional methods, these teachers emphasized permissive student management that facilitated student self-discipline and emergent lesson management in which student interests were encouraged and pursued. This combination of practices resulted in reduced time available for individualized instruction and the teaching of foundational knowledge.

The skill deficient are teachers who had goals and used methods similar to those of the more effective reduced class size teachers, but they did not have the necessary ability to successfully manage the classroom. These teachers believed in the importance of basic learning, and they did not neglect explicit teaching methods. Their inability to manage the classroom was evident in both their student management and their lesson management, however. They typically established rules and routines, but did not effectively implement them. Their classrooms were characterized by concern with maintaining order, excessive noise, and student interruptions.

Where they most dramatically departed from the more effective teachers was in lesson management. They often had overly long introductions, awkward transitions, laborious explanations, and unproductive lesson diversions. These classroom management procedures neutralized the teachers' goals and methods and resulted in limited individualized instruction and reduced time available for academic purposes.

In summary, the difference between the higher-achieving teachers and lower-achieving teachers is a difference in intention, action, or both. The higher-achieving teachers have an academic achievement focus and they have the ability to organize the classroom and present lessons efficiently and effectively to individual students. The lower-achieving teachers may have an academic achievement focus or a more personal focus, and they may be able to present lessons consistent with the focus they support, but their ability is limited in organizing the classroom in an efficient and effective way that maximized individualization.

A Model of Effective Reduced Class Size Teaching and Learning

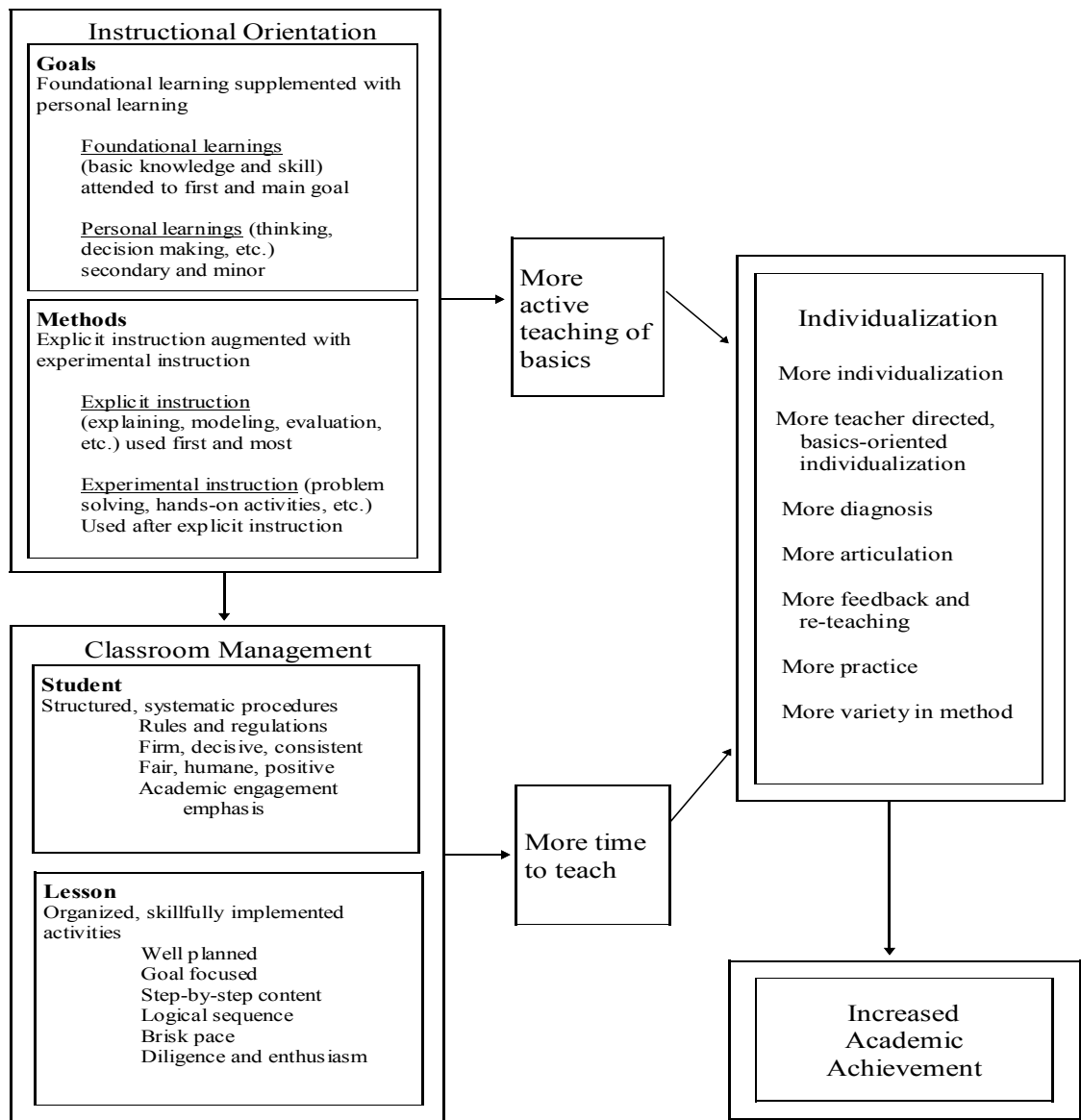
Figure 2 displays a model of more effective reduced class size teaching. It illustrates how individualization, which is the chief product of all reduced class size teaching, occurs in the more effective reduced size classes. Individual student articulation and teacher critique is a constant classroom event because teachers have the time to devote to individual students as a result of having established a well-managed classroom.

Carefully structured and administered discipline policies maximize student attention to academic pursuits, and organized, sequenced lessons focus on important goals with energy and commitment. Also, in comparison to some less effective reduced

size classes, the focus of the individualization is the direct teaching of foundational knowledge and skills.

The more effective teachers believe in the importance of acquiring basic learning as a first priority. Other learnings are attended to when and if basic learnings are mastered. They also believe that the most effective way for students to acquire basic learnings is to explicitly teach them rather than to discover them through problem solving

Figure 2. A Model of Effective Reduced Class Size Teaching and Learning



activities. Experiential learning is not neglected by more effective teachers, but they believe it is more effective after students have acquired foundational learnings.

For individualization to produce increased academic achievement, the goals, methods, student management, and lesson management of the higher-achieving teachers must all be present in some form. When they are all missing, lower student achievement results. If lesson management—consisting of well planned activities, logically organized tasks, brisk pace, and enthusiasm—is not present, greatly increased academic achievement is unlikely to occur as has been found with other less effective teachers. Although no teachers have been found who use all but one of the other elements in the way that the higher-achieving teachers use them, it is reasonable to speculate that the absence of either foundational goals, explicit teaching, or structured student management would similarly jeopardize increased academic achievement.

Implications for Practice

Although the evidence continues to grow that class size reduction results in increased student achievement in reading and mathematics in the primary grades, opposition to class size reduction programs persists because of a perceived unfavorable cost-benefit ratio. The achievement gains are seen as being meager in comparison to the funds needed to hire additional teachers and provide more classrooms.

Two arguments are put forth by class size reduction critics. First, they contend that reducing class size has not been successful and will not be successful because reducing class size does not bring about a change in teaching.² They reason, and rightly

so, that there cannot be a change in student achievement if there is not first a change in the teacher's teaching.

Second, they believe that teacher quality is more important than reduced class size in promoting student achievement.³ It follows that if reducing class size does bring about a change in teacher behavior, these effective behaviors could be taught to teachers of normal size classes and the benefits of a reduced size class could be realized without actually reducing class size. Both of these arguments are false.

Does teaching change?

The evidence that having a small class brings about a change in teaching is clear. Our work shows that when teachers have fewer students they significantly alter their classroom behavior. The change is not a major swing from teacher-centered teaching to student-centered teaching. Teachers do not cast off one philosophical orientation and adopt another as a result of having fewer students. Rather, they begin to implement more of the sound practices they prefer to use but were constrained by having a large class. They begin to individualize their instruction.

Reduced class size teachers, especially the more successful teachers, generally rely on explicit instruction as a mode of teaching, but they apply it to individuals. As one teacher remarked, she uses "tailored instruction." The same content and skills are to be acquired by all students, but at each student's particular pace and in each student's particular way. Instruction is based on the individual's current level of proficiency. It builds on what each student presently knows or knows how to do.

When teachers teach reduced size classes a new mindset appears that drives their teaching. Instead of viewing their pedagogical world as one class of 25 students, they view it as 15 classes of one student. The nature of the individualization that takes place in a small class is constant articulation and critique.

For knowledge to grow, students must give voice to their present understandings. They must say what they believe or show what they know how to do. The teacher can then offer feedback, advice, or challenge, which causes students to rethink their understandings. The opportunity for articulation and critique to occur increases dramatically as classes become smaller. More students can share their understandings more often, and teachers and others can offer more personalized feedback more frequently. As students display their knowledge, teachers can target their assistance. The result is more and deeper understanding or learning.

The individualization that takes place in a reduced size class cannot occur in a normal size class. It represents a huge change in teaching.

Acquiring the Behaviors

Normal class size teachers can acquire and may presently possess many of the behaviors that reduced class size teachers use. They can use explicit instruction, stress fundamental learnings, have well managed classrooms, and present organized learning activities. What they cannot do in any meaningful way, however, is individualize their instruction. A class with 25 students will not permit sufficient articulation and critique to maximize student learning growth. The best staff development conceivable cannot result

in adequate individualization in classrooms with 25 students. It cannot substitute for a class size reduction policy.

Advice for Teachers of Reduced Size Classes.

Having a small class is not a time for teachers to sit back and relax. It is not a time to be less assertive, less preplanned, and less focused because a small class permits these behaviors to be used without the danger of the class becoming out-of-control.

Experiential learning and students' interests are, of course, important and need to be present in every classroom, but reduced class size teachers need to be cognizant of the unusual opportunity they have been given to advance the achievement of the individual students in their classrooms. They need to emphasize academic learning. They need to use explicit, foundation-oriented individualization with special emphasis on student articulation of understandings and teacher critique and re-teaching.

Staff development programs emphasizing the teacher behaviors used by the more effective reduced class size teachers can conceivably strengthen the positive results that have been found to be associated with reduced class size. Making classes smaller is the first step. Helping teachers to improve their teaching is the second step.

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