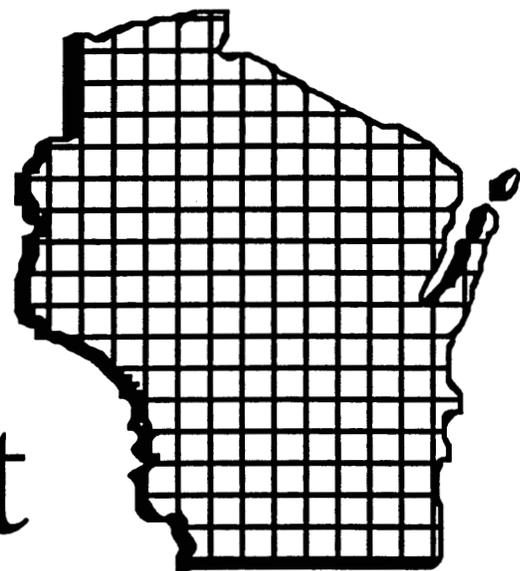


Wisconsin

Policy
Research
Institute

Report



May 1991

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**CHALLENGING
OUR BRIGHTEST
STUDENTS:**

*A REGIONAL HIGH
SCHOOL OF
EXCELLENCE*

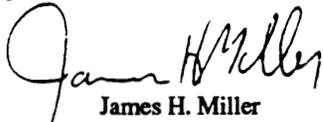
Report from the President:

While no one doubts that the problems in Milwaukee's public schools are very serious, there is still the remaining question of what happens to children in other schools and, more importantly, what happens to our brighter students. If we are to thrive economically and educationally, there is no question that when we enter the 21st century our brightest students are the ones who will have to compete successfully with the brightest students from other countries. International studies have shown that our brightest students trail their peers in other countries, as do the rest of our students. However, few states have done so little for their brightest students as Wisconsin. We have completed several studies that indicate that Wisconsin to a large degree has failed to provide a challenging curriculum for the brightest students in the state.

The purpose of this study was to develop not just comparative data between Wisconsin and other states but a rationale for developing a high school that would indeed challenge our brighter students. Professor Sammis White, of UW-Milwaukee, and John Wagner, a researcher at the Institute, spent almost two years on this project. They looked carefully at existing programs around the country and developed an idea which may be very timely for Wisconsin. The idea of magnet schools or high schools of excellence is hardly new. A number of states have built residential high schools for gifted students. In the mid-1980s, Governor Mario Cuomo of New York made the issue of high schools of excellence a centerpiece of his educational program. One of the major reasons why states have taken such an interest in these types of high schools has been that they not only challenge their brightest students academically, but they serve as a beacon for public education throughout the state. Such schools would also make a serious statement to the business community that, educationally, we are willing to challenge our brightest students.

Critics who point out that these types of schools are elitist are missing the point. The purpose of public education ought to be to allow each child to reach his or her full potential. That is what a merit school would do. It would challenge our brightest students, and enable them to develop fully their intellectual talents. While individuals may point out that some high schools have existing programs, in many instances they exist only on paper and admission is by chance, not merit. The fact is that few students in the Milwaukee area are provided with challenging curriculums. A merit school would solve that problem. As indicated by White and Wagner, a merit school would also promote integration. We need a school where our best students are challenged and produce the kinds of results that will make a case for excellence in education not only in southeast Wisconsin, but in the rest of the state as well. If Wisconsin is to prosper in the 21st century, the emphasis must be on quality education. This is an idea that has been implemented in other states and it is time that Wisconsin consider seriously whether or not it should leap into the 21st century or just continue with the status quo.

Finally, we would like to thank the Center for Talented Youth at the Johns Hopkins University for their guidance and data and the Norman Bassett Foundation, which gave us funding for this project.


James H. Miller

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Challenging Our Brightest Students: *A Regional High School of Excellence*

by

Sammis B. White, Ph.D.

and

John A. Wagner

TABLE OF CONTENTS

Executive Summary	
Introduction	1
Education for Talented Youths	4
The Situation in Milwaukee	6
Our Proposal	12
Common Questions	14
Conclusion	33
Appendix	

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Challenging Our Brightest Students:
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EXECUTIVE SUMMARY

Unfortunately, one of the most neglected segments of our student population continues to be left out of the debate on education reform. Throughout the nation, and certainly throughout our state, programs for students who are academically gifted and talented are inadequate, if indeed they exist at all.

It is ironic to find out that students possessing the most promise are also the most-neglected in terms of both resources and attention. There is much discussion about the failures of our current education system in effectively teaching minority students, poor students, and inner city students. While attempts to focus on these populations of students is necessary and long-overdue, we must not neglect the gifted student--regardless of his or her race, economic status, or residence. By addressing the educational needs of gifted students, cutting across ethnic and socio-economic status, the state will be focusing needed resources on a segment of the population that has the greatest potential to benefit the community, the state, and the nation.

In this report, we propose the establishment of a "merit high school" or a "high school of excellence," with a rigorous curriculum focusing on science and mathematics--two disciplines in which even America's best students are woefully ill-prepared. What would differentiate this proposed high school from area "magnet" high schools would be the admissions criteria, based solely on academic potential, and its total commitment to academic excellence. The school would serve all school districts in the four-county metropolitan area. It would educate about 1,000 students per year. It would be funded by a combination of state and local district revenues, supplemented by corporate and non-profit donors. It would be governed by a new independent board, composed of state and local education officials, business representatives and other private citizens. And it would also draw together the public, private, and nonprofit sectors, all of which have a critical interest in ensuring that Wisconsin has some of the best-educated citizens and workers available.

In this report we assess the general programs presently available to academically talented students in Milwaukee-area high schools. We focus on the availability of Advanced Placement (AP) courses and examinations. AP courses contain a standard curricula, are taught across the nation, and consequently have been used by many colleges and universities to derive some notion of the quality of high schools. We conclude that Milwaukee-area students are largely deprived of the challenging curricula available elsewhere in the U.S.

We also examine other "merit" schools throughout the country that have a proven record of educating some of our nation's brightest high school graduates. We have conducted several interviews and have examined much of the literature on "merit" schools in order to address many of the questions on this subject. These questions and their responses comprise the second part of this report.

Given the failure of our current approach to education in meeting the needs of so many differing subgroups of the student population, it is time to rethink how we educate them. Our proposed solution, greater segmentation of the student body into schools that can address their specific needs and potentials, seems appropriate. A magnet, merit high school for the gifted and talented youth in the Milwaukee area is a critical segment of this solution.

INTRODUCTION

In recent years there has been renewed interest in improving the quality of elementary and secondary schools in this country. There is widespread agreement that our schools are failing a large percentage of the current student body. Employers need an increasingly literate work force, but they are receiving a decreasingly literate work force. Our high school graduates cannot compete in the job market, our worst students are both illiterate and unemployable, and America's best students do poorly in international comparisons. The dismal performance of our nation's students--and future leaders--is cause for much alarm and warrants an analysis of the shortcomings of our current system of public education. Debate continues as to how to remedy this situation.

Efforts for reform stem from the realization that a single, monolithic system of education is unable to address the educational needs of all of our students. One avenue that is being overlooked is currently revered in the business community: niche serving. Most successful businesses today are successful because they have identified niches in the marketplace and are serving those niches. The analogy for the schools is that if schools are to be successful, they too must target certain niches. This analogy suggests that some schools should target gifted and talented students, other schools should focus on students who are most likely to continue with vocational training, some schools should focus on students with college potential but who are not the very brightest, and so forth. There is a need for all of these types in the work force, but their preparation is likely to involve some different material offered at different paces.

Given the failure of our current approach to elementary through secondary education in meeting the needs of so many subgroups of the population, it is time to rethink how we educate them. We have created, at times after court insistence, special programs for some student subgroups such as those with exceptional education needs. But we have largely ignored other subgroups, especially in Wisconsin. We suggest in the pages that follow that one option that should be explored in the Milwaukee area is a merit high school for math and science, two areas in which we sadly lag behind other parts of the country and most of the rest of the industrialized world. These academic areas are important enough to be singled out by President George Bush and the National Governors' Association, with a stated national goal of making U.S. students the first in the world in mathematics and science achievement by the year 2000. This sentiment is echoed by the recommendations put forth by the Wisconsin Commission on Schools for the 21st Century which calls for a "stronger emphasis on science, mathematics, and technology." The commission continues on to state that "specific learning outcomes in science, mathematics, and technology should be assigned a high priority."¹

This recommendation for a merit school in science and math is not to say that other parts of the education system do not need reform. Quite the contrary. A greater segmentation of the student body into schools that more appropriately fit its diverse needs is very much in order. The prescription for such a system is more than can be covered in this report.

¹Commission on Schools for the 21st Century, A New Design for Education in Wisconsin: Schools Capable of Continuous Improvement, State of Wisconsin, December, 1990, pp. 14, 29. It should be noted that the Commission is recommending such a priority be made for all students, and not just those gifted in the areas of mathematics and science. However, it does recommend that the state should "develop six summer institutes each year for high ability students that would stress integration of science, mathematics, and technology through course work and interaction with scientists, mathematicians, and engineers," acknowledging the lack of current opportunities for such students, p. 30.

We are proposing but one of several changes which our system of public education must undertake if it is to educate all of our students to their full potential.

JUDICIAL AFFIRMATION OF SPECIAL EDUCATION PROGRAMS

Although our founding fathers declared our rights to "life, liberty and the pursuit of happiness," no mention of education is expressly made in the U.S. Constitution. However, as the U.S. Supreme Court ruled in 1954 in the famous case of *Brown v. Board of Education*, "In these days, it is doubtful that any child may reasonably be expected to succeed in life if he is denied the opportunity of an education. Such an opportunity, where the state has undertaken to provide it, is a right which must be made available to all...."²

Few would deny the important role that education plays in the future of our children, our state, and our country. But what is the importance of defining education as a *right*, as indicated by the Supreme Court ruling?

It is interesting to note that this Court ruling was the basis for a subsequent lawsuit that led to the passage of federal law, stipulating that handicapped children not only had a right to education, but a right to an *appropriate* education that was best suited to their needs. With the passage of Public Law 94-142 in 1975, the parents and teachers of every handicapped child are required to develop and implement an Individualized Educational Program (IEP) that achieves that end.³

Federal law recognized the specific needs of a certain subgroup of the student population and mandated action to meet those needs in providing an education. Similarly, we have seen local efforts that attempt to address the particular needs of other student subgroups: support for increased funding of vocational education programs for students not interested in traditional, college education; the "Milwaukee choice plan" for low-income, inner-city students; and the proposal to establish two all-male, all-black middle schools for African-Americans in Milwaukee.

And elsewhere, individuals have demanded programs tailored to the specific needs of certain students. When such programs have been denied or continued to remain inadequate, individuals have successfully turned to the courts for their provision. Illustratively, similar to the Supreme Court decision affirming the rights of handicapped children to specialized instruction, the Pennsylvania Supreme Court recently ruled that the Centennial school district was required to provide accelerated mathematics and reading instruction for students who could perform beyond the already existing enrichment programs.

Historically, the court has recognized the vital role that education plays in allowing children to become productive, equal members of society. Denying one an education is tantamount to denying one the ability to succeed in life, to be free, and to be happy.

²*Brown v. Board of Education*, 347 U.S. 483, 493, 73S. Ct. 686, 691, 98 L. Ed. 873 (1954) as cited in 348 F. Supp. 866 (1972).

³For a discussion of the influential decision of *Mills v. Board of Education* and the provisions of Public Law 94-142, see Erwin Levine and Elizabeth Wexler, *P.L. 94-142 An Act of Congress*, (New York: Macmillan Publishing Co., 1981).

Cannot the same be said today, in an exponentially more complex, internationally competitive society than when this decision was first written? And in this context, how are we faring in the provision of such a right?

AMERICAN EDUCATION IN AN INTERNATIONAL COMPARISON

Many studies have documented the dismal showing of American students in international competitions. Especially in the areas of science and math, students from the U.S. continually rank at the bottom of the list. In 1988 the International Association for the Evaluation of Educational Achievement at Oxford evaluated elementary and secondary student achievement in seventeen industrialized countries. The U.S. ranked in the bottom half of all grade levels, even as low as thirteenth of 13 at the high school level. In one of the most popular science courses in high school--biology--American students ranked last, behind countries like Singapore, England, Hungary, and Poland. Similarly, U.S. students ranked eleventh of 13 on a chemistry achievement test and ninth in physics.

And science isn't the only field in which American achievement is alarmingly low. The Educational Testing Service surveyed mathematical skills and reported that Korean 13-year-olds were twice as successful as U.S. students in solving a two-step problem in arithmetic, such as determining a simple average. Studies at the University of Michigan showed similar gaps between U.S. and Chinese students. And other research has illustrated that the average 12th-grade Japanese student has a better command of mathematics than the top five percent of his or her American counterparts.⁴ The brightest students in the United States aren't even performing at the *average* Japanese level. Clearly even America's best are not measuring up to international standards.

WISCONSIN EDUCATION IN A NATIONAL COMPARISON

Normally, Wisconsin citizens are placated with numbers that show Wisconsin to be in the top of the list in students' test scores on the American College Testing program (ACT) and the College Board's Scholastic Aptitude Test (SAT).⁵ Even if Wisconsin students truly are leaders in SAT or ACT comparisons, many studies, like those just cited, indicate that even our best students don't measure up to the average students in many other countries. As noted by a study on science education in Wisconsin, the difference in science ACT scores between states is miniscule compared to the large differences in international test scores. That study examined students' aptitudes in physics to illustrate the general problems in science and math as a whole. The authors of the study point to the fact that "physics is the foundation for all branches of engineering and many industrial technologies," usually the introduction into the professional careers upon which the future of the United States will rest. The results of the analysis showed that 80 percent of Wisconsin high school students do not study physics during their secondary education, and in high schools with fewer than 500 students, 60 percent do not offer physics courses at all.⁶

⁴As cited by "Not Just for Nerds," Newsweek, April 9, 1990, pp. 52-53.

⁵See, for example, "Wisconsin Students Excel on ACT, SAT," Wisconsin Department of Public Instruction, September, 1987, as cited by William G. Durden, Wisconsin's Shrinking Educational Advantage, Wisconsin Policy Research Institute Report, vol. 2, no. 6, October, 1989, pp. 6-15.

⁶Hector MacDonald and K. Schlager, An Entrepreneurial Approach to Science Education, Heartland Policy Study No. 27, August, 16, 1989, p. 3.

Clearly there is a problem in our system of public education. Our focus is not to solve the whole problem, but to address one specific concern that immediately faces the future well-being of our state: the lack of educational challenge for talented students, specifically in math and science. Again referring to the recent report by the Commission on Schools for the 21st Century, the commission's members recognized the lack of opportunities for those gifted in science and math by stating: "Academic achievement leading to mastery of learning outcomes and careers in science, mathematics, and technology should be a special goal of state leadership." The commission went on to call for the establishment of "six summer institutes each year for high ability students that would stress integration of science, mathematics, and technology." The commission also recommended that the state develop a residential high school for up to 1,000 students interested in these academic disciplines, with financial contributions from private industry.⁷

But why establish programs for the academically gifted? Ironically these students--those who seem to possess such great potential--are subject to the largest achievement gap within our current public school structure today.

This is not to say that the areas of mathematics and science are the only important fields of study. Equally lacking in this country are programs that successfully instill within our students an appreciation of--indeed excellence in--Western civilization, history, literature, and art. To say that a rigorous program in science and math is needed is not to say that it should be so narrowly devised as to neglect a curriculum that also includes civilization, history, art, and literature, since nationally and locally, students do worse on verbal than quantitative national exams. Again, our proposal is to afford all students the opportunity to partake in an educational program that focuses on the needs and interests of varying subgroups of the total student population--in this case, for those gifted in science and mathematics.

EDUCATION FOR TALENTED YOUTHS

As reported by Dr. William Durden, an expert in gifted education with the Johns Hopkins Center for Talented Youth (CTY), the academically talented are the most neglected students in our schools today. He cites a study by the National Commission on Excellence in Education which reported that over fifty percent of the academically talented youths in the U.S. do not match their potential with comparable achievement. At a time when such promise should be encouraged and nourished, such a resource is forever lost by what the Commission referred to as "a rising tide of mediocrity."⁸

To combat such a loss to society, the CTY has established an identification and academic program for gifted youth. Since its inception in 1979 until 1986, over 150,000 academically talented adolescents have been identified.⁹ There is no reason to believe that Wisconsin has fewer gifted students than any other state. The next logical question becomes: "How are these students in Wisconsin being served?"

⁷Commission on Schools for the 21st Century, op. cit., pp. 29-31.

⁸As cited by William G. Durden, "Summer Initiative for Talented Junior High/High School Students in New York State" *unpublished manuscript*, December, 1986, p. 2.

⁹*Ibid.*, p. 3.

Unfortunately, the answer to this question is that these students aren't being served. The dearth of opportunities for Wisconsin's brightest youth is frightening. Indeed, the gap between academic promise and achievement is profound, representing a wasted resource that can never be retrieved. Such a waste can only exacerbate an already dismal academic climate. In October of 1989, the Wisconsin Policy Research Institute reported in "The Internal Brain Drain Reexamined" that:

The state continues to be threatened by a fundamental and deep-rooted 'brain drain' which Wisconsin in 1989 still appears to not understand or be willing to combat imaginatively and with all resources available..... The threat is an internal 'brain drain' and shrinking advantage, occurring much earlier than university study and systematically restricting a high proportion of Wisconsin's bright and talented youth to the unspent development of their talents and abilities. By the time university study is even a possibility the damage has been done. Through a lack of directed and sustained attention to the precollegiate level of education, the maximum number of bright youth who could potentially contribute to the enhancement of the social, cultural, and economic climate and development of the state and who could become its most talented citizens is already rendered unprepared for the challenges they will face.¹⁰

Not only is society robbed of these individuals' contributions, the students themselves are being deprived of achieving their full potential due to the failures of the public school system. These very individuals who show so much promise are often not even going to college, and some drop out of school altogether. Why? Because there are no programs specifically for gifted students that help them succeed or challenge them enough to reach their potential. These students often leave the public school system out of boredom and frustration.

This drop-out dilemma is not indigenous only to Wisconsin. When researchers noticed a similar situation in North Carolina, they found that "peer pressure upon some of these [gifted] students results in their becoming 'misfits'--i.e., they deliberately perform below their potential because they do not want to seem too bright or because they are bored."¹¹

Before examining what programs have been successfully established in other states, it is important to answer a more fundamental question: "Why help the academically talented?" Several answers are in order.

First of all, as cited above, gifted students are the most neglected segment of our student population today. The gap between fulfillment and potential is enormous and, from an ethical standpoint, should be addressed.

Second, this gap represents an enormous waste to our community, state, and country. The academically talented students are our most promising citizens who, if given the appropriate opportunities, can make major cultural, social, scientific and economic contributions to society. If even our brightest students can't compete on an international scale, how are we going to be able to address the inadequacies on a lower level?

¹⁰Durden, Wisconsin's Shrinking Educational Advantage. op. cit., p. 4.

¹¹See the argument for a program for the gifted in North Carolina, as cited by Borden F. Mace, "Residential Public High Schools of Excellence," *unpublished manuscript*, October 13, 1986, p. 46.

Third, other segments of the student population have programs that address their needs; so too should there be programs suited for the gifted. When such programs have been missing, other students have successfully taken the matter to the courts which have reaffirmed the right to an appropriate education.

Fourth, programs for the gifted have spill-over effects that benefit the communities in which they are located. Internships for teachers, summer workshops for students and teachers, and positive community contacts are all benefits of programs that are established for academically talented students. In addition, when recruitment for such programs and schools is done across political, social, and economic boundaries, a diversified group of talented students is brought together, thus having a positive effect on urban problems such as segregation. Such benefits will be examined in greater detail in the pages to follow.

Finally, there is strong evidence from other states that the creation of high schools specifically for gifted and talented students do yield enormous benefits to the state, to the state higher education institutions, to gender as well as to racial equity issues, and to the students who participate.

For these reasons, this study proposes the establishment of programs for the academically-talented student, embodied in a "merit high school" or "high school of excellence." On the following pages are responses to some of the questions that can be raised about this specific proposal and education for the gifted in general.

THE SITUATION IN MILWAUKEE

Currently there are no merit high schools in the state. Within the Milwaukee Public School (MPS) system, there are three types of programs for the gifted:¹²

- Magnet Schools: high schools with a theme-based curriculum in which many attending students participate;
- Career Programs: funded by magnet-school money but aren't necessarily located in magnet schools (e.g., high school computer science training, etc.);
- Programs for the Academically Talented (PAT): open to all qualified students in non-magnet schools, in kindergarten through eighth grade.

In Milwaukee, even the "esteemed" magnet schools do not recruit by ability; rather, admissions policies are set up on strictly a lottery-based system. In other words, admission has nothing to do with academic qualification; it is based on luck of the draw. Similarly, the Career Programs are available on the basis of interest.

Within the magnet high schools there are tracks which attempt to separate the most capable from the least capable. But the environment of the schools is still one of a broad spectrum of abilities, with a majority that do not stress academic achievement. The result is lower levels of achievement than the student potential dictates. At Rufus King High School, for example, the percentage of students scoring in the highest stanines on national tests has dropped successively for the past four years, largely as a result of the move to an open admissions policy. In the non-magnet schools, the curriculum is so weak that top students

¹²Identified by Jocklyn Smith, MPS Research Department, personal communication, October 30, 1989.

(valedictorians and salutatorians) have been reported to be unprepared for some of the weaker public colleges in Wisconsin.¹³ They are clearly not being educated to their potential.

In the Milwaukee suburbs there is a range in quality of high schools. It is difficult to measure their quality based on standardized tests like the ACT and SAT because some schools have many more students who take these tests than do other schools. But a common test used by colleges and universities today to derive some notion of the quality of high schools involves Advanced Placement (AP) test scores. AP courses, with a standard curriculum, are now taught across the nation. If schools become involved, they teach a pre-established syllabus. Students who complete the AP courses are then eligible to take the Advanced Placement exams. The scores range from one to five, with grades of three or higher usually carrying college credit. Thus, students can complete over one year's worth of college credits while in high school and receive advanced standing when they attend college. For admissions purposes, colleges look to see how many AP courses a student has taken and how well he or she has done on the exams.

To see how available such courses are in the Milwaukee-area public high schools, we contacted all of the schools for information on: (1) whether they offered AP courses; (2) which courses were offered; (3) how many students took the classes; (4) how many students took the exams; and (5) how well the students did on the exams during the 1988-89 school year. The results of our survey appear in Table 1.

In addition, Figure 1 illustrates the rates in which Milwaukee-area high school students participate in both the AP courses, if offered in their school, as well as the examination at the end of the course. To qualify for college credit, students must complete the exam, usually scoring a three or better.

As you can see, for the 1988-89 academic year, only 59 percent of public high schools in the area even offered AP classes. This means that students in those schools without the opportunity to take AP courses are not challenged in the same fashion as those at a place like Homestead that currently offers 13 different AP courses. Second, of those 30 schools that do offer AP classes, only five seem to offer six or more classes. (We received complete responses from only 22 of the 30 high schools, so the actual results may be slightly different.) Third, of those that offer AP classes, 19 offer AB or BC Calculus, common courses for those with math talents. Even fewer offer AP Physics (3), AP Chemistry (4), or AP Biology (9), not to mention Computer Science (5) (see Table 2). Students in a few schools--notably Homestead, Hamilton (Sussex), and Riverside among the publics and University School and Marquette among the privates--are offered a range of AP courses. (We cannot comment on Rufus King because until very recently it offered only a different but competitive diploma, the International Baccalaureate.) If we compute the number of public schools in which a student can take AP courses in math and the three sciences, the total is three. (For a distribution of the number of AP courses offered by Milwaukee-area public high schools, see Figure 2.)

¹³See, for example, Katherine Hicks and Mike Mulvey, "Did we learn enough?", Milwaukee Sentinel, April 25, 1988. In interviews with all of the 1987 Milwaukee public high school valedictorians, this five-part series reported that the students found themselves "ill-prepared" for college.

TABLE 1:

Distribution of Advanced Placement Courses and Students in Milwaukee-Area Public High Schools, 1988-89

Total Milwaukee-Area Public High Schools Surveyed.....	51
Schools Offering AP Courses 1988-89*	30
<i>% Offering AP Courses</i>	59%
Total Number of Junior and Senior Students enrolled in a High School with an AP Program (in 30 Milwaukee-area high schools).....	9,921
Total Number of Juniors and Seniors in High School with AP Classes that reported AP Class Size (22 Schools).....	8,539
Total Number of Students Enrolled in an AP Course.....	1,295
<i>% Enrolled (may include some students in multiple courses)</i>	15%
Total Number of Students who took an AP Examination.....	519
<i>% of Students at AP schools who took AP Examination</i>	6%
Total Number of Students who scored 3-5.....	387
<i>% of Students at AP schools who scored 3-5</i>	4.5%

* Note: According to a telephone survey, 30 schools offered AP courses in the 1988-89 academic year. About 25 of them responded to a written survey detailing their offerings. Of these, 22 gave full information on the number of students involved. For the calculations used in this table, we use only those schools that provided full information on their AP program, accounting for 8,539 high school students in the Milwaukee area.

**AP Participation Rates of Juniors and Seniors in
Twenty-Two Milwaukee-Area Public High Schools, 1988-89**

FIGURE 1

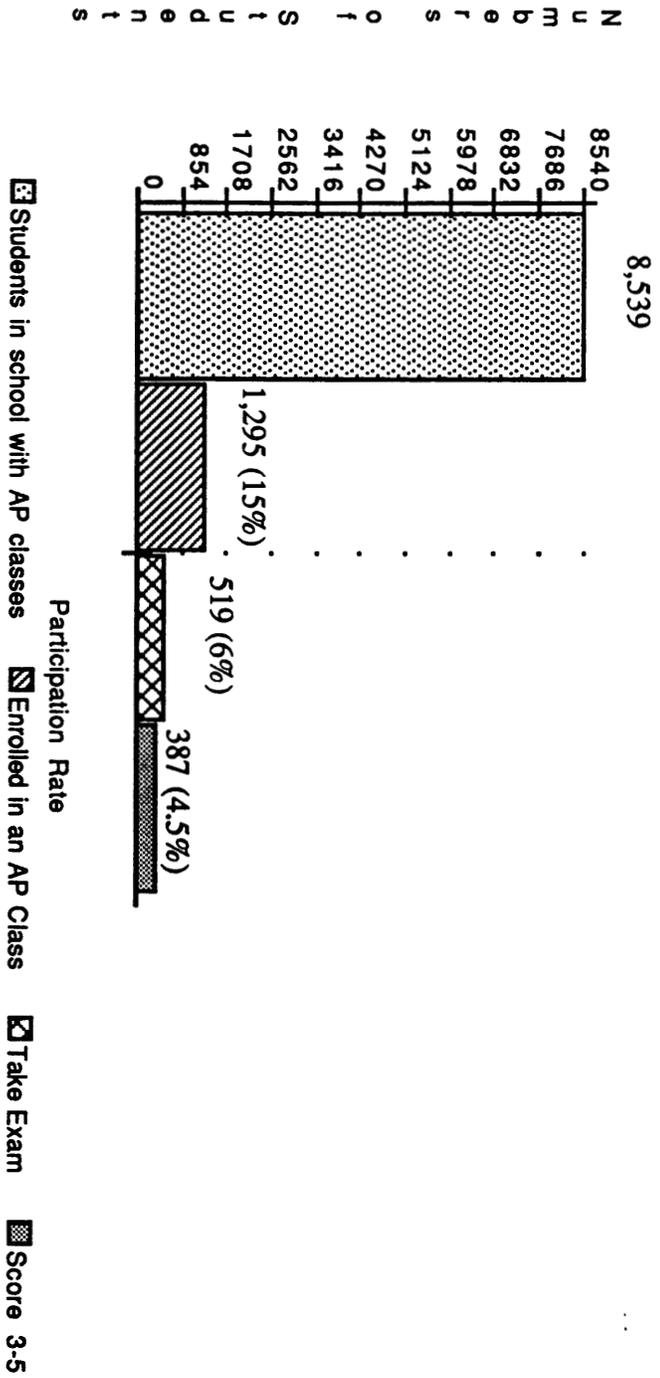


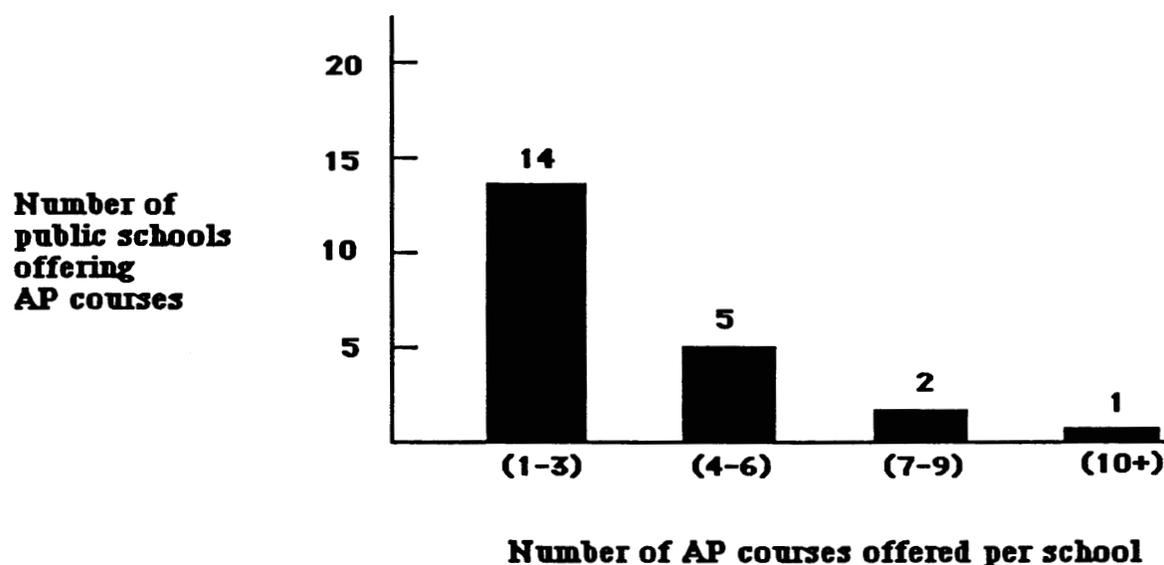
TABLE 2:

Distribution of Advanced Placement Courses in Milwaukee-Area
Public High Schools, 1988-89*

<u>AP COURSE TITLE:</u>	<u>NUMBER OF SCHOOLS OFFERING COURSE:</u>
Art: History/Drawing/General	1
Biology	9
Calculus AB	15
Calculus BC	4
Chemistry	4
Computer Science: A/AB	5
Economics: Micro/Macro	2
English: Language/Literature/Composition	12
European History	3
French: Language/Literature	4
German	2
Government & Politics: US/Comparative	1
Latin	0
Music: Listening and Literature/Theory	0
Physics: B/C-Mech./C-Elect., Mag.	3
Spanish: Language/Literature	3
US History	6

* Note: Two schools indicated that they offered a course in Calculus, although they did not specify whether it was AB or BC; one school offered an advance language course, although there was no indication of which language.

FIGURE 2 AP Course Offerings



Offering the courses is one thing; enrollments and successful completion of the exams is another. If we add up all of the students enrolled in AP courses in the 22 area schools that reported figures for the 1988-89 school year, we get 1,295 students. If we divide that number by the number of courses offered (74) we get an average of 17.5 students per course. That sounds like a nice class size, but it overstates the average number of students in AP classes, since a few schools run two classes of some courses. If we then look at the number of students who took exams (519) we see that it is but 40 percent of the number who took the courses. This could well indicate that a number of these students thought they were not well enough prepared to take the AP exams. The last measure, the distribution of scores, shows some success, with 75 percent of the students taking the test scoring a three or above, qualifying them for college credit. This average, however, is but an average: a few schools had no one scoring a three or better. And overall only 101 students in the 22 public schools which returned completed surveys scored a five. In these 22 schools, 15 percent of all juniors and seniors took AP classes, 6 percent took the AP exams, and 4.5 percent of the students scored a three or better. But these latter figures overstate the success because they report on only those 22 schools that offered AP classes, not the 21 other schools which did not.

If we use another measure of achievement related to science, we can examine the distribution of awards in the prestigious Westinghouse Science Talent Search. Each year hundreds of top students compete for national recognition for outstanding work in high school sciences. In 1990, 1,431 students applied, including ten students from nine Wisconsin high schools. Some 303 entries were named to the Honors Group (semi-finalists), including two from Wisconsin, one each from Case High School in Racine and James Madison High School in Madison. Forty finalists were selected; none were from Wisconsin. In fact, in the last twenty years only thirteen finalists have come from Wisconsin. Since 1980, six of the seven finalists have come from James Madison High

School in Madison. The seventh came from Madison East. In 1990, as a comparison to Wisconsin's two semi-finalists, Bronx School of Science had 19, Stuyvesant High School, also in New York, had 38, and Thomas Jefferson School for Science and Technology in Fairfax, Virginia, had 14.

There is little wonder that no semi-finalists have ever come from the Milwaukee public schools, since a recent report released by the Wisconsin Policy Research Institute indicated that in elementary schools some 21¢ per year is spent on science books and materials per child.¹⁴ But it appears to be equally incriminating of the surrounding Milwaukee-area schools that have had no greater success in producing science students sophisticated enough to win these awards. It is likely that the native talent is available in Wisconsin. Science is simply not stressed.

The implication of these distributions of AP courses and tests and Westinghouse competition results is that few of the brightest students today in the Milwaukee area are getting a full academic challenge in their schools. Many of the brightest students are being shortchanged, getting a lower quality education than their peers in other parts of the country.

This lack of academic challenge is hurting Wisconsin's students. A recent study conducted by Johns Hopkins' CTY on gifted students in New Jersey documents the positive effects of early identification of academic talent. Of those students identified by CTY as gifted, over 80 percent enrolled in AP course work if available at their school. The mean score for those taking the AP examinations was 4.3, versus a national mean of 3.2 for 1989. And these students continue to do well, scoring average combined SAT scores above 1400.¹⁵ This study illustrates that talented students, if identified and offered challenging academic opportunities, will excel above national norms in those areas.

One alternative to this is to push for more school districts to adopt Advanced Placement courses. But this has been a slow and unsuccessful process to date in the Milwaukee area. What would make a much more dramatic statement and positively affect a larger number of the brightest students immediately would be the creation of a metropolitan-wide merit high school for math and science.

OUR PROPOSAL

SERVICE AREA: The new merit high school for math and science would draw students from any district in the four counties of metropolitan Milwaukee. Since it would be a day school, the desire to participate would be limited only by the lack of desire to commute. All districts in the area would be required to participate by state law, so that any student who is qualified and desires to go would have that opportunity.

LOCATION: The school would be centrally located, with maximum freeway access. The likelihood is that it would be relatively near downtown because of bus service and because more students live in the higher density areas near Lake Michigan. But it is possible that

¹⁴Michael Fischer, Fiscal Accountability in Milwaukee's Public Elementary Elementary Schools: Where Does the Money Go?, Wisconsin Policy Research Institute, vol. 3, no. 4, September, 1990, pp. 26-27.

¹⁵Linda B. Barnett and William G. Durden, "CTY Advocacy and Intervention in New Jersey: Documentation of Early Identification and Out-of-School Intervention with Academically Talented Youth," Technical Report, February 22, 1991, pp. 35, 39, 63.

the school could be located on the County Grounds in Wauwatosa on the site of the new high-tech industrial park. In this location its students could make use of the laboratories and faculty at the Medical College and the new businesses which will be locating at the research park. Another possibility is to locate the school near UW-Milwaukee to allow students to take advantage of its facilities and resources.

ADMISSIONS: Admittance would be based on merit, using such measures as an entrance exam, grade point average, test scores from national standardized tests (SATs and the standard school tests such as the Iowa or Stanford tests), and letters of recommendation. There would be a special emphasis on recruiting minorities to ensure a mixed, but capable student body. All students admitted would be "academically talented."

FOCUS: The school would have a challenging curriculum for bright students. Math and science would be emphasized, but a complete high school curriculum would be offered. All courses would be accelerated, commensurate with the high talent level of the student body. Advanced Placement courses would be commonplace, and BC calculus and all AP science classes would be offered.

SIZE: The high school would be constructed to hold a maximum of 1,000 students. This would allow up to 250 students per year to enter. Such a figure is *less than two percent* of the 1988-89 total enrollment of high school students in the Milwaukee area. The small size would make it highly competitive and able to serve the best students in the area.

WHO PAYS? The funding for such a school would come from several sources. The two main contributors would be the State of Wisconsin and the participating school districts. A third major source would be the private sector which would provide contributions to the construction and operation of the science and computer labs. As we currently envision this school, facilities' monies would come largely from the state. Additional contributions from the business sector in the form of computers, software, laboratory equipment and the like would help make the building state of the art. Operations funds would come largely from the school districts that send students to the school. Each district would pay full tuition reimbursement to the merit school: the district would contribute the state funds it receives for each student plus the local cost of educating each student in the home district. The difference between this aggregation and full cost at the new school would be paid for by the state in its effort to increase the offerings for gifted and talented students. Another source of funds would be foundations which could establish a fund for such things as additional pay to attract outstanding teachers and maintenance of labs and equipment. Capital funds would also be welcomed.

GOVERNANCE: The school would be governed by an organization other than an existing district, since the school would serve a much more geographically diverse student body. There are a number of options available which have a precedent elsewhere. Among the more probable are governance led by: The Educational Trust of the Metropolitan Association of Commerce, The State Department of Public Instruction (DPI), the University of Wisconsin-Milwaukee, and an independent board consisting of representatives of all the aforementioned groups. Each of these options has benefits and costs. DPI does not operate any schools at this point, and it could be viewed as a conflict of interest if DPI both ran and oversaw its own operation. The Educational Trust also has no history of operating an entity such as a school. If it were to take on the task, it would have to establish a new board drawn largely from business and hire an administrator for the school. UWM used to run an elementary school, and Hunter College in New York City runs an entire school, so there is some precedent. But it would have to set up a separate board and find a home within the university. One possibility would be the School of Education with an explicit tie to the Center for Math and Science Education. An entirely

independent, new entity set up to establish and operate the school is also possible. It benefits from being created just for that purpose, but it suffers from not having any current status or resources. More debate is required as is more detailed specification as to the sources of the monies. The basic notion is that a new entity will be responsible for the operation of the school. (More discussion of this subject appears in Question 10 below.)

OTHER CONTRIBUTIONS: A merit high school would not be immediately welcomed by most districts in the region. They would likely see the merit school as a threat to the retention of both their best students and their hard-won revenues. But there are numerous potential benefits in the longer run to the participating districts.

The school would serve as a challenge to the existing schools to improve their curricula. The fact that each school district might "lose" some of its best students to a competing school may force district schools to raise the quality of their offerings and instruction in the attempt to become more appealing to their own students. With this impetus, schools may be able to make curricular changes that they have otherwise been unable to undertake.

The merit school would also help in this regard by conducting summer programs for math and science teachers from the contributing schools, or from throughout the state, thereby giving them the latest information in teaching math and science in the high schools. This has proven very helpful elsewhere in the country.

The merit school could also offer district teachers another step on a career ladder, the opportunity to teach at the merit school. If a system of cooperation could be established across districts, teachers could retain benefits and still move to the new school. This could make them more productive within the separate districts as they strive to be chosen for new or replacement positions in the new school.

The merit school would become the one magnet school in the area that would promote integration through academic excellence. This would help build self-esteem in the minority community because its students would be competing with the area's best students.

The merit school would raise the visibility of math and science and their critical role in the Milwaukee area's economic future--a message that is virtually lost today.

The merit school would increase the emphasis on achieving success in school to a new level in the area. This school would be a target to which a broader spectrum of students would aspire because of the visible rewards (a new school) that academic success can bring. Given the results achieved at similar schools elsewhere, this school would raise the success rates for minorities in math and science.

The merit school would help stimulate more business involvement in education. Contributing in various ways to the school would be a fairly easy initial involvement for businesses because they would see rather direct payoffs. Such direct payoffs would provide businesses with the incentive to become further involved in other, less glamorous educational endeavors.

COMMON QUESTIONS

To help make the case for a merit high school for math and science, what follows are a series of questions the reader is likely to ask about this concept and its implementation. Each is answered to the best of our abilities at this time. The record of success is there. What is required now is the commitment.

1. What are magnet schools, and how do they differ from other schools?

Magnet schools are special schools which have an ability to draw students to them because they offer services not otherwise available. Magnet schools differ most commonly from ordinary schools in the content of their curricula. Most magnet schools have a strong core curriculum, with an emphasis in a particular field (e.g., mathematics, engineering, arts, challenging curriculum, etc.). By focusing resources in a certain specialization, the potential of students whose talents lie in that field is able to be more fully realized. Consequently, talented students can be attracted to such focused programs of study.

In most instances magnet schools are allowed to draw students from across normal school-district delineations. Admission requirements, ideally, are contingent only upon prospective students' abilities and potential--crossing all social, political, and economic barriers. In some instances, however, the concept and implementation diverge. In Milwaukee, for example, magnet schools' admissions are not contingent on academic performance or particular skills but on the luck of the draw, as admissions are run on a lottery system that seeks to provide racial balance and equal access. The proposal put forth in this paper would base admissions criteria solely on academic ability. In this context the terms of "merit" or "magnet" school are interchangeable.

Magnet schools differ from "regular" schools by the focus of their curricula. While recent trends indicate the decay of a strong core curriculum, concomitant with a proliferation of non-academic electives, the magnet school focuses on a strong core curriculum supplemented with rigorous study in a certain specialization. Examples of such schools are the North Carolina School of the Arts, Brooklyn Tech (New York City), and the Thomas Jefferson High School of Science and Technology (Fairfax County, Virginia). As their names indicate, these schools stress certain aspects of their curricula, concentrating on excellence in everything from the arts to business to high technology. Magnet schools not only differ from "regular" schools, they also differ from each other by their focus.

A study of magnet schools commissioned by the U.S. Department of Education found that magnet schools offer a high quality education, providing important options and choices for students.¹⁶ Furthermore, the study noted that the quality of the magnet schools was related to a strong program identity or school theme. Interestingly enough, the specific focus or theme a school adopted did not seem to be correlated to the school's success; rather, the mere presence of an identifying theme was important. But unlike Milwaukee's theme magnet schools, the ones studied throughout this report all had competitive admissions.

Magnet schools can also differ by the geographical pool of students from which they draw. Only students from New York City are allowed to take the entrance examinations necessary to gain admission to Brooklyn Tech, Stuyvesant, and Bronx Science. Alternatively, Virginia's Thomas Jefferson High School for Science and Technology is a regional magnet school for residents throughout Fairfax County. And the North Carolina School of Science and Mathematics is a statewide, residential high school, similar to the Illinois Math and Science Academy. Magnet schools can also differ by their mode of operation: some may

¹⁶Rolf K. Blank et al., Survey of Magnet Schools: Analyzing a Model for Quality Integrated Education U.S. Department of Education, Office of Planning, Budget and Evaluation, 1983, p. 3.

be residential, enabling full-time scholarship and interaction; others may be regular day schools; still others may function during regular school down-time, such as during the summer or weekends.

2. *Who funds them? How important is private support?*

Magnet schools differ from each other by their means of support and funding. The highly acclaimed North Carolina School of Science and Mathematics receives about 90 percent of its operating budget and 75 percent of its capital budget directly from the state. Other funding is completely dependent on private and corporate donations--over \$7 million in gifts from across the nation. In the case of the Thomas Jefferson High School for Science and Technology, a separate foundation was established to elicit business support and funding. This foundation found business and industry ready and willing to develop partnerships with public education. Due to a high concentration of high-tech industries, Thomas Jefferson received not only financial support but equipment contributions, furnishing the most advanced high-tech laboratories in the country (the foundation targeted about \$3 million in equipment and capital for the eleven technology labs at the school). Clearly, these businesses recognized the long-term benefits of a well-educated, local labor pool as well as the potential commitment of the students to their equipment.

The federal government also had a role in the funding of magnet schools. The Emergency School Aid Act (ESAA) of 1976 authorized grants for magnet school programs. These funds were designed to help with the heavy start-up costs. Naturally, this program increased the interest in magnet schools. This funding, however, was phased out in the 1981-82 fiscal year, at which time more magnet schools were actually being developed without federal aid (74) than with federal aid (64).¹⁷

Non-profit entities have also been constructive in funding magnet schools. When the North Carolina School of the Arts was first being discussed in the early 1960s, then-Governor Sanford personally championed the establishment of the art school, successfully courting the Ford Foundation. The bill Governor Sanford had introduced in the North Carolina legislature, as passed, required matching funds in addition to those appropriated by the state. In addition to a national fundraising drive, a special "fund" was established to solicit contributions from local citizens and corporations.

Similarly, from the beginning of the establishment of the North Carolina School for Science and Mathematics (NCSSM), a charitable, tax-exempt fund was organized, gathering over \$7.5 million from private sources during the first three years. The annual state contribution was just over \$5 million in FY 1985-86. NCSSM is a residential high school, with nearly 480 students, 14 live-in resident advisors, and 52 faculty members. Obviously residential high schools are more expensive to maintain.

The Louisiana School for Math, Science and the Arts is also a residential, although completely public, magnet high school. Attendance is free to all qualified students, fully funded through state legislative appropriations. Admission is open, on a competitive basis, to all juniors and seniors residing in the state. State appropriations totalled \$3.05 million (1986) and \$3.1 million (1987). Annual student enrollment has been just over 400.

¹⁷Ibid., p. 13.

In Illinois, the state legislature passed a bill establishing the three-year, residential Illinois Mathematics and Science Academy, appropriating \$3.5 million in 1985 for the first year of school operations. The Academy received nearly \$12 million from the state General Assembly this past fiscal year.

Funding for other magnet schools:

Bronx High School of Science, Brooklyn Tech, Stuyvesant and Townsend Harris: no special funding by the New York City Board of Education; funds received on the same basis as other New York high schools. Differences in costs are recouped through corporate donations.

Regis High School, New York City: an anonymous endowment made in 1914 provides a capital fund to furnish free tuition for the entire student body.

Mary Baldwin College, Virginia: received a \$250,000 grant from the Jessie Ball duPont Religious, Charitable and Educational Fund to enroll 11 students. The program's success enabled expansion to 27 students in 1986. This is another variation of programs for the talented--taking top high school students and enrolling them in college courses while still high school students.

Thomas Jefferson High School for Science and Technology, Virginia: publicly supported by Fairfax County taxpayers, although it also receives major corporate support largely for capital expenditures. Local firms, including Computer Science Corp., TRW, Hazelton Labs and Martin-Marietta have donated about \$3 million to equip 11 labs. Fairfax Education Foundation was also set up to supplement funding through industry (composed of 40 sponsors who pay to belong to the foundation). Grants are made to the school, among other projects.

In addition to corporate support, philanthropic contributions have been an important source of financial assistance in establishing and furnishing magnet schools. Several grant-making foundations are located throughout the state. Again, the geographical service area for the school would in large part decide from where financial support could be solicited. If the magnet school was only for the Milwaukee area, local businesses and charities would be called upon. Alternatively, if it became a statewide school, the base of support would be extended. In either event, the benefits of educating high-quality students would accrue to the entire state.

3. *How large an area does each serve? What is the size of the potential pool of students for each class?*

As mentioned above, the geographic area to be served by a magnet school differs according to the school's charter--some schools draw students from throughout a city, some throughout a county, and others draw from throughout the state. Still others draw from a national student body, with a certain percentage of those admitted reserved for the state or locality in which the magnet school is located.

To assess the potential pool of a magnet school, one must first determine the type of student to be admitted. Most magnet schools examined in this study, as well as our proposal, serve academically gifted and talented students. The size of the pool of gifted and talented students is as elusive as this definition suggests. The problem is one of identification.

Some experts in education for the gifted and talented, including Dr. Durden of Johns Hopkins University's Center for Talented Youth (CTY), stress the need to admit students who are academically qualified to excel at an ambitious and rigorous course of study. To admit less-qualified candidates would be unfair because they could become frustrated and "turned off" by the curriculum, and the more able students would not be allowed to progress as rapidly, possibly causing them to become bored. For the Johns Hopkins CTY program, prospective students at the 7th- and 8th-grade levels are required to take a nationally-standardized exam such as the SAT. Of those who take the exam, approximately 20 percent in the 7th grade qualify as "truly gifted," scoring above the mean of college-bound seniors on the math and verbal sections. Obviously this percentage is not generalizable to the population as a whole, due to the fact that most 7th-grade students don't take the SAT unless they think they can qualify for some advanced programs and have scored in at least the 95th percentile on other standardized tests.

4. *What is the composition of the student body (e.g., race, sex, income, test scores, school grades, etc.)?*

In the magnet school study commissioned by the U.S. Department of Education, it was found that magnet schools had a positive effect on efforts to achieve desegregation.¹⁸ The following demographic breakdowns were obtained for eight magnet schools:

Bronx High School of Science: 56% White; 19% Asian; 15% Black; 10% Hispanic. It claims the most diversified student body in the world.

Brooklyn Technical High School: 50% Black; 24% White; 13% Asian; 13% Hispanic.

Illinois Mathematics and Science Academy: 57% Male; 43% Female; 50% from the Chicago metropolitan area. (No racial data were available.)

North Carolina School of Science and Mathematics: 55% Male; 45% Female; 80% White; 20% Black and other minorities.

Regis High School (New York City): 100% Male; 84% White; 11% Hispanic; 5% Black; 7.8% from families with incomes under \$15,000; 7.9% from families with incomes between \$15-20,000; 25.1% from families with incomes between \$20-30,000; 33.2% from families with incomes between \$30-50,000; 26% from families with incomes over \$50,000.

Stuyvesant High School (New York City): 54% White; 33% Asian; 8% Black; 5% Hispanic.

Thomas Jefferson High School of Science and Technology (Fairfax County, VA): 41.8% Female; 58.2% Male; 71.9% White; 2.9% Black; 2.4% Hispanic; 27.6% Asian.

Walnut Hills High School (Cincinnati): 54% Female; 46% Male; 66% White; 31% Black; 2% Asian; 1% Other; 8% students from "low income" families.

¹⁸Ibid., p. 4.

5. *What are the explicit admissions criteria?*

As previously mentioned, magnet schools can differ in the criteria by which they admit students. A program for the truly gifted and talented needs to be able to adequately identify those students who stand a reasonable chance of success in such a rigorous program. There are numerous methods for assessing student intelligence and capability, including the use of I.Q. tests; national, standardized tests like the Iowa Test of Basic Skills or the California Achievement Test, the SAT or ACT; class rank in grade school; recommendations by previous teachers or school administrators; previously-achieved grade point averages (GPAs); specifically-designed entrance examinations; essays and interviews. A lottery is definitely not one of the acceptable methods.

Admittedly, the assessment of an individual's intellectual abilities is clearly open to some controversy and debate. Each method of assessment is sure to elicit both positive and negative reactions. Nevertheless, given limited resources and a rigorous curriculum, the attempt must be made to identify as best as possible those students deemed gifted or talented. And since no one method is perfectly able to measure intelligence, the employment of a combination of methods is preferable, attempting to balance objective criteria with more subjective standards.

CTY's Dr. William Durden does not recommend the use of I.Q. exams that are "heavily oriented towards verbal aptitude and thus while a high score may be evident, that score may indicate little about a child's specific ability in mathematics or the sciences."¹⁹ Johns Hopkins has pioneered a method for identifying mathematical, scientific, and verbal talent among those aged 10 to 14 years. The approach, replicated in many programs, employs a combination of standardized tests: both an in-grade achievement test (e.g., Iowa Test of Basic Skills or the California Achievement Test) and the College Board's Scholastic Aptitude Test (SAT). Durden claims that the SAT is "an excellent measure of a student's ability to reason and read well, respond quickly, and perform well under stress. In addition, as the result of at least 14 years of replication with subsequent academic progress, the SAT has proven to be a powerful instrument for predicting successful educational performance among junior high school students in mathematics, science and other subjects when the program formation is adjusted to a child's high pace and level of learning."²⁰

Similarly, Northwestern University's Center for Talent Development (CTD), which conducts annual talent searches for gifted students in the Midwest, relies upon the SAT examination, as well as recent grades, written statements, and recommendations. Most courses through the CTD program require a combined SAT (of both verbal and math) of 850-900. Keep in mind that these are 7th and 8th graders scoring at such levels, and not college-bound seniors who normally take the SAT.

Admissions criteria for magnet schools vary greatly. The following are examples of some methods employed:

Bronx High School of Science/Brooklyn Tech/Stuyvesant: an in-grade, standardized competitive exam administered by the NYC Board of Education,

¹⁹William G. Durden, "Summer Initiatives for Talented Junior High/High School Students in New York State" p. 9.

²⁰Ibid., p. 11.

assessing both verbal and mathematical skills; GPA; class percentile cutoff; and a school recommendation.

North Carolina School of the Arts: auditions.

North Carolina School of Science and Mathematics: I.Q. test; a separate achievement test; a test of Critical Thinking; SAT; essay; letters of recommendation from teachers and guidance counselor; class percentile cutoff.

Regis/Townsend Harris High School: percentile cutoff; recommendations; essay and interview; GPA; entrance examination.

Thomas Jefferson High School of Science and Technology: Specialized High School Admissions Test (similar to those administered for Bronx Science and Stuyvesant); GPA; essay; data sheet; three letters of recommendation.

Our recommendation, as stated above, is that the Milwaukee school use a variety of criteria in its admissions decisions.

6. *What are the implicit admissions criteria (e.g., political jurisdiction, race, sex, skill areas)?*

Obviously, magnet schools will seek to select individuals whose skills match the established curriculum of the school. Some schools stress mathematics, business, the arts, or science and technology. Admissions criteria are then tailored to identify those who have similar talents.

Some magnet schools are single-sexed institutions, such as Regis High School in New York which is all-male, or Mary Baldwin College in Virginia which is all-female. Mary Baldwin College allows students to complete both a high school and college degree in an abbreviated amount of time.

Some schools reserve a set number of places for certain students (e.g., based on race or geographical location) to ensure a beneficial demographic representation of the students. For example, the North Carolina School of Science and Mathematics is a statewide magnet school. However, out-of-state students who meet the admissions criteria can apply but cannot exceed 15 percent of the student body. Likewise, students from other states and countries can enroll in the Illinois Math and Science Academy, if qualified, but cannot exceed 10 percent of the class. In both cases, those from outside the state are required to reimburse that state for the cost of the education, otherwise borne at taxpayer expense.

7. *How selective is each school?*

Selectivity of magnet schools may be correlated with the admissions criteria (see numbers 5 and 6 above.) Programs or schools that are established for the truly gifted and talented tend to be very selective to ensure that the accepted students can withstand the rigorous curriculum. Some general magnet schools are not selective at all. In the previously cited study commissioned by the Department of Education, selectivity was not found to be positively correlated with the success of the magnet schools studied. However, it is important to point out that there could exist self-selection which would be an intervening variable. In other words, if a magnet school has a reputation of having a good, rigorous curriculum in mathematics, students who do not assess their talents to be in that field or

who do not want to participate in a more-demanding curriculum most likely will not apply to that school. Consequently, some degree of self-selection does occur.

Although it certainly is not the only way to rank selectivity, determining the acceptance rate yields the following results:²¹

Regis High School: 9% acceptance (140 accepted out of 1,500 applicants)
Bronx High School: 6% acceptance (800/12,000)
Brooklyn Tech: 9.6% acceptance (1,150/12,000)
North Carolina: 25% acceptance (200/800)
Stuyvesant: 6% acceptance (750/12,000)
Illinois Math and Science Academy: 28% acceptance (210/750)

8. *What differentiates each school from the schools which their students would otherwise have attended?*

Basically, there are two things that differentiate magnet schools from "regular" schools: the schools themselves (including their theme-oriented curricula), and the outputs, or the graduates. To determine what makes the magnet schools different from their alternative, refer to questions one and two.

The accomplishments of magnet school graduates afford some measurement of their success that allows us to compare magnet students with students who graduate from "regular" public schools. Although there are many other factors to consider before a definite analysis can be made (e.g., self-selection, admissions criteria, etc.), magnet schools did graduate some impressive students:

- Brooklyn Tech, Bronx Science, Stuyvesant: more Westinghouse Science Talent Search awards from these three magnet schools than from any other state, or even regions, of the U.S.; 1st place U.S. Olympiad in Math, 1986, from Stuyvesant; graduates include 7 Nobel Laureates; 60 National Merit Scholarship semifinalists from Stuyvesant, 2nd only to North Carolina; Stuyvesant exceeds any other high school in the country in National Achievement Scholars (for black students, 20) and the National Hispanic Achievement semifinalists (21).
- Illinois Math and Science Academy: students' average SAT-V is 530; SAT-M is 610 (national average for college-bound seniors is SAT-V and SAT-M of 430 and 500, respectively).
- Regis High School (New York): Senior profile of 123 members of the class of 1986: SAT average composite of 1271 (SAT-V 612, SAT-M 654); 6 National Merit Scholars, 20 National Merit Finalists; 159 total scholarships received; 87% participated in the AP program, with 80% scoring 3 or higher (86 students); admission to many prestigious universities.
- North Carolina School of Science and Mathematics: Senior profile of approximately 200 members of the class of 1986: PSAT/NMSQT Mean Verbal 55.7, Mean Math 62.4; SAT-V 560, SAT-M 626, Composite SAT 1186; 51 National Merit

²¹It is important to note that the above data are not given to provide a comparison of schools or a ranking of selectivity. Other variables, such as the number of years a school has operated as well as the size of the potential pool of students from which they draw, among others, will have some effect on the acceptance rate.

Scholarship finalists; 63 semifinalists; class of 1984 was offered \$2.7 million in scholarships and grants; student design used by NASA in the space shuttle; of the 1400 graduates since 1980, 99% have gone to a four-year college and 67% majored in math or science as compared to only 40% of the top 10% of students nationally.

- Thomas Jefferson High School for Science and Technology: (out of a senior class of 400) all but one are going to college; 59 won National Merit Scholarships (fifth in the nation); 15 Westinghouse Talent Search semifinalists (third in the nation); average achievement test scores were in the top 2% for both math and science, and in the top 6% in reading comprehension.
- Walnut Hills High School (Cincinnati): 1985 class profile of 329 seniors: 40% participated in the AP program, with an average score of 3.30; 29.5% received scholarships; 1 Presidential Scholar; 5 National Merit Scholars, 13 National Merit Finalists; Tested in the 88th percentile nationally in reading and 89th percentile in math on the California Achievement Test.

9. *What are the explicit goals of the schools?*

The 1983 Department of Education study found that explicit goals and objectives were important characteristics contributing to the success of magnet schools. Not only is the success of a magnet school positively correlated with the identification of a theme or set of stated goals, but "in magnet schools with high education quality, the principal, teachers and other staff are selected according to criteria that are consistent with the school theme and objectives." Furthermore, the study notes that "magnet school teachers in effective schools typically have high levels of commitment to the magnet concept and high interest in theme-based instruction."²² Developing a school theme and adhering to it is also a key to these institutions' success.

Regis High School (New York City) claims it aims to: "provide an intensive and advanced high school program for students of superior academic ability...[and] to provide an environment which challenges students to grow personally, morally, religiously and in the service of others."

The North Carolina School of Science and Mathematics states its "charge is to identify and cultivate the talents of gifted students and help them to attain their potential. The heart of the academic program is a rich and challenging curriculum, one on which the curious young people thrive. The science program requires that students take biology, chemistry, and physics, and offers electives....NCSSM's mathematics program emphasizes problem solving and breadth of mathematical experience, while stressing computer proficiency as a graduation requirement....NCSSM's second charge is to develop the means to counter widespread educational deficiencies, such as those found by recent nation-wide studies--too few challenging courses, too few qualified teachers, and too limited a choice of curricula. The school is asked to produce imaginative, effective programs that are adaptable to many school environments...."

In its annual progress report of 1985, the Walnut Hills High School (Cincinnati) states that the school's goals are: "Improve Achievement in Basic Skills and Establish Academic Standards....Improve Attendance, Discipline and Safety....Implement the Bronson

²²Blank, op. cit., p. 28.

Agreement [affecting minority recruitment, retention and involvement]....Implement the Process for School System Decentralization...[and] Develop and Implement Strategies for the Effective Use of Technology...."

In a report entitled *Residential Public High Schools of Excellence*, the missions of the following schools are stated:

Louisiana School for Math, Science and the Arts is to "foster optimum development in academic pursuits and the arts in a total living-learning environment. The school serves as a resource center for in-service training and research in the area of gifted and talented education...."

Illinois Math and Science Academy was created as a direct response to a Governor's Task Force that concluded "there is a widely recognized perception that the nation is facing a crisis in fulfilling its needs for citizens trained in the fields of science, mathematics, and technology....The state of Illinois has an obligation toward this national issue and to its own need." The goal of the Academy is to fulfill this need.

It was this goal that was reiterated in a recent interview with an official with the Illinois Math and Science Academy who mentioned that the school was mandated several statewide goals. Not only were they to educate the "top one-half of one percent," but the Academy was also to improve math and science education in general. Consequently, the Academy assembles training programs for teachers (not only those employed at the Academy), offers program and curriculum development seminars, math and science research symposia, and summer workshops.²³

The goals of many other theme-based magnet schools are evident by an adherence to a specified, rigorous curriculum. Consequently, the objective of the North Carolina School for the Arts is to develop the potential of talented students in the arts; the objective of Bronx High School of Science is to develop the potential of students in science; and the objective of Brooklyn Tech is to develop student potential in the field of high technology.

The proposed Milwaukee merit school would also have a very strong theme: the commitment to excellence in science and math.

10. How is each school governed? To whom is each accountable?

Most magnet schools are governed by a type of school board. The composition of the board is largely determined by the means with which the school is funded. Consequently, schools like the North Carolina School of the Arts, the North Carolina School of Science and Mathematics, the Louisiana School for Math, Science and the Arts, and the Illinois Math and Science Academy--all of which receive the majority of their funding through direct appropriations from state legislatures--are governed by a board of trustees, composed largely of state officials. Likewise, Bronx Science, Brooklyn Tech, and Stuyvesant--all of

²³Dr. Stephanie Marshall, Illinois Mathematics and Science Academy, personal communication, May 8, 1990.

which receive funding from the New York City Department of Education--report to a board of city officials. Many boards are supplemented by experts in the field of education, as well as by private individuals.²⁴

Several schools are successful examples of public-private partnerships. Since the North Carolina School of Science and Mathematics opened its doors, corporations, foundations, and private individuals have contributed \$8 million for programs, capital improvements, and an endowment. Consequently, leaders in industry (including a scientist from IBM and the director of the Mathematics and Statistics Center at Bell Laboratories) have also been invited to participate as members of the NCSSM board of directors. The board representation for other schools is as follows:

Bronx Science: members include parents and school officials
Brooklyn Tech: members include city school officials
Regis: members include parents and school officials
Stuyvesant: members include school officials
Townsend Harris: members include parents and school officials

Although Bronx Science, Brooklyn Tech, and Stuyvesant are all governed by the New York City Board of Education, the Board of Regents of New York State establishes the graduation requirements with the city's Board of Education.

The case of funding for Thomas Jefferson High School in Fairfax County, Virginia, is similar to the New York high schools in that it receives funding from the Fairfax County Board of Education, just like the other high schools in that same district. (It does receive somewhat higher funding from the board than the other non-magnet schools.)²⁵ However, in addition to the county's funding, a separate foundation also provides resources for Thomas Jefferson. The Fairfax Education Foundation was established to supplement funding from industry for the school: 40 industry sponsors pay to belong to the foundation which is headed by a secretary and executive director. It was hoped that industry support would be on-going, but such support has been hard to maintain. Industry support initially established eleven high-tech labs at a cost of nearly \$4 million. However, these labs are so complex that they require substantial resources to keep them up to date and "state of the art." Most of the maintenance costs of these laboratories are covered by funds from the foundation.

Thomas Jefferson High School differs from the other four high schools in Fairfax County in that it reports directly to the Deputy Superintendent of Public Schools, bypassing the four Area Superintendents to whom the other schools report. This was not always the case, but TJHS sought to bypass the Area Superintendents in order to gain increased flexibility. According to one official at TJHS, however, this was not accomplished. Because the Deputy Superintendent is responsible for all the high schools, she or he can't

²⁴Not surprisingly, the study of magnet schools commissioned by the U.S. Department of Education found that strong leadership and the school board's commitment to the school were essential variables to the school's success. This study clearly concludes that: "magnet schools will not succeed unless there is strong district leadership including school board commitment to a magnet schools policy and involvement of the superintendent and key district administrators in implementing a district magnet plan...." See Blank, op. cit., p. 4.

²⁵The information on the governance of Thomas Jefferson High School, as well as its funding and relationship with the Fairfax Education Foundation, was provided by Dr. Cha Guzman, TJHS, personal communication, April 24, 1990.

champion the specific needs of TJHS. Furthermore, Area Superintendents can often act as a cushion in resolving complaints or disputes. Such problems now go directly to the Deputy Superintendent.

The case of the Illinois Math and Science Academy is somewhat different.²⁶ The Academy is governed by a board consisting of thirteen voting and four nonvoting members. The voting members are appointed by the state for a six-year term and are required to be a representation of scientists, educators, and public citizens. The four nonvoting members include the State Superintendent of Public Instruction, the Director of the Board of Higher Education, the Director of the College Board, and the Superintendent of the school district in which the Academy resides.

The Academy is a completely autonomous state agency. It is under the Board of Higher Education for budgetary purposes only; unlike other local educational agencies it is otherwise completely independent. It receives direct line-item appropriations by the state's General Assembly, listed under the budget of the Board of Higher Education. In its first year (1986-87), the Assembly appropriated \$3.5 million for 200 students. This past year the Academy received nearly \$12 million for its current enrollment of 560 students. (Keep in mind that the Academy is a three-year, residential high school.)

Like Thomas Jefferson High School, the Illinois Academy also has a foundation--the Illinois Math and Science Academy Fund for Advancement in Education. It is governed by a separate board of directors. The Fund was established in February, 1986, and has since contributed approximately \$1.5 million in both in-kind and cash contributions to the Academy.

In the Milwaukee case, we propose that the school be governed by an independent board composed of both public and private members that would represent the many parties that have an interest in the school's success. Among those represented would be DPI because of state funding; UWM, if it were selected to operate the school, or a representative of whichever organization houses the school; a few local school district delegates who would have the responsibility of representing all of the districts which participate; local business leaders, noted educators, scientists, and public citizens.

The most appealing notion is that the academy would be an autonomous state agency like the school in Illinois. It would be under the state DPI, for budgetary purposes only, but otherwise it would be independent. Its ties to the UWM Math and Science Center or to some other organization would be for convenience and initial definition to help the school get started. The school, however, should not be operated by any one district, such as Milwaukee, because the school's purpose and service area are much broader than any one school district presently supports.

The school, as with the others noted above, would have its own foundation with a separate board that would be charged with fund-raising from foundations and the private sector. The two most critical areas of need would be equipment for the laboratories and their on-going maintenance. Other support, such as extra pay for teachers, and funds for lecture programs, community outreach, and other enrichment programs would also be welcomed. An important component would be the establishment of a co-op program to give these students exposure to what it is persons with math and science aptitudes and interests really

²⁶Information about the Academy's governance was obtained from Dr. Stephanie Marshall, op. cit.

do. Such co-op programs would increase the appeal of the school to students looking for experience and to businesses which are looking for talent.

11. *How expensive is the education per child? How does this compare with the cost of other high schools in the service area?*

The Department of Education study found that the costs of providing an education were slightly higher for magnet schools than they were for non-magnet schools, but that "the quality of education and racial integration in magnet schools are increased by the extra spending." Specifically, the average total cost for educating a student in a magnet school was about \$200 more than providing that education in a non-magnet school in the 1980-81 academic year. However, this amount decreased to only \$59 more for the 1981-82 year.²⁷ In today's dollars the differences would be greater but justifiable.

It is important to differentiate between start-up costs that tend to be high, and long-term operating costs which tend to level out. High-tech laboratories and state-of-the-art equipment are expensive. As indicated above, many magnet schools have been able to defray such added expenditures with the help of corporate donations.

The Department of Education's study attributes higher costs for magnet schools to higher teachers' salaries (attracting the brightest and most-qualified individuals) and higher transportation costs. Furthermore, it stated that "magnet schools with specific, single themes, such as arts or science, have lower costs than combination magnets with two or more themes in a school." Consequently, costs will vary among magnet schools, just as they will vary among regions of the country.

That is not to say that the full costs must be borne by the taxpayer or even the student. Aforementioned arrangements (i.e., public-private partnerships) maintain low tuition rates. Some institutions, such as Regis High School, offer all students who gain admission free tuition, thanks to an anonymous benefactor's endowment of the school. Other institutions offer generous scholarships and financial assistance. Because most magnet schools receive a proportion of their funding from state legislatures, tuition is set within a range offered by non-magnet public schools.

In our Milwaukee setting, the cost of tuition and who bears it is more problematic because the school would serve multiple school districts in an area much smaller than the state. There is wide variation in per-pupil expenditures across these districts. If one district spends \$6,000 per student, and another district spends \$12,000, some formula would have to be agreed upon for funding from each district if the merit school costs were, for example, \$9,000 per student.

One option would be for each district to pass along the state aid associated with each student from their district who attends the new school plus the full cost of tuition up to their own total expenditure or \$9,000, whichever is lower. This would mean that the school district that spends \$6,000 would send \$6,000 total to the merit school; a district that spends \$12,000 would send \$9,000 to the merit school. The state would make up the difference from the cheaper districts because of its interest in promoting quality education for gifted and talented students. And each district would have an incentive to encourage talented students to attend the merit school.

²⁷Blank, op cit., p. 5.

In our study of merit high schools around the country, we looked at average per-pupil expenditures in order to compare them to the reported cost of educating a student in the Milwaukee-area high schools. MPS reports that its average per-pupil expenditure for all grade levels was \$5,944 for the 1989-90 academic year. MPS does not break down expenditures by grade; consequently no per-pupil expenditures are available for grades 9-12. Other sources have reported per-pupil expenditures for the MPS as high as \$6,451.²⁸ Comparatively, per-pupil expenditures were obtained for the following merit schools:

- Walnut Hills (Cincinnati): 1988-89 per-pupil expenditures of \$3,283; 1989-90 per-pupil expenditures of \$3,468.
- North Carolina School of Science & Mathematics: 1988-89 per-pupil expenditures of \$13,300; 1989-90 per-pupil expenditures of \$12,400; 1990-91 (estimated) \$13,600. It is important to note that North Carolina is a residential high school, and these costs include the following: student services (including room, board, books, etc.), general administration, instruction, library services, and the physical plant. The estimated cost of education was \$8,500.
- Illinois Math and Science Academy: 1988-89 per-pupil expenditures of \$17,059; 1989-90 per-pupil expenditures of \$20,403. Like the North Carolina School, the Math and Science Academy is also a residential high school. If one looks just at educational spending per pupil, costs are estimated at \$6,023 and \$6,691, respectively, for the two academic years.
- Thomas Jefferson High School of Science & Technology: estimated costs for 1989-90 were \$8,000 per student.

Per-pupil costs for these merit schools range from being less expensive than MPS per-pupil expenditures, to being up to approximately \$2,000-\$2,500 more per student for academic instruction, discounting residential expenses. Excluding start-up costs, in our proposal for a Milwaukee-area merit school with a total student body of 1,000, this would amount to a range from no more monies needed to an additional \$2-\$2.5 million to supplement current per-pupil costs. Again, these funds could come from a variety of sources, including in-kind contributions (equipment for labs, etc.) which would further defray per-pupil expenditures.

12. What type of businesses participate, and what is their rationale?

Although there are many different estimates, *U.S. News & World Report* recently stated that American businesses and industries are spending as much as \$30 billion a year training and educating workers. That's more than the total Gross National Product (GNP) for some countries. Another study estimated that the decline in U.S. educational achievement costs us \$87 billion a year in a lower GNP. And often times the costs are for remedial education--education that should have already been acquired.²⁹

²⁸Fischer, op. cit., p. 4.

²⁹John Bishop, "Is the Test Score Decline Responsible for the Productivity Growth Decline?" *American Economic Review*, March, 1989, as cited in "Executive Alert," National Center for Policy Analysis, July/August, 1989.

That estimate includes on-going training and staff-development programs that allow U.S. employees to learn and compete in today's ever-changing international market. That is exactly why business is participating in American education. It has no choice.

In the past, America was able to fuel the industrial and post-industrial revolutions with a strong manufacturing base. Generally speaking, an educated work force was not a requirement. It has been pointed out that the 25 percent drop-out rate (the percentage of American students who never make it through high school) has not changed much during the last 50 years. The difference is that in the 1930s, 1940s, and 1950s, it didn't matter as much because these high-school dropouts were still able to seek gainful employment because of the extensive manufacturing base of the American economy.

Today, however, we are in an internationally-driven, high-tech age in which employees are required to be able to think, rationalize, retrain, and handle complex information. In 1987, the New York Telephone Company had to test 57,000 persons before it could find only 2,100 qualified applicants to become operators and repair technicians--not even the hi-tech jobs of computer programmers or researchers. These horror stories are by no means unique to New York, and they have similarly been echoed by companies of all sizes and all locations, including Milwaukee. Last summer, the Wisconsin National Federation of Independent Business (NFIB) surveyed over 13,000 of its members. Of the members that reported having hired a Wisconsin high-school graduate during the past two years, 14 percent reported that the high-school graduates were unable to read sufficiently in order to perform their jobs. Furthermore, 23 percent of the business owners found that the graduates' math skills were insufficient, and 22 percent reported that "the grad[uate]s were unable to understand written and oral instructions."³⁰

Not only are the demands of employment more technical and require a better-educated work force, but there is also a decline in the size of additions to the labor pool itself. American businesses need workers to replace an aging work force. Milwaukee employers need access to a talented labor pool to be competitive. If local talent is not developed to its fullest capabilities, Milwaukee employers will either have to compete (unsuccessfully) with less talent or try to import it from other parts of the country or world. Local employers like General Electric claim that it is very hard to attract highly trained workers to Milwaukee when these workers have choices of where they can live. It would be much easier and wiser to produce more local talent who know the joys of living in Milwaukee and who would jump at the chance to find high-tech employment in Milwaukee. Businesses should understand that their well-educated labor pool would be much larger if they were to support a Milwaukee-area merit school. In this context it is obvious to see the rationale behind businesses' involvement in education; their very survival depends on the future supply of educated workers.

Business organizations are taking active measures in school reform. Companies ranging from Burger King to Sears and Goldman Sachs have entered the field of education, setting up their own schools and academies. As the new education secretary, Lamar Alexander, stated while unveiling President Bush's school reform proposals, we shouldn't "think of school districts as having a monopoly to operate public schools."³¹

³⁰See NFIB Wisconsin Editorial "Many High School Grads Don't Make the Grade at Wisconsin Small Businesses," June 1, 1990.

³¹As cited by Hilary Stout, "Firms Help Set Up, Run Public Schools," The Wall Street Journal, April 18, 1991.

Locally, Wisconsin Manufacturers and Commerce has an employment education council. Businesses who voluntarily serve on such councils and committees would be a place to seek support for a merit school. There have even been calls by leaders in private industry to take steps to develop a high-tech research community in southeastern Wisconsin. In fact, acreage has already been identified by some political leaders who want that area to become one of the nation's leading medical centers and research parks. Clearly, ambitious goals demand ambitious actions, requiring a strong educational commitment. Every corporation with its headquarters in the Milwaukee area has an inherent, even selfish, interest in ensuring an adequately educated work force.

Consequently, we find an alliance between the business and education communities that seeks similar goals: the production of well-educated citizens.

13. *What is the impact, if any, on the schools from which the magnets "steal" students? What proof is there of the alleged impacts?*

When the establishment of the North Carolina merit schools was being debated, concerns were voiced that a special school would draw away the most talented students, "skimming the cream off" of the student body. Indeed, similar arguments can be heard when the proposal for establishing any sort of merit school is brought up.

This argument comes from those who advocate "mainstreaming" in education. As the theory goes, the bright students can help teach others and can in turn learn from the other students whom they teach. It seems that this argument, however, is built upon two flawed assumptions.

First of all, even in the present public school structure, students are already somewhat divided in their curriculum. The "bright" students are usually enrolled in honors courses or Advanced Placement (AP) courses. Some high schools participate in a track system. Nicolet High School, for example, offers A and B level honors courses, varied by difficulty and content. So there already exists some sort of "intellectual segregation."

Secondly, even if the perfect classroom existed and students of all potential and talents were mixed, the mainstream theory necessitates the active involvement in the learning process of the "bright" students. However, studies have shown that students who are truly classified as gifted and talented are unchallenged in a "regular" classroom environment, sometimes becoming behavior problems and often turn into passive learners. This is one of the effects of unchallenging educational environments for the gifted and talented that a merit school would correct.

Interestingly enough, experience has shown that when a merit school is established and the top one to three percent of the students of a public school enroll in the merit school, they are replaced with a new one to three percent. In other words, other students assume more of a leadership role in their academic performance in the non-magnet school. The 1983 Department of Education study has also shown that magnet schools tend to improve community confidence in public education for all schools.³² (For a more detailed discussion of this point, see question 15.)

³²Blank, op cit., p. 5.

To assess the total impact on a school-by-school basis, one must first decide the area to be served by the merit school. Obviously a statewide or regional magnet school would have less of an impact than a city or district school. Determining the size of the school is also important; most magnet schools tend to be no more than 200-400 students per class. So an entire school would comprise no more than 800-1,600 students--a minimal impact on statewide enrollment.

A Milwaukee-area school with 250 students per grade, totaling 1,000 students, would contain less than four percent of all Milwaukee high school students. Expanding the service area, such a school would enroll less than two percent of the entire Milwaukee-area high school population.

14. *What have been the local reactions to the merit high schools? Who supports/denigrates them?*

Opposition to the establishment of a special merit or magnet school will most likely come from the educational establishment--present teachers, administrators, and even school board members who perceive a merit school to be a threat to the status quo. This has been the situation when most other magnet schools have been debated. The educational establishment--at both the national and local levels--calls magnet schools "elitist." Fortunately, with regard to many of the established merit schools, that charge of elitism has faded away. Former Governor James B. Hunt is quoted in a recent interview as claiming that the North Carolina School of Science and Mathematics, which barely won legislative approval, now enjoys the widest political support. He said that "like a light on the hill" the school improves the quality of other schools whose principals want to emulate their success.³³

Initial support will tend to come from members of higher education (i.e., the college or university level) who will benefit from better-educated incoming students, leaders in industry who need to invest in better-educated employees, and gifted and talented students and their parents who will benefit from the challenges of an advanced curriculum.

Support also has come from minority groups. Minority students tend to get imprisoned in the inadequate inner city curriculum. A merit school that enrolls able students--regardless of race or socio-economic background--can effectively cut across such barriers to advancement. The only criterion for admission should be an ability to perform at a determined level in the area to be stressed by the curriculum. In the Milwaukee school a special recruitment program including special summer courses would be included to ensure minority representation in the student population.

15. *What was the quality of the competing schools when the magnet was established?*

The concept of magnet schools was originally adopted to achieve desegregation of inner city and suburban schools. Inner city schools tended to be plagued with low educational achievement, thus trapping inner city students who couldn't afford to move to the suburbs or enroll in private institutions. General educational quality tended to be poor.

Since resources are allocated on the basis of enrollment, it was thought that if a certain school's curriculum was strengthened, its reputation would improve. Thus students would

³³Fred M. Hechinger, "About Education," The New York Times, October 24, 1990.

be drawn back from the city and the suburbs, thereby crossing economic and racial barriers. This necessitates, obviously, a system of choice whereby students could enroll in a magnet school even if it was outside of their own school district.

The Department of Education study found that magnet schools have a positive impact on desegregation (see number 4 above for racial breakdown of selected merit schools). They also serve as models of educational excellence and restore confidence in public schools. This eventually leads to improvement in other public schools in the area that have to compete for students and the resources that follow them.

In Milwaukee, we have a range of school quality. Some students have access to schools which are challenging while others are relegated to average or below average educations. The intent of the proposed magnet school is to give all gifted students the option to attend a truly challenging high school.

16. *What have schools done to build local support for their operation? How many have programs that bring in other high school teachers during the summer?*

Many of the noted merit schools that have been discussed have strong community ties that engender a high level of communal support and pride in the school. Keep in mind that most merit schools were established to address a need or concern in the community: inadequate educational opportunity. Detailed descriptions of the debate and eventual establishment of the North Carolina School of the Arts and the School of Science and Mathematics illustrate this point.

Like the North Carolina merit schools, the Thomas Jefferson School of Science and Technology in Fairfax County, Virginia, has--since its inception--involved community leaders from business, government, banking, and the educational sectors. Active support by noted individuals in the community assures a continued level of significant support.

And as merit institutions have grown, they have also been able to provide important community services. The North Carolina merit schools, for example, run summer programs and internships for teachers in other schools that benefit from their state-of-the-art facilities and can improve instructional techniques through professional development. One of the state missions of the North Carolina School of Science and Mathematics is outreach, to "develop the means to counter widespread educational deficiencies, such as those found by recent nationwide studies....Accordingly, NCSSM sponsors a vigorous outreach program functioning as a laboratory and resource center for the teaching and learning of science and mathematics at all levels, in all schools of North Carolina."

Most merit schools also require a certain amount of community service from their students before they can graduate. This centers around the complete development of the student in the context of an advanced, liberal education. Students at NCSSM are required to spend three hours each week in community service jobs and four hours each week performing work service chores on campus. Similarly, students at Regis High School in New York participate in a Christian Service Program.

The proposed school in Milwaukee would most certainly sponsor a rigorous program to serve the educational needs of area teachers and students. This would, in fact, be a major corollary function of the school: to help upgrade the science and math education of all area students, not just those chosen to enroll in the high school program. On this subject, the proposed merit school would be an excellent and natural provider of the "summer

institutes" for mathematics and science called for by the Governor's Commission on Schools for the 21st Century. The school would also be open to a student service component. The students here should give as well as receive.

17. *What is the payoff to the local community of such magnets (e.g., fuller utilization of human resources, integration, leadership in quest to improve educational outcome, economic development through technology, etc.)?*

The effects of magnet schools on desegregation (i.e., a student body integrated across racial, political and socio-economic barriers) are discussed above. See questions 4 and 15.

Merit schools have also provided an economic return on a community's investment. For example, in addition to the benefits of community service cited above, a student at NCSSM designed an experiment that was accepted by NASA and included in the space shuttle. More than two thirds of NCSSM graduates, some of the brightest high-school graduates in the country, remain in-state and consequently strengthen North Carolina's college and university system. As stated by the NCSSM prospectus: "When these students graduate, their training and talents will enable them to lead North Carolina into, and beyond, the science and technology of the 21st century." Clearly the investment in NCSSM is seen as an investment in North Carolina's future.

Another study of NCSSM's graduates revealed that some 70 percent of the school's minority graduates (Blacks are 11 percent of the student body; Asians, 8.7 percent; American Indians, 1.6 percent; and Hispanics, 1 percent) had chosen math, science, or related technological majors in college. The school significantly expands the minority population in technical fields and sets examples that minorities at other high schools can emulate.

Gender distribution is also very different. This same study of NCSSM's graduates revealed that 61 percent of female graduates were science, math, or technology majors, a total almost three times the 26 percent cited by the College Board for female college-bound seniors in the top 10 percent of their high school classes. Of these NCSSM graduates already in graduate school in science, math, or technology, 52 percent are female as compared to a 1987 figure from the National Research Council that a mere 19 percent of graduate students in all fields are women.³⁴

Similar findings were the result of a survey to graduates of the Illinois Mathematics and Science Academy. Nearly 58 percent of the Academy's graduates declared a college major in math or science; 47 percent of the female graduates declared a major in those disciplines. Furthermore, over 27 percent of the Academy's first graduating class (the school was established in 1986) entered university study as sophomores.³⁵

³⁴The North Carolina School of Science and Mathematics, "Fulfilling the Mission: First Decade Alumni Survey Results," June, 1990.

³⁵Illinois Mathematics and Science Academy, "Illinois Mathematics and Science Academy Summary of Major Findings, 1990 Interviews with 1989 Graduates," Spring, 1990.

In the case of the specialized schools of New York City, like Bronx Science or Brooklyn Tech, students are "farmed out" to researchers at area universities or institutes. In some instances, students participate in important research or laboratory work and sometimes publish their findings as co-authors with members of the laboratories.

Professionally and economically speaking, merit schools have an extremely high level of graduates who go on to higher education (in most cases above 90 percent of the graduating class; often as high as 98-100 percent). This means that these individuals will most likely be sufficiently educated to enter the work force on a professional level--addressing the severe shortage of such workers as discussed above. Consequently, these become taxpaying individuals, not welfare recipients.

And, finally, merit schools do enable a fuller utilization of resources--both human and non-human. Many merit high-school programs are able to take advantage of area colleges and universities during their down-time, using their extensive laboratories or professors who would otherwise be idle during the summer months or weekends. In this respect, a merit school in the Milwaukee area would have the valuable resources of such institutions as Marquette University and UW-Milwaukee, in addition to the many other, smaller colleges in the area.

Also, merit schools develop more fully the human potential of both students and teachers. In merit schools, teachers must be selected on their superior ability to teach--a demand necessitated by the composition of a gifted student body. As is the case in the New York and North Carolina merit schools, among others, teachers from other public schools are brought in for internships and training workshops that enable them to be more effective teachers in their own districts. Knowledge and the art of teaching it are disseminated.

CONCLUSION

Efforts toward educational reform need to improve both education and the way in which we educate our children. One monolithic system has failed to address successfully the diverse educational needs of the various subgroups of the student population. Students who are academically gifted or talented have remained principle victims of this failure. This report attempted to outline one proposed solution for students deemed gifted in math and science: the establishment of a merit school for math and science.

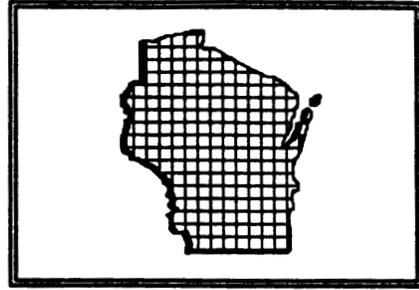
The evidence from merit high schools elsewhere in the country is compelling. Such schools have been extremely successful in upgrading the quality of education not only for those students fortunate enough to be chosen to attend, but also for students in the competing schools. The magnet schools have provided both competition and support for the existing schools with the result being greater emphasis in both types of schools on not only math and science, but on excellence in education.

If the Milwaukee area is to have the well-educated leadership it will need to compete in the 21st century, it must foster that leadership. And that leadership must be better prepared technically than is the case today. We have abundant proof that math and science are not getting their due at local schools. The proven anecdote is the creation and operation of a regional math and science merit high school.

This proposal is not meant as a panacea for all that ails our system of education. What it provides is but one alternative or one piece of the puzzle comprising true renovation of the way in which we educate our students.

THE WISCONSIN POLICY RESEARCH INSTITUTE

A Survey on Education



The following information is needed to determine the extent to which area high-school students are participating in both the Advanced Placement (AP) courses and AP examinations. The following list contains the titles of all of the courses offered by the AP program. Please check only those classes offered at your school. Also indicate the number of students enrolled in each course, as well as the number of students who took the AP exams in the corresponding fields:

AP Course Title	Check if AP courses offered at your high school, 1988-89	Total Number of Students enrolled in each course, 1988-89	Total Number of Students taking an exam in these subject areas in 1989
Art: History/Drawing/General			
Biology			
Chemistry			
Computer Science: A/AB			
Economics: Micro/Macro			
English: Lang./Lit./Composition			
European History			
French: Language/Literature			
German			
Gov't & Politics: US/Comparative			
Latin			
Calculus AB			
Calculus BC			
Music: Listening & Lit./Theory			
Physics: B/C-Mech./C-Elect., Mag.			
Spanish: Language/Literature			
US History			

The following information will be used only to assess an aggregate description of Advanced Placement examination scores. No scores will be singled out by institution. If you keep test score results as reported, please complete the following:

	5	4	3	2	1	0	Total
Number of students in 1989 with a score of							

THANK YOU for your assistance in this project!

Total number of Junior- and Senior-year students, in 1988-89: _____

Yes, please send a summary of the survey results to: _____
(include name and address)

ABOUT THE INSTITUTE

The Wisconsin Policy Research Institute is a not-for-profit institute established to study public policy issues affecting the state of Wisconsin.

Under the new federalism, government policy increasingly is made at the state and local level. These public policy decisions affect the lives of every citizen in the state of Wisconsin. Our goal is to provide nonpartisan research on key issues that affect citizens living in Wisconsin so that their elected representatives are able to make informed decisions to improve the quality of life and future of the State.

Our major priority is to improve the accountability of Wisconsin's government. State and local government must be responsive to the citizens of Wisconsin in terms of the programs they devise and the tax money they spend. Accountability should be made available in every major area to which Wisconsin devotes the public's funds.

The agenda for the Institute's activities will direct attention and resources to study the following issues: education; welfare and social services; criminal justice; taxes and spending; and economic development.

We believe that the views of the citizens of Wisconsin should guide the decisions of government officials. To help accomplish this, we will conduct semi-annual public opinion polls that are structured to enable the citizens of Wisconsin to inform government officials about how they view major statewide issues. These polls will be disseminated through the media and be made available to the general public and to the legislative and executive branches of State government. It is essential that elected officials remember that all the programs established and all the money spent comes from the citizens of the State of Wisconsin and is made available through their taxes. Public policy should reflect the real needs and concerns of all the citizens of Wisconsin and not those of specific special interest groups.