DOCUMENT RESUME

ED 268 533 CS 209 652

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TITLE Class Size and English in the Secondary School.
INSTITUTION ERIC Clearinghouse on Reading and Communication Skills, Urbana, Ill.; National Council of Teachers of English, Urbana, Ill.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO ISBN-0-8141-0692-7
PUB DATE 86
CONTRACT 400-83-0025
NOTE 44p.; Prepared by the NCTE Task Force on Class Size and Workload in Secondary English Instruction.
AVAILABLE FROM National Council of Teachers of English, 1111 Kenyon Rd., Urbana, IL 61801 (Stock No. 06927, $5.00 member, $6.00 nonmember).
PUB TYPE Reports - Research/Technical (143) -- Information Analyses - ERIC Information Analysis Products (071)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Classroom Environment; *Class Size; Crowding; *Educational Research; *English Instruction; Research Reports; *Teacher Student Ratio

ABSTRACT

Recognizing the contradictory or inconclusive findings on class size in English, this booklet provides a summary and analysis of existing class size research and describes the kinds of research that would shed new light on the question of class size and secondary English. The first section contains the report of the Task Force on Class Size and Workload in Secondary English Instruction for the Executive Committee of the National Council of Teachers of English. It describes charges given to the task force, existing research on the effects of class size, general recommendations for research, and recommended topics for research. The second section, containing a summary of research on class size and English, discusses reviews of the literature, reports of studies on the effect of class size on achievement and on quality, and highlights some particularly comprehensive studies on achievement and quality in different class sizes. A reference list of about four pages is included. (EL)

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Class Size and English in the Secondary School

Prepared by William L. Smith, Chair,
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and Workload in Secondary English Instruction

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Office of Educational Research and Improvement
U.S. Department of Education

National Council of Teachers of English
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NCTE Stock Number 06927

Published 1986 by the ERIC Clearinghouse on Reading and Communication Skills and the National Council of Teachers of English, 1111 Kenyon Road, Urbana, Illinois 61801.

Office of Educational Research and Improvement

This publication was prepared with funding from the Office of Educational Research and Improvement, U.S. Department of Education, under contract no. 400-83-0025. Contractors undertaking such projects under government sponsorship are encouraged to express freely their judgment in professional and technical matters. Prior to publication, the manuscript was submitted to the Editorial Board of the National Council of Teachers of English for critical review and determination of professional competence. This publication has met such standards. Points of view or opinions, however, do not necessarily represent the official view or opinions of either the National Council of Teachers of English or the Office of Educational Research and Improvement.

Library of Congress Cataloging in Publication Data

Smith, William L., 1940-
Class size and English in the secondary school.

Bibliography: p.
1. English language—Study and teaching (Secondary)—United States. 2. Class size—United States. 3. High school teachers—United States—Work load. I. NCTE Task Force on Class Size and Workload in Secondary English Instruction. II. ERIC Clearinghouse on Reading and Communication Skills. III. Title.
LB1631.S65 1986 428'.007'12 86-4399
ISBN 0-8141-0692-7

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Foreword

The Educational Resources Information Center (ERIC) is a national information system developed by the U.S. Department of Education and now sponsored by the Office of Educational Research and Improvement (OERI). It provides ready access to descriptions of exemplary programs, research and development reports, and related information useful in developing effective educational programs.

Through its network of specialized centers or clearinghouses, each of which is responsible for a particular educational area, ERIC acquires, evaluates, abstracts, and indexes current information and lists that information in its reference publications.

ERIC/RCS, the ERIC Clearinghouse on Reading and Communication Skills, disseminates educational information related to research, instruction, and personnel preparation at all levels and in all institutions. The scope of interest of the Clearinghouse includes relevant research reports, literature reviews, curriculum guides and descriptions, conference papers, project or program reviews, and other print materials related to all aspects of reading, English, educational journalism, and speech communication.

The ERIC system has already made available—through the ERIC Document Reproduction System—much informative data. However, if the findings of specific educational research are to be intelligible to teachers and applicable to teaching, considerable bodies of data must be reevaluated, focused, translated, and molded into an essentially different context. Rather than resting at the point of making research reports readily accessible, OERI has directed the separate clearinghouses to work with professional organizations in developing information analysis papers in specific areas within the scope of the clearinghouses.

ERIC is pleased to cooperate with the National Council of Teachers of English in making *Class Size and English in the Secondary School* available.

Karl Koenke
Associate Director, ERIC/RCS

Introduction

Most of the time, people operate by common sense. You don't have to know Archimedes' principle to notice that things seem to weigh less when they're under water. You don't have to understand the physics of hurled objects to figure out that juggling six balls is harder than juggling three, and juggling twelve is probably impossible. It stands to reason, too, that a teacher with 100 students can read and react to their writing more frequently than a teacher with 150 students can, and that a student in a class of 20 will get a larger share of the airwaves during discussion than will a student in a class of 35.

The National Council of Teachers of English "Statement on Teacher Load: Secondary English" invokes simple arithmetic to show that even the teacher with 100 students--NCTE's recommended maximum—is faced with an immense task: "For a teacher load of 100 students, a minimum of 20 minutes per week per student for the evaluation of writing involves 33.3 hours—the equivalent of four working days—in addition to the time required for the preparation and teaching of the other language arts skills." That's only common sense.

But wait a minute. Isn't common sense the intuition which tells us the earth is flat? Didn't common sense once tell doctors that bleeding their patients would make them get better? If we scratch the class size question a little, will we discover that common sense is a bit fragile on that issue, too? Maybe peer editing groups or trained teacher aides could effectively reduce the English teacher's workload without a significant loss of learning and without a decrease in class size. Maybe students could do *some* writing that the teacher never reads, thus engaging in valuable practice without overburdening the teacher. Teachers might also do a lot of grading of student papers in their nonteaching periods, if no other assignments were given during that time.

Maybe, and maybe not. We don't have an adequate research base to answer these questions with confidence. Of course, many English teachers believe that research would bear out their initial commonsense ideas about the benefits of smaller classes; but at this point little hard data can be found, and it is hard data that often convince legislators and educational decision makers. As Rex Brown of the Education Commission of

the States said in a 1985 address to the National Testing Network in Writing, "policy makers and other managers . . . prefer purportedly scientific and purportedly objective data to all other kinds of information, whenever they need to rationalize a decision."

Case in point: the initial data on the federally funded Head Start and Title I programs seemed to discourage the idea of early intervention. Head Start students showed few significant gains compared to non-Head Start students. Later, though, longitudinal studies showed that, over the years, the Head Start children stayed in school longer and reaped other benefits. Other long-range studies of preschool education in New York and Michigan have shown similar positive results. Consequently, there is a general renewed interest in early childhood education, day care, and various other early intervention programs. Also, National Assessment of Educational Progress (NAEP) test scores are frequently invoked to encourage funding of student writing programs and to promote cognitively based curricula in various disciplines. Although *all* research doesn't affect legislative and educational decisions, it is clear that *some* certainly does. And class size is precisely the kind of issue that captures the attention and interest of policy makers and decision makers.

Aware of the gap between our commonsense judgments and firm research knowledge about class size, members of the National Council of Teachers of English passed a resolution at the 1983 Annual Business Meeting, mandating that

> the National Council of Teachers of English establish a task force to summarize existing research on the relation of workload to teaching and learning; and that this task force propose additional research if needed.

The background statement for the resolution pointed to the "contradictory or inconclusive findings" on class size in English and the lack of "supportive documentation" available to educational decision makers attempting to reduce workload. The NCTE Executive Committee responded immediately to the resolution, appointing William L. Smith, University of Pittsburgh, as chair of the Task Force on Class Size and Workload in Secondary English Instruction. Other members were Elizabeth K. Burgess, Metropolitan Nashville Board of Education; James L. Collins, State University of New York at Buffalo; Bryant Fillion, Fordham University at Lincoln Center; George Hillocks, Jr., University of Chicago; James Hoetker, Florida State University; Nancy S. McHugh, Grant High School, Van Nuys, California; and Thomas W. Albritton, Jr. (consultant), Florida State University.

The Task Force was directed to prepare a summary and analysis of existing research on class size and English instruction at the secondary

level, and, thereafter, to describe the kinds of research that would shed new light on questions of class size in English. This ERIC/RCS booklet is a result of their work. Thomas Albritton's analytical summary, presented as the second section of this booklet, constitutes the basic body of data that the Task Force examined in preparing recommendations. As might be expected, Albritton found an abundance of class size research that has been hotly debated in the profession—most recently, meta-analysis of class size studies. Also predictably, he found very little research focusing on the particular problems of English instruction and class size.

However, there has never been a shortage of earnest testimony and expressions of alarm about class size and English. Since the 1950s, NCTE has recommended a maximum of 100 students for high school teachers of English, a position reaffirmed in subsequent years. During the 1960s, the Council recognized "Honor Roll" schools throughout the country—that is, schools which improved teaching conditions by reducing class size and workload for English teachers. In the 1960s and 1970s, NCTE activities included a Committee on Class Size, a subgroup of the Commission on Curriculum devoted to the study of class size, a bibliography on the topic, a SLATE Starter Sheet, and other expressions of concern. In 1980, the Secondary Section produced a Workload Starter Kit for high school English teachers.

Common to all these efforts are two elements: feelings of frustration, and acknowledgment of the inconclusiveness of research on class size and English instruction. The frustration, at least, is documented. A 1955 report by William Dusel for the California Association of Teachers of English (CATE) showed that teachers were spending an average of 28.5 hours a week checking student writing. A 1984 CATE survey mirrored a similar intensity of concern as California teachers ranked class size as their primary professional problem, citing large class size twice as frequently as low salaries.

Although some states and districts have acted on commonsense assumptions and on the recommendations for reduced class size made by NCTE and numerous disinterested educators over the years, from James B. Conant to Ernest Boyer, if such places are to become the rule rather than the exception, the commonsense arguments will need to be verified by extensive and continuing research.

The significance of this booklet, I believe, is in the Task Force's fresh approach in considering research questions, in the rich ideas they present, and in their lucid and economical expression. Here are researchers and teachers working together to define issues in ways that are understandable not only to specialists in research but also to audiences of teachers, administrators, legislators, and other laypersons. If the Council and the

broader research community are to develop studies that provide new insights into class size and English, the ideas presented for research by the Task Force are a useful and important starting point.

Of course, we need to acknowledge at the outset that research might come up with answers that we do not wish to hear. Clearly, English teachers have an urgent interest in demonstrating the congruence of common sense and formal research in matters of class size. But researchers must nevertheless proceed objectively in studying class size, and the profession at large must not look at the question ideologically. Sometimes research yields conclusions of uncommon sense; counterintuitive principles account for major advances in noneuclidian geometry and quantum physics. Surely the English teaching profession is tough-minded and resilient enough to make best use of whatever new knowledge is generated by research on class size.

Charles Suhor
Director, ERIC/RCS

1 Report of the Task Force

Charger Given to the Task Force

The Task Force on Class Size and Workload in Secondary English Instruction was asked to prepare a report to the Executive Committee of the National Council of Teachers of English. Among the points to be covered were (1) a summary and analysis of the current state of knowledge on the effects of class size and workload in English instruction in the secondary schools; and (2) descriptions of needed studies on the effects of altered class size and workload in secondary English instruction. The first charge was fulfilled by Thomas Albritton of Florida State University. His review, presented as the second chapter of this text, became the basis of our study, discussion, and deliberation. We present below our views on class size and workload in secondary English, and we recommend the kinds of research that we think would be most useful and revealing.

First, however, a context is needed for our remarks. Traditionally, class size has been about thirty students per class, and a teacher's workload has been five classes per day. However, in some reports, these numbers have been as high as forty-five students per class and seven classes per day. Also traditionally, the effect of class size has been the subject of debate and passionate disagreement. English teachers have noted the deleterious effects large classes have on teaching and learning, and NCTE has advocated a class size of twenty to twenty-five and a total maximum workload of one hundred students per teacher per day. With a few notable exceptions (e.g., Florida and Vermont), such admonitions seem to have had little effect. Even when enrollments have declined, class sizes have stayed the same because school officials have chosen to close schools and reduce the number of teachers rather than reduce class size.

As the Task Force examined Thomas Albritton's review of research, we came to the conclusion that the literature on class size does not settle the debate. Both sides in this debate can be supported by what appears to be good evidence. Indeed, the literature can be and has been used to fuel disagreement rather than to settle it. After close analysis, however, we concluded that asking which side is right would not yield any useful answers.

The research literature suggests that class size by itself, especially in English classes, is not the primary determinant of learning, but that *class size, when combined with mode of instruction, is a powerful determinant of learning.* In the next section of this report, we clarify the meaning of this position on class size by discussing distinctions between types of learning and among modes of instruction.

Existing Research on the Effects of Class Size

Research on class size (e.g., Glass and Smith 1978; Hedges and Stock 1983) indicates that class size can have a powerful effect on student achievement. However, the research also indicates that achievement for students in classes of twenty is not likely to be much greater than for those in classes of forty. This is important for us in English because almost all of our classes are in that range. Reduction of class size from forty to twenty would produce an effect size of only about .15 standard deviations, a very modest change. However, a reduction from forty to ten would result in the average student's achievement rising from the 50th percentile to the 65th percentile, an effect size of .5 standard deviations—a large change indeed.

Unfortunately, reducing class size to ten is probably impossible. Nevertheless, the important finding is that class size, by itself, is related to achievement, and this relationship is even stronger if class size is combined with other variables. But, to date, researchers have largely ignored the relationship of class size to other variables, even those known to affect achievement dramatically. Further, researchers have not examined the relationship between class size and subject matter; yet problems of both subject matter and instructional design are undoubtedly pertinent to policy decisions on class size.

Subject Matter

Certainly one of the key differences among subject matters as they exist in school curricula has to do with the type and taxonomic levels of objectives they hold forth for students. Researchers have known for many years that far too many teachers aim at and test for low-level objectives of recall and translation—the lowest level of categories in Bloom et al.'s (1956) *Taxonomy of Educational Objectives.* If all our teaching efforts were aimed at recall and simple translation, perhaps class size would be unimportant. Given appropriate equipment and acoustics, a lecture on the themes and structure of Ernest Hemingway's *A Farewell to Arms* would be just as effective for ten listeners as for one hundred, when the

goal is simple recall. However, if the goal is for the students to analyze the theme and structure of any novel, common sense suggests that students will, at some point, have to engage in such analyses under the guidance of a teacher. In such cases, classes of thirty to forty may very well be too large.

Cognitive psychologists have recently drawn distinctions between what they call *declarative knowledge* and *procedural knowledge* (Stein 1984). Declarative knowledge is knowledge of *what*—of things, details, forms, rules, etc. Procedural knowledge is knowledge of *how*—of skills, routines, and strategies necessary to operate within some particular task or set of tasks. Evidence is strong that knowledge of both kinds is necessary in tasks at all levels of Bloom's taxonomy. For example, writing an original story, even a simple one, involves declarative knowledge of lexical items, syntactic structures, and story schemata, as well as procedural knowledge of the routines and subprocesses necessary to pull together the elements that will make up the story.

Although there is a sense in which the study of any subject matter involves both declarative and procedural knowledge and tasks at all levels of Bloom's taxonomy, procedural knowledge and higher-level tasks are probably more characteristic of the teaching of English than of any other subject matter. Research evidence is strong, and becoming stronger, that an instructional focus on higher-level tasks and procedural knowledge is essential to increasing reading and writing abilities (Bereiter and Scardamalia 1982; Flower and Hayes 1981; Hillocks 1986). We believe that when the goals of instruction are procedural and at the higher taxonomic levels, class size becomes a far more important factor.

Instructional Design

Variables of instructional design are also pertinent to research and policy making about class size. Available research indicates that certain modes and focuses of instruction can have powerful effects on student learning. Research on mastery learning, for example, indicates several crucial elements of instruction: teacher assessment of student knowledge and skills prior to the beginning of instruction; quality of learning cues; systematic assessment to determine student understanding; and corrective instruction as it proves necessary.

A meta-analysis of research on teaching composition demonstrates that instruction focusing on peer-group problem-solving activities is five times more powerful than conventional whole-class lecture methods (Hillocks 1986). Other research indicates that simple aspects of instruction, like grading homework, have a powerful effect on learning (Walberg 1984).

All of these and other powerful instructional variables are quite time-consuming, however. *Class size, therefore, may determine whether or not they are ever put into practice, for class size influences the extent to which they can be successfully employed.* Yet there is no research on the relationship of these variables to class size.

General Recommendations for Research

There is little research on the effect of class size on the teaching of English, either as a direct effect or as a mediated effect. Therefore, there is a clear need for *English-specific* research—but not simply to redo old research in a new discipline. Rather, the new research should be much broader, in design, in method, in who conducts the research, and in the variety of outcome measures used.

The extant research on the effects of class size indicates that there is an effect when class size is below ten and over thirty and that smaller differences in class size may affect learning when mediated through other variables. Therefore, it is necessary to determine, analyze, and test those mediating variables. For example, student talk might be one such variable, for there is evidence that when students talk more they learn more. However, each mediating variable may also be an outcome variable; for example, class size probably affects the amount of student talk, and class size in combination with amount of student talk may affect another outcome variable, such as depth of understanding of a novel.

As a first step in the research process, we suggest the obvious: consider what would be acceptable evidence of desirable change in students' and teachers' performance, attitudes, knowledge, procedures, and so on, and in the interaction between students and teachers in these areas. Often an item generated will be, at least to some degree, under the control of the teacher, and thus can be both an independent and a dependent variable.

Since we do not have data on the interaction of class size and these other variables, and thus have no certain idea whether more thorough examination of a variable is warranted, the next step would be to gather evidence which will inform further research. Considering the number of variables that might interact with class size, a lengthy program of research would be required. Because such research is needed, *we urge the university research community to seriously consider it.* In particular, we urge graduate advisers to suggest such research to their doctoral students. Additionally, we urge federally funded labs and centers, such as the Center for the Study of Writing and the Center on Effective Secondary Schools, to plan such research. However, the required evidence need not come only from rigorous, highly controlled research. Indeed, *we believe that reports from*

classroom teachers and from observers in classrooms would also provide considerable insight, if viewed as a whole and if minimal efforts were made to create some commonality across the studies.

Research by classroom teachers does not require much funding, but it does require desire and some organization. NCTE, through its various committees (e.g., the Research Committee), through its affiliates, through its Research Foundation, and in conjunction with the National Writing Project, can encourage this research and provide teachers the basics for carrying it out.

Recommended Topics for Research

An exhaustive list of possible research projects is beyond the charge of this Task Force. Instead, we prefer to recommend a direction for this research and to exemplify the kinds of studies which could be done.

The basic pattern for the *kinds of research* we suggest is as follows:

Direct Effect:	Effect of class size on variable X, which is used as the outcome measure.
Mediated Effect:	Effect of class size in conjunction with variable X (now a mediating variable) on some other outcome measure.

A meaningful program of research involving surveys, case and observational studies, and experimental studies would examine at least three sets of variables in relation to class size: (1) *diagnosis and assessment* of student knowledge and abilities; (2) *learning tasks and instructional activities*; and (3) *feedback.*

Diagnosis and Assessment

Available research indicates that instruction is far more effective when teachers plan it to conform with what students already know and can do. The best methods for initial assessment of student abilities and knowledge have not been established; nevertheless, such assessments are clearly necessary. How much time they take, what precisely is to be examined, and how they affect ensuing instruction are mandatory questions. For a teacher to make such assessments is clearly time-consuming, and the more students any teacher has, the less time available to consider the particular needs of any one student. Although this appears to be obvious, we have no specific research on how these ideas relate to the teaching of English.

Examples of needed research:

1a. Effect of class size on the frequency of diagnostic evaluation of student writing.

1b. Effect of class size, in conjunction with controlled frequency of diagnostic evaluation of student writing, on improvement in writing ability or on students' attitudes toward writing.

2a. Effect of class size on the teacher's knowledge of individual students' abilities on a task or concept (e.g., punctuation, or the ability to understand the concepts in a poem).

2b. Effect of class size, in conjunction with the teachers' knowledge of a student's ability, on the kinds of and the profit from specific instruction in areas of diagnosed weakness.

Learning Tasks and Instructional Activities

Recent research indicates that the kind of instructional focus in a classroom can have an enormous effect on what students learn. This is especially true in composition (Hillocks 1986). How class size influences what English teachers choose as a focus of instruction, however, is totally unknown. Perhaps more importantly, we know nothing about the time involved in pursuing one focus as opposed to another. We have known for decades that instruction in formal grammar has no effect on increasing most students' skills in composition (Mellon 1969), yet teachers continue to choose grammar study as the major focus of instruction. Grammar is an easy choice: the materials, though not effective, are plentiful. Choosing more effective techniques, like inquiry, entails many more hours of planning, but confronted with over one hundred students per day, teachers are not likely to do this planning. Thus, the extent to which class size influences curricular decisions is an important question for research.

Examples of needed research:

1a. The effect of class size on student talk (time, frequency, and number of students who talk).

1b. The effect of class size, in conjunction with the amount of student talk, on the number of ideas and the amount of supporting evidence for those ideas that appear in students' essays on a topic related to the subject of discussion.

2a. The effect of class size on the number of student-initiated conferences with the teacher.

2b. The effect of class size, in conjunction with the number of student-initiated conferences, on student attitudes toward writing or literature or language study.

Feedback

The continuing assessment of student progress is perhaps the most important key to effective instruction. In the teaching of literature and composition, however, such assessment is extremely difficult, in part because such learning is complex, in part because so little is known that teachers must devise their own assessment criteria and procedures at each juncture of instruction.

In the teaching of English, feedback is conventionally thought of as coming *after* students write something. Simple arithmetic indicates that even cursory feedback to one hundred students, if each one writes once per week, requires over eight hours if the teacher spends only five minutes reading and commenting on each paper; thoughtful reading and feedback require much more time than this. But studies of time and effect are scarce, despite the fact that extensive commenting is believed necessary for improvement in writing.

For effective instruction, feedback may be more important when students are in the process of learning new concepts, dealing with a new textbook, or generating their own pieces of writing. Indeed, research on student revision shows that most revising is done while drafting, not between drafts (the points at which teachers usually provide feedback). But clearly, the number of students a teacher has in a class will impose limits on the type and quality of feedback available to individual students during these interim stages. Research in this area is sorely needed.

Examples of needed research:

1a. The effect of class size on type or number of comments on students' papers.

1b. The effect of class size, in conjunction with the number of comments written on students' papers, on improvements in subsequent revisions of those papers.

2a. The effect of class size on the teacher's responses (number, kind, and quality) to students' questions about a piece of literature.

2b. The effect of class size, in conjunction with the teacher's responses, on the depth of understanding of a piece of literature.

There are many kinds of outcome variables which could be used for almost any research topic. Student learning and attitude are the most obvious, but we suggest that researchers also consider the student's perception of the teacher, the subject, and the school (or schooling). In addition, it is important to look at the teacher's perception of the student, what the teacher learns, how the teacher's behavior changes, and his or her sense of accomplishment and self-worth.

We would, finally, like to provide a sense of the range of variables we suspect might interact with class size. The following list is only suggestive.

1. number of individual teacher-student contacts
2. range of opportunities for students to use language
3. number and range of student-initiated enterprises and projects
4. degree of individual involvement in class activities
5. range, across time, of activities and approaches used in class meetings
6. students' use of exploratory talk and expressive writing
7. helpfulness and tolerance in teacher-student conferences
8. number of homework assignments collected and checked or marked
9. number of writing assignments collected and commented on
10. nature of teacher's response (oral and written) to written work
11. requests for and checks on students' revisions of written work
12. frequency of drill work and exercises
13. teacher's use of workbooks and textbooks
14. types of tests teacher uses (e.g., quantitative measures versus qualitative measures; written tests versus informal observation)
15. use of devices to monitor progress
16. use of lecture and lecture/recitation
17. use of groups and group activities
18. number and types of questions teacher asks

The Task Force on Class Size and Workload in Secondary English Instruction completed its work in a formal sense in 1985, when this report and a series of recommendations for action were presented to the NCTE Executive Committee. We hope, though, that the perspectives we have provided are not a conclusion but a beginning. If further research is conducted to sort out and shed light upon the innumerable questions related to class size and English instruction, the work of the Task Force will be well rewarded.

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2 Summary of Research on Class Size and English

This summary was prepared by Thomas W. Albritton, Jr., Florida State University, in cooperation with members of the Task Force on Class Size and Workload in Secondary English Instruction.

Reviews of Reviews

One thing is certain: teachers prefer small classes. There is no research, poll, or word-of-mouth query that will contradict this statement. They believe smaller classes allow them to be more creative and energetic—and thus more effective. They also believe that smaller classes create a more desirable classroom environment; and, consequently, that the small class allows students to achieve more than they do in large classes (Cotton and Savard 1980; Millard 1977; Shapson et al. 1978; Haddad 1978; and many others). Over the last ten years, there have been many studies and reviews of literature concerned with the faith classroom teachers have in small classes. A review of the research published since the late 1960s on the effects of class size shows that, as is usually the case with generalized faith, the matter is more complicated than it seems. There is no absolute answer to whether or not small classes are better. Such a question reduces "better" to the variable of class size alone, and research or observation will quickly prove that many factors combine with class size to determine the quality of educational experience (Cotton and Savard 1980; Chang and Ogletree 1979; McClusky 1978). And even when considering class size in isolation, one finds that there are benefits and problems with both large and small classes (Haddad 1978). Because most studies either fail to consider every possible factor or operate under manipulative biases, most of the research reveals either no significant results or results which seem significant but are not trustworthy.

Vignocchi (1980) reports that lack of experimental control and failure to study whole-class environments have created a series of insignificant findings in class size research. Vignocchi does cite some significantly positive effects of small class size on reading achievement and math concepts learning, but the number of reported studies favoring large

classes for achievement in these same subject areas casts doubt on even these significant results. Vignocchi concludes that the effect of class size is negligible unless coupled with good instruction, and he suggests that the way a teacher uses the time for the student-teacher interaction that smaller classes allow is the factor that truly determines the student's achievement.

A review of research by Cotton and Savard (1980) reiterates the importance of teaching method to the success or failure of a class of any size. Even though smaller classes have the potential to allow the teacher to develop and use a wider variety of instructional skills, this development and use do not occur automatically with the reduction of class size. Cotton and Savard argue that no optimum class size exists for all instructional situations, and that appropriate class size depends on age/grade, student aptitude, subject, and instructional method. Furthermore, they argue that researchers must define terms like *large, small,* and *class* more clearly in order for results discussed in these terms to have any applicable meaning. These points considered, the researchers found a significant advantage in small classes for low-ability, special education, and primary students; and for improving student attitude, teacher morale, and the flow of classroom processes.

Chang and Ogletree (1979) cite reports demonstrating that the relationship between class size and academic achievement depends on the way the teacher manages and organizes the class. Like Cotton and Savard, they find age/grade levels, ability/aptitude, and socioeconomic status to be factors in class size effect, with smaller classes proving beneficial for younger pupils, pupils of lower ability, and pupils of low socioeconomic backgrounds. Chang and Ogletree agree with other scholars that small classes offer the possibility for, but do not ensure, improved instructional methods. They add that if a teacher has certain instructional weaknesses, these too will be exaggerated by reducing class size.

McClusky (1978) believes that we should consider what ends we want to serve by manipulating or analyzing class size, since there seem to be several clear reactions to the class size question but no certain understanding of how to apply those reactions. Haddad (1978) points out the advantages and disadvantages of different class sizes. He explains that, according to research, a small class will allow instructional variety, greater interaction among students, more individual learning, more creative activity, more divergent thinking, and fewer discipline problems. Smaller classes, he says, will also create an increase in the number of emotional and intellectual demands on students and on teachers, causing an increase of personal exposure, a greater need to be alert, and the feeling of being under closer scrutiny of peers and superiors. Furthermore, Haddad mentions, in a smaller class, though a teacher can be attentive to individual

needs, this attention may deny students time for independent learning. Similarly, Schofield (1974) notes that smaller classes provide cohesiveness and closeness, but are more difficult and increase the effects of peer pressure. Further, although larger classes increase variety and foster interpersonal relationships, they also contribute to a higher level of interpersonal aggression and disruption.

These diverse results support McClusky's recommendation that we should carefully consider our goals for studying the class size issue. If the goal is better achievement, then, according to research, there is no guarantee that class size by itself is a means to this end. It is clear to McClusky that class size alone does not control achievement criterion scores. He further reminds us that classroom quality does not necessarily have any effect on achievement or learning.

Many researchers, however, believe that classroom quality is an important factor in achievement and, therefore, an important goal for educational planning and research. Templeton (1972) cites Olson's (1971) study, reviewed later in this report, as empirical evidence that smaller classes produce higher levels of quality in the classroom environment. Templeton points out that most of the studies supporting small classes are concerned with factors other than raw achievement, a fact that reminds us of McClusky's questioning goals and concerns. If McClusky is correct in finding no connection between classroom environment and achievement, then one must decide how important teacher and student morale, among other factors, are in and of themselves in the operation of schools. If there is a connection between quality and achievement, researchers must define that connection more clearly than they have in the past.

One way of improving research in this regard would be to do some longitudinal studies. In his review of the literature, Lindbloom (1970) asserts the significance of classroom quality (via small classes) on academic achievement. He cites findings indicating some of the benefits of small classes: small-group activity, mass orientation as well as individual concern, individual attention at the primary level, greater chance for individualized instruction, and greater variety of educational activities per normally scheduled class. The achievement benefits of small classes may be recognized, he says, in studies which allow enough time for teachers and students to adjust to class size changes. The problem with small classes, he argues, is teachers' failures to adjust to them. In one study which Lindbloom analyzed, 43 percent of the instruction taking place in the small class was designed for large classes: it was mass oriented and in a lecture format. McKeachie (1971) contends that many teachers have been trained for large classes and are unable to change their approach when faced with the instructional options which smaller classes provide.

A report by Pidgeon (1974) notes the need to break from the traditional large-class approaches, which are naturally restricting and limiting, especially for smaller groups. And Lindbloom cites the longitudinal studies of Balow (1969) and of Furno and Collins (1967), covering four and five years respectively, as proof for the success of time in overcoming the patterns of previous instructional methods. Both of these studies favor small classes for student achievement, and the latter favors small classes for overall achievement and achievement in reading and math by a ratio of 7.3 to 1 for classes of twenty-five or fewer students compared with classes of more than twenty-five (Lindbloom 1970). Lindbloom argues that, given word of the class size change and time to adjust methodology (approximately three years, he says), the teacher can react in such a way that change in class size can directly and independently affect teacher behavior and, in turn, student achievement. He recommends more longitudinal studies to bear out his contention.

Pidgeon (1974) supports the idea that attitude affects achievement. He cites certain achievement problems with small and large classes that are caused by the social or attitudinal conditions particular to these different class sizes. Citing the research of Burstall (1970), Pidgeon reports that performance in French classes (ranging in size from three to forty-nine) decreases if the size dips below twenty because of a lack of vitality in the smaller class. Also, he reports that larger classes, in general, contribute to student failure by being exhausting and frustrating. Pidgeon cites several factors which, separately or along with class size, can contribute to academic achievement: homogeneity of classes, grade/age level, work space provided, subject studied, social status, amount of ancillary assistance used in teaching, and overall teacher load. He, like Thompson (1978), stresses the often unconsidered importance of teacher workload as a factor contributing to class quality and student achievement in relation to class size.

Murphy (1975) rejects the contention that teacher load (pupils taught per day) has any effect on pupil achievement. But Bamburg (1977) reports in detail the hazardous effect that more than 150 students a day per teacher can have on activities like the teaching of composition (in special composition classes and in other general English classes) and in specialty classes, even where the class size is small, if the teacher must prepare for three or more different classes every day.

Applebee (1977, 1978) describes the damage that large classes and heavy loads impose on the quality of English instruction. With a daily load of 150 students (typical, but exceeding the recommended maximum of 100), a teacher of English spends twenty to twenty-five hours a week grading papers, not to mention the time spent preparing for class and serving on extracurricular committees and programs. Applebee (1978)

reports that award-winning students in the 1977 NCTE Achievement Awards in Writing Program were all from smaller classes in which discussion of papers, conferences, orientation to writing process, and imaginative and expressive writing could occur. Teacher overloads cut into the time needed to apply this much care to the teaching of composition.

Murphy (1975) blames inconclusiveness in this area on the absence of good research: lack of random selection, lack of control over teacher variables, lack of control over socioeconomic situations in different school districts, and lack of longitudinal studies. He cites Balow (1969) and Furno and Collins (1967) as good longitudinal studies, but he doubts their results because, he says, the researchers failed to consider other important factors. For example, most of the classes in these studies contained students of low ability. Murphy adds that, in most studies, including these extended ones, there is no significant difference in achievement due to different class sizes, and that, in fact, some which do show differences differ in favor of larger classes.

Jencks (1972) comments that smaller classes may very well widen the gap between disadvantaged and advantaged pupils: "Making learning highly competitive and therefore defining some children as 'successes' while others are 'failures,' schools make it more difficult for the slower children to learn anything and more attractive for the quickest to learn a lot." Here Jencks is reiterating the fear expressed by Haddad (1978) that smaller classes can put more pressure on students. Concerning the assumption that schools with small classes have students with unusually high verbal scores, Jencks argues that these smaller classes often occur in school districts with more money to create smaller classes and hire the best teachers, or with more affluent, education-conscious parents. With such districts involved in a study, demographics become important factors in choosing two schools for a comparison. Jencks notices that comparing classes from similar schools in the same district almost never produces a difference in achievement between students from large classes and those from small classes. This observation implies that, when achievement differences do occur, they are caused by factors other than class size. Jencks also argues that the existence of small groups of students with special advanced needs could cause the formation of small classes for these advanced students, thus creating the appearance that the small class size produced the advanced achievement. Similarly, when low-ability students create their own small class, there is an impression that the class size caused the students to perform below average.

A group of graduate students from the University of North Carolina at Chapel Hill reviewed literature on class size and concluded that only under "unusual circumstances" is there a direct relationship between small class size and positive academic achievement. These researchers report

that "it appears to be quite clear that if neither method nor content are [sic] changed, then reducing class size will have no significant effect upon student attainment" (University of North Carolina at Chapel Hill, School of Education 1978).

Laughlin (1976) determines from his review of studies that the benefits of smaller or larger classes are social or psychological, but not academic. According to him, many of the changes and manipulations in class size are made for "purely social" reasons rather than for reasons based on research.

Class Size Effect on Achievement: A Report of Studies

In general, the research on the effects of class size on pupil achievement is highly inconclusive, with almost as many different results as there are studies. Johnson and Garcia-Quintana (1978a) twice tested the effects of class size and the use of teacher inservice training on the achievement of South Carolina first graders, once during the 1975–76 school year, and again during the 1976–77 school year. During the first year, the researchers offered inservice training to some of the teachers involved with the study and not to others. Also, paraprofessional assistants were used in the first year but not in the second. Pre- and posttests for achievement (Comprehensive Tests of Basic Skills, Levels A and B) were given to the students, first graders from across South Carolina who were grouped into classes of approximately nineteen or twenty-seven students. In the first year, teachers who had received inservice training produced increases in students' reading achievement, regardless of class size. The only group not showing a significant increase in achievement was the large class for which the teacher received, during the course of the study, no inservice training. Overall achievement and reading achievement were better in the smaller classes than in the larger classes, but there was no significant difference between the achievement of students in smaller classes and that of students in larger classes for math or language.

Meredith et al. (1977) describe this same project. Null hypotheses were formed originally, they say, based on the inconclusiveness of the review of previous studies. The researchers expected class size and teacher inservice training to have no significant effect on student achievement in math or reading. However, the results of the first year's project, as reported by Meredith and her colleagues, are as follows: mean posttest scores in reading achievement were significantly higher for smaller classes; mean posttest scores for reading achievement were *not* significantly higher for classes with teachers who received inservice training; small classes which had teachers who had *not* received inservice training showed the highest mean scores for reading achievement; and large classes without inservice

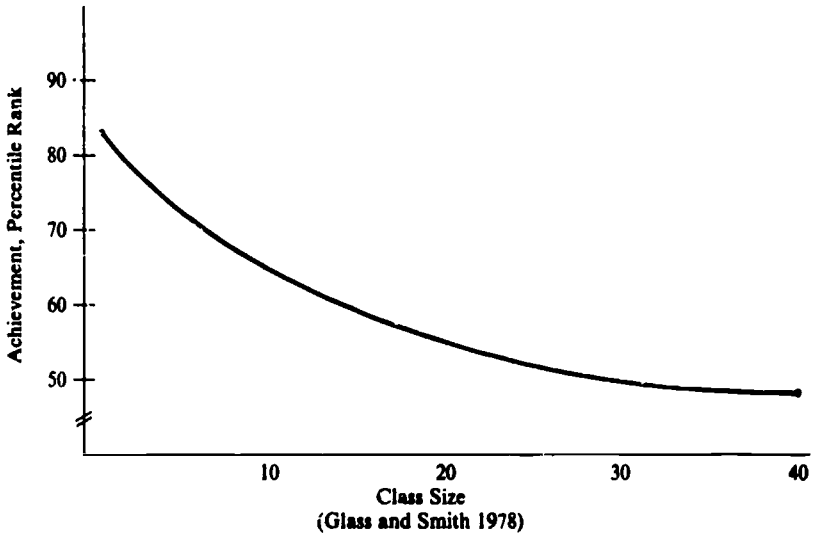
teacher training showed significantly lower reading achievement scores than any other type of class. For math achievement, Meredith et al. report no significant difference in achievement due to class size or teacher inservice training, nor any relationship between the two factors. Language achievement was not affected by class size, inservice training, or their relationship; and of all three variables, only class size had an effect on "overall" achievement posttest score averages.

Johnson and Garcia-Quintana (1978b) also report on the 1976–77 South Carolina First Grade Pilot Project. Null hypotheses were again proposed, but the variables involving teacher inservice training were eliminated because all teachers received equal amounts of such training—three inservice sessions between pretest and posttest. The researchers in 1976–77 expected no significant difference in reading, math, language, or overall achievement depending on the variable of class size. The small classes (experimental group) contained approximately twenty students, and the large classes (control group), approximately twenty-nine. The fifty classes participating were balanced for extraneous variables of race, sex, and attendance in kindergarten. The small classes had a slightly higher percentage of Title I students than did the large classes, a factor which, among others, the researchers credit for the somewhat different results in the 1976–77 test as compared to the 1975–76 test. The results of the second year's test indicate no significant difference in achievement between large and small classes in reading, math, language, or overall (posttest combination). The researchers assert that the extra Title I students in the small classes may have reduced any advantages those classes may have enjoyed, and that the absence of experimentally uncontrolled paraprofessional help and the universal nature of teacher inservice training may have removed formerly effective factors. One might infer that training all of the teachers increased achievement in the first study, thus creating "no significant difference" in the second study because all classes were improved. However, if, as Meredith et al. (1977) suggest, the best results occurred in small classes with teachers who had *not* received inservice training, the blanket application of inservice training that occurred in the second study may have lowered the performance of small classes while it raised that of some larger classes. Selective inservice training, intelligently assessed and based on the particular needs of different class sizes, may produce the best achievement results overall. For future study, Johnson and Garcia-Quintana recommend extending the South Carolina study to a longitudinal format including three or more class sizes and considering the effects on achievement of race, sex, socioeconomic status, and academic ability, as they relate to class size.

Results of class size studies can vary significantly as the South Carolina First Grade Pilot Project shows, when they are repeated with slight altera-

tion, or even when the same study is described by two different sets of researchers. This phenomenon demonstrates the intricacies contributing to various reports, and it shows the impact of perspective and communication on the results of studies. These factors are crucial to understanding the most cited of the class size studies, the meta-analysis by Glass and Smith (1978). Its results ostensibly reflect all class size/achievement reports compiled over the course of the twentieth century. Glass and Smith began their study by reviewing the literature on class size since 1900, using the key words, "size," "class size," and "tutoring" to search ERIC, Dissertation Abstracts, and the bibliographies of those studies. Of the approximately three hundred reports analyzed, seventy-six were deemed valid and relevant and were used in the meta-analysis.

The results in those reports were applied to a statistical formula designed to determine the difference in achievement between any two classes of different sizes. To justify including studies of various qualities and validities, Glass and Smith note that the better studies show results of the same type as the poorly done studies, except that the high quality results are clearer, more extreme, and more significant in expression. The mixture of quality, therefore, they believe, did not negatively affect the results they obtained. These results, simply stated, are that classes with twenty or fewer pupils achieve significantly more than classes with more than twenty pupils. Glass and Smith modified this simple generalization by designing a graph which compares class size (0–40) with percentile rank of an average pupil (50–100):



This graph expresses differences in achievement due to class size which would, normally expressed, be too small to be significant. For example, there is hardly any noticeable difference in achievement for an average student between a class size of thirty-five and one of twenty. But when expressed in changing percentile points, the difference becomes one of moving from average (50th percentile) to well above average (over the 60th percentile rank). Such a change in class size, according to Glass and Smith, could improve overall average achievement in each class significantly.

Glass and Smith's study has been well received and is used as a point of departure for new research by Cahen and Filby (1979). These researchers accept Glass and Smith's results and form a list of new lines of inquiry that would help explain the reasons for the class size effect reported by the meta-analysis. Cahen and Filby are likely to accept Glass and Smith's results enthusiastically, however, since they worked with Glass and Smith on the first report of the meta-analysis. Except for a few teachers and principals who were eager to find evidence to strongly favor smaller classes, the Glass, Smith, Cahen, and Filby study has been accepted with skepticism. Its chief and earliest critic is the Educational Research Service (ERS) of Arlington, Virginia. The ERS begins its criticism by reminding the public that a substantial number of the comparisons used in constructing the below-twenty-pupils portion of the meta-analysis graph are actually "extremely small instructional arrangements such as one-to-one tutorials and classes of two to five pupils" (Educational Research Service 1980). The implication is that the category is not just less than twenty, as in eighteen, but is substantially less than twenty, perhaps as in five or two, and, therefore, that the report is misleading. The ERS also implies that, even if we accept that a class size of two to five pupils leads to academic success, reducing all classes to this effective size would be economically impossible. The ERS argues further that Glass and Smith ignored the insignificance of class size, as is indicated by the right side of the graph, and based their entire argument for smaller classes on the left side (classes below twenty in size); thus Glass and Smith unjustifiably overgeneralized their results. Glass and Smith relied on too few studies, says the ERS: "Of the 110 comparisons used in producing the graph, 73 percent came from only *4* of the 14 studies [which the authors considered 'well controlled']" (Educational Research Service 1980). The ERS believes that, in using and comparing both well-done and poorly done studies, Glass and Smith reduced even the meaningful studies to the validity level of the least valid study analyzed.

Glass (1980) answered selected criticisms from the ERS, explaining a balanced proportion of all class sizes, including, but not biased toward, extremely small classes. He explained the significance in percentile rank

even in the farthest right ranges of the graph. And he explained the harmlessness, indeed the supporting qualities, of poorly executed studies in comparison with strong studies.

There were more complaints from the ERS about the work of Glass and his colleagues, many of which Glass answered in rebuttal, and discussion of which would make this report far too lengthy. Suffice it to say that the ERS responded to Glass's rebuttal, implying that his defensiveness and sarcasm added to the reasons for doubting the objectivity and accuracy of the meta-analysis report. Glass, in turn, found the ERS's critical conclusions "confused, garbled, and empty," and said that they "counsel only inaction" (Glass 1980).

Others have commented on Glass and his colleagues' results, some skeptically, but none quite so aggressively as the ERS. Cacha (1982) acknowledges and accepts the ERS's criticism of the meta-analysis, doubting the statistical significance of the results, questioning the success of integrating the results of many different studies, and reiterating the warnings against generalizing, both in terms of results and in terms of the language used to describe these results. "Can their most quoted conclusion, 'average pupil achievement increased as class size decreased,' be used without qualifications?" Cacha asks.

Hess (1979) points out some of the flaws in the methodology of Glass and his colleagues. First, they assume that the large size of the analysis sample assures them of randomization; whereas in reality, according to Hess, the boundaries of the sample are "fixed by a variety of experiments and researchers, each concerned with the issue of class size." The approaches to, and reports of, the South Carolina project illustrate this factor of variety. Second, Hess reports the uncertain influence of the time variable between 1900 and 1979, recognizing that results may change with the changing motives and expectations of researchers, which of course vary from era to era. Third, the large sample might compound the errors of past studies. Fourth, Hess warns against Glass and Smith's lack of respect for "statistical significance." He states that they force multidimensional results onto a linear scale, limiting their scope of classroom demographics to only two factors, pupil ability and pupil age, while ignoring factors such as the teacher's salary, students' socioeconomic backgrounds, overall morale and attitude, and other environmental conditions under which methodologies and performance must function and occur.

By using statistical modifications of Glass's study, however, Hedges and Stock (1983) repeat the meta-analysis of class size effect on student achievement, obtaining similar results, and, through their modifications, eliminating some of the troublesome factors of Glass's randomness,

"linearity," and diverse class sizes. Hedges and Stock produce a four-dimensional graph which describes more thoroughly the dynamics involved with class size differences and achievement. Applying this new formula of analysis requires disregarding cases which are biased or which have insufficient information. Hedges and Stock claim their modifications are "sensitive to the amount of information upon which the individual effect size estimates are based, that is, larger or smaller degrees of freedom, [whereas Glass's] procedure is not" (Hedges and Stock 1983).

Glass himself, in a calmer tone than the one he used when responding to the ERS, tries to explain some of the problems that consistently arise with regard to his technique of meta-analysis (Glass 1982). He describes the benefits of meta-analysis—quantification, objectivity, and general conclusions—and argues against the assumption that one must compare similar studies or be guilty of matching apples and oranges. He insists that researchers are safe and correct to compare differences; that even when the research is less than perfect, the results of a study should still be considered and can contribute to significant findings. Other critics have accused Glass's results of being biased by the medium—journal, book, thesis, or dissertation—in which the different data were found. To this, Glass replies that a meta-analyst must collect all available literature and then adjust for the different publication (and other) biases. Glass admits that meta-analyses are carried out on lumpy sets of nonindependent data, and he expresses the need for averaging the results of similar conditions for the purposes of condensing variables.

Several other studies of the effects of class size on academic achievement either support the null hypothesis, as does the South Carolina project, or find only limited effects of class size on achievement. Woodson (1968), for example, finds that small classes produce higher achievement for low-ability students and reading classes, but that in most math classes, better achievement is produced with large classes. He finds class size to be a less important factor of achievement in higher grades than in lower grades.

The District of Columbia Public Schools (1978), using scores on the Prescriptive Mathematics Test as data, finds no significant or consistent effect of class size on the average percentage of posttest objectives mastered in mathematics.

De Angelis (1977) finds no significant effect of class size on achievement in a secondary school science laboratory, but his study lasted only for six months, with De Angelis himself teaching both sections (forty-six students and twenty-three students) of the study, using the same method for both. The brevity of the study and the fact that De Angelis's teaching

did not account for the changing environment are reasons to question the validity of this finding of "no significant effect." But his study is an illustration of the importance of both longitudinal and methodological adjustment in order to notice advantages that other studies attribute to small or large classes.

Lindsey (1974) determines that the three most important variables in the interrelationship of class size, hours of instruction, and achievement are (a) the socioeconomic class of the student's family, (b) the student's program of study, and (c) the student's sex. Though achievement in academic programs (in the study he examined) was unaffected by class size, Lindsey finds that the achievement in vocational and general programs in seven different countries increased as class size increased, to peak achievement levels at optimum class size and hours of instruction. These levels varied, depending on the student's sex. In some cases, girls in Scotland for example, there was no ceiling on optimal class size—the larger the class, the better the performance—whereas for boys in Scotland, there was an optimal class size of approximately twenty-nine, around which either larger or smaller classes produced poorer achievement. Since his findings are observational rather than experimental, Lindsey warns that factors other than size, factors that he had not controlled for, could be causing the achievement differences.

In a later article coauthored with Cherkaoui, Lindsey adds that students of lower socioeconomic status seem to benefit more from large classes than from small ones, perhaps because the teacher is less likely to speak in a fashion unfamiliar to students with a nonstandard language base. The communication from teacher to student will be clearer as the teacher considers a larger audience, which is likely to be more diverse, and which, therefore, will demand more careful communication (Lindsey and Cherkaoui 1975).

In one of the few studies focusing on English instruction, McDonald (1980) reports that a class size of no more than fifteen improves student achievement in writing by increasing the amount of feedback the student can receive and the amount of rewriting and revising that can occur under supervision.

Since 1970 or thereabouts, there have been some significant studies of the effect of class size on student achievement. But because of the multitude of variables at work around this issue, the results of studies have been either questionable and unreliable or inconclusive and virtually useless. Such is not the case with studies of class size effect on conditions of teacher morale, student attitude, and overall classroom quality.

Class Size Effects on Quality: A Report of Studies

One of the reasons for improved academic quality in smaller classes is that teachers do not have to operate under the limitations imposed by larger classes. For example, in smaller classes, teachers are better able to diagnose student problems and needs, since they are more likely to know each student personally. Therefore, they will be better able to fit a cure to the diagnosed problems than they would be in a larger and more impersonal class (Noli 1980). For the same reasons of intimacy, the teacher of the smaller class can offer more substantive and helpful feedback than can the teacher of a larger class (Noli 1980; McDonald 1980). Furthermore, because there are fewer discipline problems in smaller classes, there is more instruction time per class period (Noli 1980).

If one can assume that learning and educational quality are directly proportional to the time engaged with learning activities, then the smaller class, with its increased "on-task" time for students and increased attention from teachers, would seem superior to the large class, which may not provide as many of these educational conditions. Small classes allow proper conditions for "teaching to mastery" by setting the "parameters" (cf. Bloom et al. 1956) on how much mastery learning can occur. Furthermore, teachers in smaller classes have higher levels of expectation, which often produce higher student morale and performance (Noli 1980).

Some other generalizations about the qualitative effects of class size are reported by Beckner et al. (1978). They find that teachers use a wider variety of instruction in smaller classes than in larger classes. Also, students benefit from individual instruction and from more creative work and divergent thinking processes, both of which can be encouraged and monitored in smaller classes. Further, teachers of small classes are able to teach basic skills and subject mastery better than teachers of larger classes. Finally, Beckner and her colleagues, like other researchers, note that teachers' attitudes are better in small classes than in large ones.

Squires (1980) notes that among other "indicators of effectiveness" in schools are a low number of discipline problems and a teacher's "extensive contact with a limited number of students in several aspects of their education."

A report by the American Federation of Teachers (1973) states that small classes are necessary for individualization of instruction; individualization, in turn, being necessary to better meet learning needs, especially in elementary school.

Using a tool called "Indicators of Quality" as the criterion for judging classrooms, Olson (1971) finds that the lecture format of instruction

produces the poorest classroom quality in both elementary and secondary schools. Small-group work, however, produces the highest scores. Likewise, quality scores decrease as class size in both elementary and secondary schools increases. The scores reflect a classroom's quality on four criteria: individualization, interpersonal regard, group activity, and creativity. Olson points out, however, that quality is directly affected by educational activity, implying that class size indirectly allows for different activities, the suitability of which varies with academic subject, student demographics, and other contextual values. He also adds that the use of paraprofessionals enhances classroom quality in elementary classes, but that in secondary classes where more than one adult is present, quality scores are consistently more than 3.0 points lower.

In a meta-analysis of classroom processes and quality, similar to that of achievement due to class size, Glass, Smith, et al. (1979) find significant evidence that smaller classes provide for greater teacher knowledge of pupils, better student-teacher interaction, greater variety of instructional activities, more small-group work, greater teacher directiveness, more positive teacher control, more creative instruction, more frequent conferences with parents, more material covered, more positive evaluation and feedback, better use of space, and better general quality of instruction.

The results of Filby et al.'s (1980) study connect smaller classes with easier classroom management; fewer discipline problems and less teacher anxiety; less time wasted; greater teacher "with-it-ness"; greater ease in monitoring classroom activity; less summative and more formative evaluation; a greater amount of hands-on learning activities in the form of class trips and science projects; more time for poetry, work folders, story writing, games, labs, nature walks, and so forth; and, in all, greater teacher accuracy in diagnosis and monitoring.

Although the teacher plays an important role in establishing the quality of a class, it is the students who receive the benefits of that quality and who, by their behavior, contribute the most to setting the level of that quality.

Just as smaller classes allow more intimate student-teacher interaction, so do they affect relationships among students, providing, theoretically and according to some researchers, for more cooperation between students and more peer teaching (Noli 1980). Although Ward (1975) argues that there are no significant results to support the belief that smaller classes produce better student attitudes, other studies have directly connected class size with positive attitudes for both teachers and students (Beckner et al. 1978; Squires 1980; Glass, Smith, et al. 1979; Filby et al. 1980).

Whether or not attitude changes arise from class size changes and changing interpersonal conditions, other directly academic results can occur from modifying student interaction. Students learn group behavior, leadership, and participation skills in small classes better than they do in larger classes (Beckner et al. 1978); interpersonal regard is better in small classes than in large classes (Beckner et al. 1978; Olson 1971); and smaller classes usually offer a better opportunity for attaining goals (Beckner et al. 1978). Further, when students believe that they can succeed, that they can get ahead without being unfairly held back, their performance and progress are better (Squires 1980).

Olson (1971) reports that "any way one tries to slice it, small classes produce significantly higher scores [on the "Indicators of Quality" criteria] than large ones." In smaller classes, students show more creativity, participate more in group activity, and have more individual contact with teachers and other students.

Filby et al. (1980) reiterate these findings, but warn that quality judgments are often subjective and call for greater care in considering the factors of positive classroom quality. They say that a smaller class size, among other things, can cause students to pay greater attention to academic tasks; be more actively involved in class lessons; participate more; and demonstrate greater self-control, respect, and responsibility toward other students.

Smith and Glass (1979) find that, according to previous studies, smaller classes have a positive effect on student attitude, individualization, and participation. These effects in turn produce better study habits, greater student directedness and engagement, more interest and enthusiasm, better self-concepts, and better attitudes toward teachers, school, and class.

Another element which contributes to the quality of classroom process, and which is also related to the effects of class size, is classroom density, or crowding. Bushnell (1978) has found that students who are highly anxious perform significantly better on exams in small classes. He pretested students for a general disposition toward anxiety, determining them to be either highly, marginally, or minimally anxious. Then he analyzed the exam scores of these students in a large, heavily populated lecture hall and in a small, not-so-heavily populated laboratory environment. The scores of low- and high-anxiety students in the large, dense class differed by approximately twenty points on the average, while the mean difference between the scores of high-anxiety and low-anxiety students in the smaller class was not statistically significant. Marginally anxious students scored over twenty points lower on exams when sitting directly

adjacent to a highly anxious student than they did otherwise. Even students with low levels of anxiety performed slightly better in smaller, less dense classes than they did in the larger, more densely populated classes. In short, all of the pupils in Bushnell's study reacted negatively to the distracting effect of crowding.

Weldon and colleagues (1981) expound on the phenomenon of crowding as a component of the class size/class quality issue. Their results differ from Bushnell's in that they find that the *perception* of crowding, even in small lablike classrooms, causes as much stress, and an equally unsuccessful academic experience, as does the large lecture hall. Weldon offers a counterargument to those favoring greater interaction as a small class benefit: "If increased interaction implies increased competition for resources, then perception of crowding increases." But he adds, "if increased interaction implies increased cooperation, then perception of crowding decreases." In spite of all the ostensible advantages for instruction in small classes, Weldon notes that even tutorials may suffer from the effects of crowding. Group size is less important than group dynamics; if there are fewer students, but those students are constantly violating each other's space and jockeying for the teacher's special attention, then the class will suffer as much from crowding as will a class three times the size.

Some Particularly Comprehensive Studies

There have been several studies performed since 1970 which speak to both achievement and quality in different class sizes. The most remarkable of these studies—remarkable because of its combination of thoroughness, control, and startling content—is the one performed in Ontario by Stan Shapson and his colleagues (1978). In this study, the researchers created balanced and heterogeneous classes of sixteen, twenty-three, thirty, and thirty-seven students, who were all pretested for achievement. They also pretested the participating teachers for expectations of classroom quality and student achievement, and for ways that they would alter methods for the smaller classes. The teachers were then observed during the year to compare their expectations and beliefs with their actual behavior. The researchers also tested parents' expectations about the effects that the smaller classes would have on their children.

The evaluation of students included standardized achievement tests, analysis of art and composition samples, and questionnaires on attitudes and self-concepts. The study was run over a period of two years, with a shifting of class size and teacher population after the first year to make sure no teachers or students participated in the same-sized classes for two

consecutive years. (The same students and teachers were used both years, but they were moved to different classes.) The students were in grade four the first year of the study, and grade five the second. The methods of analysis were Olson's "Indicators of Quality," the Toronto Classroom Observation Schedule, the Canadian Test of Basic Skills, the New York Self-Concept Inventory, and questionnaires prepared for determining teachers' and parents' expectations (Shapson et al. 1978).

The first phase of the results—teacher and parent expectation—proved that these individuals were confident that a smaller class size would have a positive effect on students. Teachers expected greater individualization and involvement, more special attention, and a more relaxed classroom tone in smaller classes. They expected larger classes to be more rigidly controlled, less individualized, and more restricted, and they believed that their teaching strategies, their use of floor space and audio-visual aids, and their effectiveness in student evaluation would all be improved in smaller classes. There was the assumption, also, that smaller classes would produce better student achievement. The expectations of parents were similar to those of teachers.

As the years unfolded, however, there was only a small effect of class size on overall achievement, with significant benefits occurring in the learning of mathematics concepts in classes of sixteen students. Performance in math concept learning was significantly less in classes of thirty than in classes of sixteen. Achievement was also less in classes of twenty-three and thirty-seven, but the differences were not significant. There was no other significant effect of class size on achievement, either in art, composition, vocabulary, reading, or math problem solving.

There was no significant effect, according to the "Indicators of Quality," of class size on amount of individualization, interpersonal regard, creative expression, or group activity. No pupil participation variables were affected by class size. Pupil satisfaction, self-concept, and attitude toward school were also unaffected by class size. Although the number of pupils addressed individually was higher in classes of sixteen than those of twenty-three, thirty, or thirty-seven, none of the other variables for teacher-pupil interaction, such as lecturing versus other teaching methods, or amount of teacher policing behavior, was affected by smaller classes. In fact, if any result occurred in terms of instructional method, it was that lecturing was used less frequently in classes of thirty than in any other class size. Reading occurred more frequently in classes of sixteen than in classes of thirty, but there was no other relationship of class size to subject matter noticed by the researchers.

The most interesting point of the Shapson study is their finding that teachers, even after the two years of the experiment, still indicated that

they believed they had significantly altered their methods of instruction, their use of special teaching aids, and their amount of teacher-pupil interaction and individualization, even though observation proved that no such alterations had taken place. Teachers' expectations, attitudes, and perceptions seemed, among all the other class size variables, the most, and almost the only, strongly affected factor in the academic environment. Granted, a good teacher attitude is not harmful, but other studies have shown that class size, though it may affect teachers' attitudes, does not affect actual teacher behavior (Oakley 1970). And a teacher's preference for small classes will not have any direct, positive effect on the students in those smaller classes (Woodson 1968).

Wright et al. (1977) report this same Ontario class size study, mentioning as a rationale for the study's variety of approaches that one should be concerned not only with achievement test scores but with conditions under which pupils learn. They emphasize that class size questions are really questions of teaching method: of purposes, goals, and executions.

One flaw in the study reported by Shapson et al. (1978) and Wright et al. (1977) is that by changing classes after the first year, the researchers lose the important factor of longitudinal adjustment, pointed out by other studies. Another possible flaw in the Ontario research is that their actual class sizes vary, so that what is called sixteen may range from twelve to twenty; likewise "twenty-three" may range from twenty to twenty-seven, and so on. Comparisons between classes that show no significant differences may, in fact, be comparisons between two classes of the same size.

Other studies have confirmed the confusing role of class size in overall educational experience. A study performed on Edward W. Clark High School students in Las Vegas found that there was no significant effect due to class size on academic attainment or satisfaction with learning environment for classes in Business Law or Introduction to Business. There was also no significant difference in student satisfaction due to class size in U.S. Government classes, but smaller classes had an apparent positive effect on academic attainment (Edward W. Clark High School 1968).

McKeachie (1971) finds that, although smaller classes seem to promote retention, critical thinking, and positive academic attitudes, larger classes allow more room for a teacher to exercise his or her imagination because the greater number of students allows the teacher to use more combinations of instructional approaches. McKeachie also finds that combining discussion with lecture produces the most positive academic and attitudinal results in students, depending, he adds, on the method of testing and on how the student is, and expects to be, evaluated.

Cheatham and Jordan (1976) find that smaller classes (twenty) are more desirable for performance-oriented courses (foreign languages, English composition, driver's education, and speech communication, for example), and that students in large classes (eighty) do well with a lecture/exam format. They find that a class size of approximately forty, as compared to classes of twenty and eighty, is the least desirable in terms of success in either performance or exam scores.

Based on the beneficial effects of combining size conditions, as reported by McKeachie (1971) and Cheatham and Jordan (1976), Weber and Hunt (1977) have determined that a large class which practices small-group work in special sessions would gain the benefits of both sizes, satisfying, as well, concerns about the cost of creating smaller classes in public schools.

Somewhat contrarily, O'Donnell (1977) recommends reducing class size early on, in the elementary years, to prevent some of the academic problems that occur in secondary schools. It is in the secondary schools, where the student populations are larger, that the need for smaller remedial classes would most severely disturb the already fragile demographics of teacher and space availability. Using smaller classes in elementary school is, economically, less harmful, and serves as an active measure for academic achievement, rather than a reactive measure, which, unfortunately, often comes too late to help those who need it most.

Conclusion

The effects of class size on achievement and classroom environment are not as simple or as uniform as one might think. But with a thorough understanding of particular class size factors and reactions, coupled with directional and diverse training, teachers can confront different classroom environments with the possibility of optimal academic success. Given teachers who are prepared, intelligent, versatile, patient, and dedicated, we will be able to study the effect of class size on student achievement and classroom quality more fruitfully.

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