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Six Month Review

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ILLINOIS MATHEMATICS AND SCIENCE ACADEMY

Six Month Review

Reflections of A Pioneering Educational Community

Stephanie Pace Marshall, Ph.D., Director

February, 1987

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INTRODUCTION

The Illinois Mathematics and Science Academy (IMSA) was established by the Illinois legislature in 1985. It is a three-year residential program serving students gifted in mathematics and science. The Academy admits students who have completed the academic equivalent of the ninth grade and offers a program of secondary and post-secondary course work.

The Academy is governed by a seventeen member Board of Trustees, appointed by the Governor of Illinois, State Superintendent of Education, and the Executive Director of the State Board of Higher Education. With the exception of the initial appointment, board members serve six year terms. Of the seventeen members, thirteen are voting members and four are ex-officio non-voting members. The ex-officio members are the State Superintendent of Education, Executive Director of the Illinois Community College Board, Executive Director of the State Board of Higher Education, and the Superintendent of Schools in the public school district where the Academy is located.

Members of the Board of Trustees are selected from across the state of Illinois and represent secondary education, higher education, the scientific community, the corporate sector, and the general public. The Board meets once a month at the Illinois Mathematics and Science Academy. In addition to an Executive Committee, Board Committees have been established in the areas of program, personnel, and buildings and grounds.

The Illinois Mathematics and Science Academy is located in a unique educational facility that was built in 1977. The former high school/middle school complex was originally a part of the Aurora West School District, and was closed when anticipated student enrollment did not materialize in the district. The building has 330,000 square feet of open space, and 125 classrooms to serve the needs of our students and faculty. In addition, the Academy has three gymnasiums, an auditorium, laboratories, music rooms, and an Olympic size swimming pool.

The Academy is extremely futuristic in its architecture and design; its high ceilings and small number of "closed classrooms" reflect our philosophy of openness and experimentation and contribute to student/faculty interchange.

STUDENT PROFILE

The Illinois Mathematics and Science Academy (IMSA) serves students who ordinarily enter the sophomore year of high school. Following three years at the Academy, students are prepared to enter at least the sophomore year at the university.

This year's class of 210 (120 males and 90 females) represents a sample of the state's brightest youngsters. Students vary in age from 12 to 15.

Illinois legislation requires that our student population reflect the ethnic, racial, and gender distribution of the state of Illinois. Our present class is 70% Caucasian, 10% Black, 15% Oriental, 3% Hispanic, and 3% other ethnic groups. Fifty-five percent of our students are from the Chicago suburban area and forty-five percent are from other areas of Illinois. The Scholastic Aptitude Test (SAT) average score for these students in mathematics is 620, and the average SAT verbal score of IMSA students is 537. Our students took the exam as eighth or ninth graders. These scores are approximately 150 to 200 points higher than those achieved by college bound seniors.

Seven hundred sixty-eight (768) applications were received for this initial class of 210. In September, 1987, we will be admitting a class of 300 students, which will bring the total student population of the Academy to 500. Within three to four years we envision that the Academy's total population in all three levels will be between 800 and 900 students.

In addition to being academically talented, students bring to the Academy a marked determination, task orientation, and good learning skills.

CURRICULUM

This year we are offering students a core curriculum in science, mathematics, English, social science, foreign language, and physical education. There are no electives other than the specific choice in foreign language. Students take six academic subjects plus physical education. We are now in the process of developing our program for next year, as well as formulating a tentative curricular program for the third year.

This year, each student is taking a course in mathematical inquiry (algebra, geometry, trigonometry, analytic geometry, calculus), two courses in integrated science (chemistry and physics), and courses in English, social science, physical education and foreign language. Presently we are offering foreign language instruction in French, German, Spanish, Latin, and Russian. We anticipate offering courses in Japanese next year, and we are also exploring the addition of Mandarin Chinese the following year. Our language program is one of complete immersion and students are requesting additional foreign language opportunities. One computer laboratory of donated APPLE equipment has been established and in the near future, students will be on-line with the PLATO system at the University of Illinois.

CURRICULUM PHILOSOPHY

We have termed our mathematics classes "mathematical inquiry," and our science classes "integrated science." It is our intent to develop an "interdisciplinary and integrative" program so that the content areas are interrelated and students see knowledge as holistic and synergistic. Writing is a critical component in each of the subject areas. While this emphasis on writing is causing some student consternation, I believe that all students appreciate the academic rigor of the English and social science programs, as well as the mathematics and science offerings. We are committed to the concept that although the Academy emphasizes math and science education, we must produce articulate citizens with a sense of social responsibility. Our goal is to enable students to become ethical problem solvers.

The faculty and I have spent a considerable amount of time discussing the issue of academic rigor. Gifted student programs often have focused on critical and creative thinking skills, isolated projects, and tasks. Students must, however, begin with fundamental information; it is when one knows the most that one can be the most creative. While a basic tenet and underlying principle of the Academy is laboratory research, and the hands-on manipulation of first-hand data, we are also emphasizing that the students acquire not only skills but information, so that they are able to go beyond the data and synthesize information. The

Idea that students are apprentice investigators is a critical thrust of the Academy.

Presently a faculty curriculum committee is exploring issues of scope and sequence in all content areas so that we can develop a comprehensive program for our next group of incoming students.

CO-CURRICULAR PROGRAM

In addition to the academic offerings, we have been able to offer a range of athletic programs. However, because of inadequate funding, we have not been able to offer the complement of programs in the fine and performing arts. Our athletic programs include: Swimming (we have an Olympic size swimming pool on campus), tennis, basketball, baseball, badminton, softball, volleyball, cross country, track, soccer, and bowling. We have the nucleus of a chorus and a small orchestra to help us initiate the fine arts program next year. We believe the addition of the fine and performing arts are essential for our students who come to the Academy with considerable musical and artistic talent and interest.

In addition to athletic competitions, we are also involved in a number of academic and interscholastic competitive projects and programs. These include the Future Problem-Solving Bowl, chess, and a number of math and science programs; one of which is INTECH, a mentorship program whereby students work directly with researchers and scientists from nearby laboratories.

CONSTRUCTION

We are in the process of completing construction of two dormitories to house our present student population of 210 students. Temporary housing has been provided in the Academy facility while we await dormitory completion. We anticipate that the dormitories will be completed in the spring, and we will move our students into the new dorms at that time. These dormitories are being constructed by the Capital Development Board with funds appropriated by the Illinois legislature.

In January, we received an appropriation to begin the construction of three additional dormitories, as well as make improvements on the Academy facility. We anticipate that we will break ground on these additional dormitories in March, and that they will be ready for student occupancy in the Fall of 1987.

FY 88 BUDGET

This year the Academy received \$3.5 million from the Illinois General Assembly for our operating budget. This appropriation was arrived at after numerous meetings with key members of the General Assembly, and the State Superintendent's, and the Governor's staffs. While \$3.5 million enabled the Academy to open, this underfunding did not enable us to provide elective programs or programs in fine arts, computer science, library, outreach and mentorship that we had envisioned we would have. In addition, faculty are teaching far more students than we believe is appropriate if they are to develop curriculum for statewide dissemination.

The Board of Trustees has requested \$10.9 million to develop our program for 500 students. I will be making a major commitment of time and effort in Springfield, Illinois during this legislative session to provide information about our needs to insure adequate funding for the Illinois Mathematics and Science Academy. While financial resources are not the answer to all problems, the Academy requires an adequate appropriation in order for us to accomplish our legislatively mandated missions. These include: 1) To develop an exemplary academic program for students gifted in mathematics and science, 2) to serve as a laboratory for research experimentation, and innovation in curriculum development in mathematics and science, and 3) to serve as an outreach center for the improvement of mathematics and science instruction statewide.

While the nation has responded to the needs of special education students through the initiation of Public Law 94-142, (which mandates special education programming for youngsters who are physically or emotionally handicapped), we have not, as a nation, been quick to respond to the very special needs of gifted and talented youth. The response of the State of Illinois to provide residential programs for exceptionally talented youngsters is a most positive action. In fact, residential academies for gifted students are "special" education programs. There is a "burden" in being gifted. Current research on gifted education and gifted programs clearly indicates that differentiated instruction is essential if gifted students are to maximize their potential. Gifted students are in many ways students "at risk" and because of that, require programs that meet their unique needs.

VISITORS AND PUBLICITY

Although we have only been open six months, the Academy has received a great deal of national and international attention and publicity. We have been visited by representatives of several states that are contemplating the establishment of residential gifted high schools. We have

also received visitors from Puerto Rico, Shanghai (China), Israel, and Korea. We have been featured internationally on CNN television and as a result we received a letter from administrators in Australia inquiring about the Academy. We have also been visited by Dr. Ted Sharp, Executive Assistant to the Under Secretary for Education from the U.S. Office of Education, Washington D.C.

I believe the reputation of the Illinois Mathematics and Science Academy is growing and that we will become a most positive force in educational improvement in Illinois and ultimately the nation.

The representatives from other states that have contacted us about the possibility of establishing residential academies for academically talented youngsters in math and science include officials from Indiana, Oklahoma, California, New York, and Maryland. Several of these officials visited us or will be coming to the Academy in the near future.

UNIVERSITY AFFILIATES

In an effort to establish broad areas of collaboration across the state of Illinois, we have initiated a consortium of colleges and university relations called the University Affiliates of IMSA. We have contacted the presidents of the major universities of Illinois, inviting them to appoint a representative to serve on a board of Academy university affiliates. This board is designed to share information and develop collaborative programs between the Academy and the institutions of higher learning in Illinois. This proposal for an affiliate/Academy Board has been received most positively by the members of the university community.

COLLABORATIVE RESEARCH

Although we are the newest of the three gifted residential institutions in the United States, the Illinois Mathematics and Science Academy initiated the establishment of a collaborative research network. The North Carolina School of Science and Mathematics is in its eighth year, and the Louisiana School of Science and Mathematics and Performing Arts is in its fourth year. The Directors of these schools in North Carolina and Louisiana have expressed great interest in this research consortium, and we are also exploring collaborative program development.

We are jointly preparing a preliminary proposal to the Johnson Foundation, (the sponsors of Wingspread Conferences) to establish a meeting of personnel from the three residential academies, as well as representatives of other secondary schools across the nation that have specialized programs in science and mathematics. The Johnson Foundation has indicated preliminary support of this concept for a Wingspread Conference.

We have also contracted with a research team from Northern Illinois University to help the Academy develop a data collection system for a comprehensive research base. We will be submitting a grant proposal to the National Science Foundation to develop longitudinal research data between the three institutions.

We are also working with the National Science Foundation and the University of Illinois on a collaborative project to develop an interdisciplinary research model for problem solving, using multiple data bases and the most advanced technologies. We have received initial reactions from representatives of the National Science Foundation that they are interested in this most unusual joint proposal between a secondary school and a major university.

ADMISSION PROCESS FOR 1987

Several weeks ago, 11,000 application forms were distributed in Illinois to superintendents, high school principals, and guidance counselors. We requested that each of these school personnel help us to provide admission application forms to interested students. Last year 800 student applications were received for the 210 students ultimately selected. We felt this initial interest in the Academy was quite extraordinary, since the fiscal appropriation for the Academy had not yet been determined at the time applications were received.

We anticipate that we will be receiving between 1000 and 1500 completed applications for the new class of 300 students to begin in the fall of 1987.

Once the applications have been received, they will be reviewed by a state-wide screening committee, appointed by the Dean of Admissions and Research at the Academy. This group will be trained in screening applications according to a process developed by Dr. Clifford Wing of Duke University. The process is termed the accomplishment-based assessment and its premise is that a student's present accomplishments are better predictors of future accomplishments than SAT scores or grades. Following this preliminary screening process, SAT scores and grade point averages will also be assessed. Letters of recommendation from mathematics and science teachers, as well as high school guidance counselors are also a part of the application process. In addition to other information, students are required to tell us why they want to become an IMSA scholar and how they believe they can contribute to the mission and goals of the institution.

We anticipate that we will receive an exemplary group of applications from which we will select our new class of students.

FACULTY SELECTION

We are now involved in the recruitment process to add to our faculty for the 1987-1988 school year. A selection committee (including teachers) has been appointed to review applications and interview candidates. A performance list of Academy Expectations for Faculty has been developed. These will be distributed to prospective candidates. We are also in the process of searching for a Principal of the Academy and a Dean of Academic Affairs.

Candidates for Academy positions are asked to write responses to specific questions developed by each Academy team, (Math, Science, Social Studies, English, Foreign Language). These questions are subject area specific and are designed to assess subject area knowledge and skills in pedagogy. In addition, prospective candidates are asked to address the question, "What have you accomplished in education that is remarkable?" We felt that this was an essential question to ask since we are looking for exemplary educators.

IMSA FUND FOR ADVANCEMENT OF EDUCATION

Several months ago the IMSA Fund for Advancement of Education was established by the Board of Trustees. Soon we will be receiving our not-for-profit corporation status. The IMSA Fund has recently employed a Director of Development to orchestrate and develop strategies for our corporate campaign.

Our goal is to raise between fifteen and twenty million dollars over the next three to five-year period to assist the Academy.

A Case Statement to support the need for the Fund is in the process of being completed, and we are confident that this will help us receive the financial support of the corporate sector. While state support will be critical to the Academy's success, an endowment fund, established through corporate contributions, will serve as a foundation to maintain the Academy at the cutting edge of educational change.

A KALEIDOSCOPIC PERSPECTIVE

I have provided you with a very brief overview of the first six months of the Illinois Mathematics and Science Academy's existence. Our school is located in Aurora, Illinois, and in many ways, this location is serendipitous. Aurora is Latin for "Dawn," and we are truly at the dawn of a bold new venture in education.

Our initial efforts have resulted in a synergistic institution that is far more than the sum of its parts. As I reflect on the six months that have evolved, a collage of images and impressions appear.

Our students, teachers, and staff are unusual people; they have all assembled in this place because of their belief in the possible, and their willingness, through a tremendous amount of energy and commitment to change that possible future into a probable future. Students tell us that this institution has changed their lives; in fact, many faculty members have echoed the same response. Teachers have said that it is the first time that they have felt really alive as professionals, because they are now in an environment where their skills are appreciated, and that they are given the instructional and curricular autonomy necessary to become empowered professionals.

Students tell us that it is the first time they have felt safe; that they feel free to ask the questions that they had been thinking for a long period of time. They feel a sense of community here, perhaps because the unusual living arrangements have forced them to live with 25 to 30 other students in temporary accommodations. They have developed strong bonds with each other. Moving into the dormitories will be a relief to us administratively, but we want to maintain the strong sense of community that these young "Pioneers" have developed through their close association with their peers.

The days are unusual and long for all of us. The rewards, however, are multiple. One such affirmation came for me late one evening, when a student knocked on my office door and said: "Dr. Marshall, I've just gotten my first "A" in physics!" "Will you give me a hug?"

This is an academically rigorous but nurturing environment; that is our intent and our design.

I like to use the metaphor of a kaleidoscope when I think about the Academy. Our culture is beginning to take shape, but we are a constantly changing and evolving institution. I hope that always remains our posture if we are truly to be a laboratory for educational research and experimentation.

Your active participation will be critical to our success, to maintain that open perspective. Our willingness to ask the hard questions and to do the right things for the right reasons will be essential.

I hope that I have captured your imagination, at least in part, and given you some qualitative sense of what we are about.

I welcome your participation in our research projects as well as any insights you might have in curriculum development, faculty selection, student admissions, or other areas of outreach, mentorship, or collaboration.

I look forward to working with you as we continue to chart a new educational course.