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THE FUTURE OF COMPUTER TECHNOLOGY IN EDUCATION

FOR THE PAST FIVE YEARS, IT HAS BEEN PAINFULLY EVIDENT THAT OUR EDUCATION SYSTEM IS FAILING TO PRODUCE ENOUGH NEW ENTRANTS TO THE WORK FORCE WITH THE NECESSARY SKILLS. EVEN THOUGH MYRIAD CITY, STATE AND NATIONAL COMMISSIONS HAVE BEEN STUDYING AND RECOMMENDING ACTIONS, FAR TOO LITTLE PROGRESS HAS BEEN MADE.

IN FACT, THE MOST GLARING WEAKNESS IN OUR EDUCATION SYSTEM IS MANIFESTED BY THE STEADY DECLINE IN THE PROFICIENCY OF OUR WORK FORCE AT ROUTINELY APPLYING THE BASIC CONCEPTS OF MATHEMATICS AND SCIENCE. THIS SERIOUS DEFICIENCY LIMITS THE ABILITY OF U.S. COMPANIES TO IMPROVE QUALITY AND PRODUCTIVITY -- CRITICAL FACTORS IN DETERMINING COMPETITIVE POSITION IN WORLD MARKETS.

INEPTNESS IN OUR WORK FORCE IN MATH AND SCIENCE CAN BE TRACED TO A NUMBER OF FACTORS, STARTING WITH LACK OF INTEREST BY MOST YOUNGSTERS IN STUDYING THOSE SUBJECTS IN SCHOOL. COMPOUNDING THIS PROBLEM IS A SERIOUS SHORTAGE OF QUALIFIED MATH AND SCIENCE TEACHERS AND THE GENERAL WEAKNESS OF MANY OTHER TEACHERS IN THOSE IMPORTANT FIELDS.

MEETING THE DEMAND FOR VASTLY MORE EFFECTIVE EDUCATION AND TRAINING IN RESPONSE TO THE CHALLENGE OF FIERCE FOREIGN

COMPETITION WILL REQUIRE BASIC CHANGE. EXPERIENCE HAS SHOWN THAT JUST ADDING ONTO OR MODIFYING THE PRESENT SYSTEM WILL NOT PRODUCE THE DESIRED RESULTS.

WHAT IS NEEDED IS A NEW COMPREHENSIVE APPROACH, BASED ON COMPUTER-BASED TECHNOLOGY AS THE PRIMARY METHOD OF DELIVERY FOR PRIMARY, SECONDARY AND UNDERGRADUATE EDUCATION. IN THIS MODE, THE COMPUTER IS USED TO DISSEMINATE HIGHEST QUALITY INFORMATION AND KNOWLEDGE, SERVE AS A LABORATORY DEVICE, MANAGE INSTRUCTION, CONDUCT TESTS AND GENERATE REPORTS. AT THE SAME TIME, PROGRAMS CAN BE FORMULATED WHICH MEET THE NEEDS OF EACH STUDENT.

TEACHERS ARE FREED OF INEFFICIENT TRADITIONAL LECTURING, TESTING AND RECORD KEEPING; HENCE, THEY HAVE MORE TIME TO DEVOTE TO MEETING THE NEEDS OF INDIVIDUAL STUDENTS.

GOALS OF A COMPUTER TECHNOLOGY-BASED SYSTEM INCLUDE IMPROVED LEARNING OUTCOMES, LEVELING OFF THE EVER-RISING COST OF EDUCATION AND HIGHER TEACHER SALARIES. ACHIEVEMENT OF THE LAST GOAL WILL HELP ATTRACT MOST OF THE BEST AND

BRIGHTEST OF OUR YOUNG PEOPLE INTO TEACHING CAREERS, WHICH CURRENTLY ARE FAR FROM BEING THE MOST POPULAR.

TO SEE HOW EFFECTIVE COMPUTER-BASED TECHNOLOGY CAN BE IN THE TEACHING PROCESS, WE NEED ONLY LOOK AT THE EXPLOSION IN THE RATE OF ITS USE BY INDUSTRY AND A NUMBER OF GOVERNMENT AGENCIES. ACROSS A WIDE SPECTRUM OF USES, SUCH INDUSTRIES AS TEXTILES, TRANSPORTATION, HEALTH CARE AND AGRICULTURE ARE APPLYING IT TO IMPROVE LEARNING OUTCOMES AND REDUCE COST. BY FAR, THE LARGEST USER IN THE GOVERNMENT IS THE ARMED FORCES; HOWEVER, FAA HAS EXTENSIVELY UTILIZED COMPUTER-BASED TRAINING VERY EFFECTIVELY FOR MANY YEARS.

HOW CAN A NEW COMPREHENSIVE COMPUTER TECHNOLOGY-BASED APPROACH BE IMPLEMENTED, CONSIDERING INSTITUTIONAL INERTIA TO CHANGE? IN FACT, MAKING THE NECESSARY CHANGES TO ESTABLISH THE NEW SYSTEM IN EXISTING K-12 SCHOOLS OR UNDERGRADUATE INSTITUTIONS WOULD TAKE A LONG TIME -- MUCH MORE THAN IS AVAILABLE, CONSIDERING THE URGENCY FOR IMPROVEMENT IN EDUCATION.

THE ANSWER IS TO IMPLEMENT THE APPROACH IN NEW SCHOOLS WITHIN EXISTING SCHOOLS, THEREBY LARGELY AVOIDING BUREAUCRATIC RESISTANCE TO CHANGE. IN OTHER WORDS, FOR UNDERGRADUATE EDUCATION, SELECT SEGMENTS OF FOUR-YEAR COLLEGE CURRICULA, PREFERABLY IN NEW FIELDS SUCH AS

ADVANCED MATERIALS IN ENGINEERING. ALL COURSES FOR THE ENTIRE FOUR YEARS WOULD BE DELIVERED TO THE MAXIMUM EXTENT FEASIBLE WITH COMPUTER-BASED TECHNOLOGY.

ALREADY, THERE IS A CONSIDERABLE AMOUNT OF COMPUTER-BASED LESSON MATERIALS, I.E, COURSEWARE, AVAILABLE FOR THE FIRST TWO YEARS OF AN ENGINEERING CURRICIULUM. HOWEVER, MOST OF THE COURSEWARE FOR THE LAST TWO YEARS WOULD HAVE TO BE DEVELOPED. THIS IS A LARGE UNDERTAKING. COOPERATION AMONG A NUMBER OF UNIVERSITIES IS REQUIRED TO ASSURE THAT THE COMPUTER-BASED COURSEWARE IS PREPARED BY THE LEADING PROFESSORS IN EACH SUBJECT. IN ADDITION, FEDERAL FUNDING IS REQUIRED TO HELP UNDERWRITE THE COST. HOWEVER, I BELIEVE THIS WILL BE FORTHCOMING DUE TO FRUSTRATION OVER LACK OF PROGRESS IN IMPROVING EDUCATION AND THE RELENTLESS PRESSURE OF FOREIGN COMPETITION WHICHWILL BE GROWING EVER MORE INTENSE IN THE FUTURE. ONCE HIGH QUALITY, COMPUTER-BASED COURSEWARE HAS BEEN DEVELOPED, IT CAN BE USED BY MANY INSTITUTIONS.

THE APPROACH IS SIMILAR IN K-12 SCHOOLS IN THAT EITHER NEW FREE-STANDING SCHOOLS, OR SEPARATE SCHOOLS WITHIN EXISTING INSTITUTIONS, SHOULD BE ESTABLISHED FOR EACH LEVEL OF K-12 EDUCATION (ELEMENTARY, MIDDLE AND HIGH SCHOOL). AS WITH UNDERGRADUATE EDUCATION, COOPERATION AMONG A NUMBER OF

SCHOOLS AT EACH LEVEL IS ESSENTIAL FOR ASSURING THE DEVELOPMENT OF THE MOST EFFECTIVE COURSEWARE, AS WELL AS ACCELERATING THE TRANSITION TO COMPUTER TECHNOLOGY AS THE PRIMARY DELIVERY METHOD.

GIVEN THE WIDESPREAD AVAILABILITY OF COMPUTER TECHNOLOGY-BASED DELIVERY IN K-12 AND UNDERGRADUATE EDUCATION, THERE IS STILL THE MATTER OF STIMULATING MUCH GREATER INTEREST BY YOUNG PEOPLE IN MATH AND SCIENCE. CERTAINLY STUDENTS WILL BE MOTIVATED BY A MUCH MORE POWERFUL EDUCATION SYSTEM WHICH RESPONDS TO THEIR INDIVIDUAL LEARNING NEEDS -- LEARNING SUCCESS WILL GENERATE THIRST FOR MORE LEARNING. YET THAT MAY NOT BE ENOUGH IN TODAY'S COMPLEX SOCIETY. YOUNGSTERS NEED TO BE GIVEN MORE INFORMATION ON THE RELEVANCE OF MATH AND SCIENCE TO HELPING ASSURE A PRODUCTIVE AND HAPPY LIFE. VERY EARLY, THEY START WONDERING ABOUT WHAT THEY WILL DO WHEN THEY GROW UP. HENCE, THEY MUST BE TAUGHT CONTINUOUSLY, STARTING IN KINDERGARTEN ABOUT JOBS AND THE WORLD OF WORK. EMPHASIS WOULD BE PLACED ON JOBS AND THE REVELATION THAT MOST JOBS ORIGINATE FROM THE PROCESS OF APPLYING TECHNOLOGY TO DEVELOP NEW PRODUCTS AND SERVICES AND GET THEM INTO THE MARKETPLACE. MOST PEOPLE IN OUR SOCIETY GO THROUGH LIFE WITHOUT KNOWING WHERE JOBS ORIGINATE OR THE MEANING OF THE WORD TECHNOLOGY. IN FACT, MOST PEOPLE ARE TURNED OFF WHEN

THE WORD IS MENTIONED. THEREFORE, IT IS ESSENTIAL TO PROVIDE THAT UNDERSTANDING EARLY IN LIFE. THIS CAN BE ACCOMPLISHED ECONOMICALLY AND MOST EFFECTIVELY THROUGH THE CONTINUOUS USE OF COMPUTER-BASED COURSES. BY THE TIME A YOUNGSTER REACHES MIDDLE SCHOOL, A GOOD UNDERSTANDING WILL HAVE BEEN GAINED OF TECHNOLOGY, ITS CRITICALLY IMPORTANT ROLE IN SOCIETY AND THE NEED FOR STUDENTS TO TAKE MATH AND SCIENCE IN SCHOOL.

WE NEED TO MOVE RAPIDLY WITH THE PROGRAM I'VE OUTLINED FOR IMPROVING LEARNING BY USING COMPUTER-BASED TECHNOLOGY AS THE PRIMARY MODE OF DELIVERY. OTHER COUNTRIES ARE BECOMING AWARE OF ITS ENORMOUS POTENTIAL. THE COUNTRY WHICH IS ABLE TO FIRST IMPLEMENT SUCH A PROGRAM WILL HAVE A GREAT COMPETITIVE ADVANTAGE. LET'S BE SURE THAT COUNTRY IS THE UNITED STATES OF AMERICA.