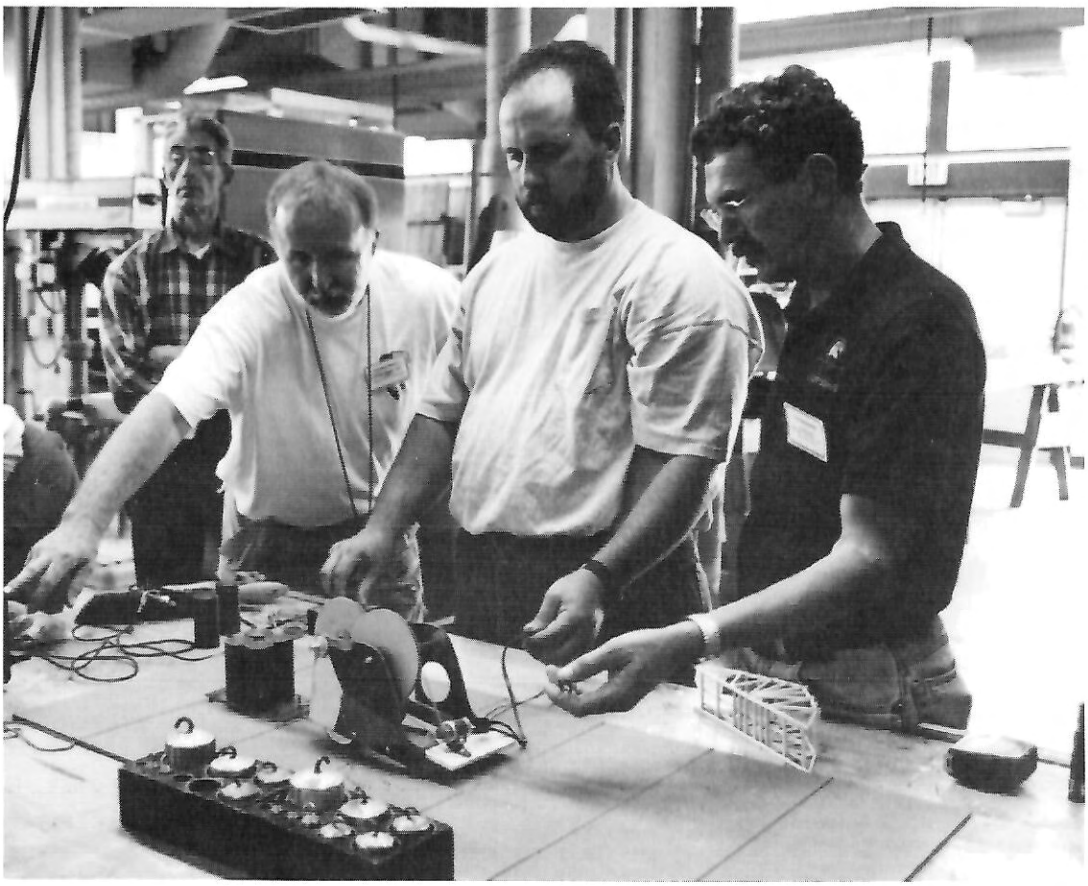
Maryland

Technology Teacher

Volume 1
Fall 1998

The Journal of the Technology Education Association of Maryland

TECH EXPO OCTOBER 17, 1998



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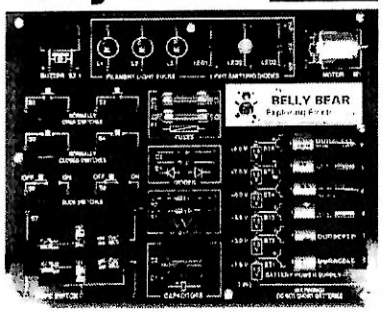
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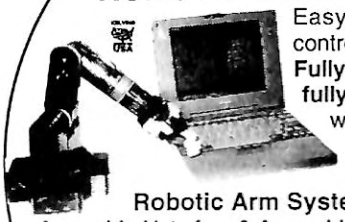
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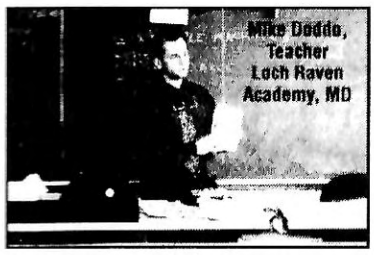
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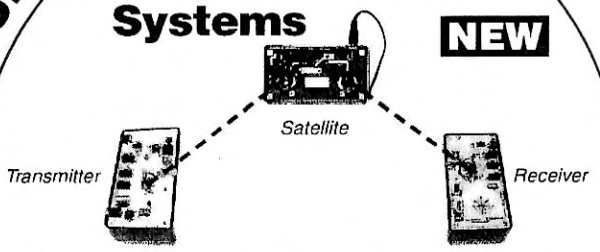


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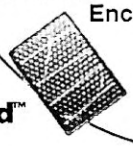
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Maryland Technology Teacher

Journal of the Technology Education Association of Maryland

Vol. 1 **Fall 1998**

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The Maryland Technology Teacher is the official publication of the Technology Education Association of Maryland (TEAM) with executive offices at the Baltimore Museum of Industry, 1415 Key Highway, Baltimore, Maryland 21230.

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President's Message

David Buddenbohn

Technology Education is an integrated, experienced-base instructional program designed to prepare students to be knowledgeable about technology - its evolution, systems, technologies, utilization, and social and cultural significance. It results in the application of mathematics and science concepts to technological systems in such areas as, but not limited to: construction, manufacturing, communications, transportation, biotechnology, and power and energy. Students are challenged to discover, create, solve problems, and construct solutions by using a variety of tools, machines, computer systems, materials, processes, and technological systems.

Sound familiar? This definition was taken from the Grandville High School Technology Education Website. Grandville High School is in Grandville, Michigan. The instructor, Mr. Spencer Dolloff, has produced a very impressive web page with a variety of links and interest areas. You will be very impressed, check it out at:

www.geocities.com/capecanaveral/6973/

My purpose for starting this way is threefold. First I was so impressed by this web page that I felt it should be given credit and shared with our membership. If there are Technology Education programs around our state that are developing their own web pages and providing data links such as this, we should post these and share the work with others in the state. Let me know of the web page development and maybe we could post them as links from the TEAM web page (which is still being developed). As always, you can e-mail me information at:

dbudd@mail.ameritel.net

The second reason for starting with this definition of Technology Education is to emphasize a point. I have been saying for sometime that Technology Education is growing. It is growing in our state and it is growing around the nation. This definition could have been taken directly out of a "Donald Maley" document. (And maybe it was.) What it does show is that Technology Education is nationwide. I was amazed at how Mr. Dolloff's curriculum mirrors the things we are doing in Maryland. Integrated, experienced-based, studies of technological systems: construction, manufacturing, power and energy etc. It mirrors Maryland Technology Education precisely. There are a lot of curriculum plans out there, and more and more they are coming into focus with each other. I believe this trend is good for Technology Education. The base and structure have been built and now we begin to create a solidarity of curricular focus that has broader reaches than just Maryland. If Technology Education is to ever be seen as a core curriculum area, this solidarity is necessary. Once again we can all help this effort by sharing ideas and efforts with each other.

The third and most important purpose for starting this letter with the definition of Technology Education is to bring some discussion to the assessment process being implemented in Maryland and how Technology Education could impact this educational trend. I am referring to the Maryland School Performance Program and its assessment program (MSPAP). I believe we need to understand these assessment processes and be ready to embrace them. Further, Technology Education can begin to set the standard for other curriculum areas to follow as we learn how these assessment processes are implemented.

MSPAP testing takes place during the third, fifth and eighth grade. In the future, high school students will be included in this process. Middle school students are given problems to solve that require them to use knowledge and skills developed in all of their classes. These assessments are intended to show how well schools are doing in preparing students to solve problems either cooperatively or individually and to apply what they have learned to real-life situations.

Technology Education teachers present students with real-world problems. Students create solutions to those problems using relevant mathematics and science concepts and skills. They also assess the social and environmental impacts of their solutions. Several writing techniques are used in technology education as well as strategies for researching topics. Many Technology Education teachers are already using teaching strategies that support MSPAP. We all need to embrace these strategies and demonstrate to the larger educational community that Technology Education is actively preparing students for these assessments and beyond for their future.

TEAM is now planning its Technology Education EXPO 98. The theme of this years exposition is, " Technology Education: World Class Skills for Success". As we provide

students with excellent opportunities to prepare for MSPAP, we will continue to develop technological literacy in all students. The upcoming EXPO will feature some of the people who are making a contribution to the achievement of all students. We believe that now is the time to focus on Technology Education as an important means of developing "Skills for Success." I hope that all TEAM members will take part in this year's EXPO. This really is a window of opportunity for TEAM, and a time for Technology Education to shine.

True learning includes first, a sense of accomplishment and satisfaction, second, an excitement which generates further exploration, and third, a desire to relate this new ability to other areas. It is our position that the study of technology can stimulate this cycle and foster true learning in science and mathematics as well. Beyond all practical reasons, we encourage the study of technology by young people for the simple joy of it and for the great satisfaction that comes with an understanding of how the world works.

National Science Board (1983)
Educating Americans for the 21st Century

Maryland Technology Teacher

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Critical Questions for Technology Educators

Thomas Wright

We should subject all technology education curriculum, regardless of its structure, to the same scrutiny. Less emotion and more critical analysis of the technology education curriculum and methods are needed. To this end, a series of questions have been developed from *Technology for All Americans* (1996), *Teaching Technology* (Wright, Lauda, Isreal, 1995), and *Technology Education — A Position Statement* (Wright and Lauda, 1993). They are presented as a way to evaluate the effectiveness of technology education programs.

1. **Does the program communicate a clear educational goal?**

   The primary goal of technology education is to develop technologically literate people. This implies that they can understand, use, and manage technology. The instruction and management system used in the program should contribute to this goal. In technology education, students should be actively involved in seeking and applying technological knowledge in a wide variety of contexts that require diverse types of tools and materials.

2. **Does the program show evidence of a clear definition of technology?**

   Technology is generally considered to be the knowledge and application of techniques to create, produce, and use artifacts, systems, and environments that help modify or control the natural world. It is the result of human volition. Unlike science, which is discovered knowledge, technology is created by people for people. The program should help students know what technology is, and what it is not.

3. **Does the program present a historical perspective of technology?**

   As a discipline, technology has a way of thinking, an accumulated body of knowledge, and a set of events and personalities. The program should make students aware of the people and milestones that mark the development of technology as humans have progressed.

4. **Does the program present the processes or actions of technology?**

   Technology involves a number of human activities. It is *developed* through invention and innovation using processes such as designing, tinkering, and trial and error. Developed ideas are made into tangible items through *production* processes that are controlled by various mechanisms and systems. People *select* and *use* appropriate technologies to meet their needs and wants. Finally, society *assesses* and *regulates* technology according to its values and ethics. The program should allow students to engage in all of these processes and not be limited to one type of activity such as design and production.

5. **Does the program present technology through authentic contexts?**

   Technology helps people locate and extract natural resources, grow and harvest crops, erect buildings and other structures, produce products, exchange information and ideas, move people and cargo, provide for the physical health of living things, etc. The program should be structured so that students understand the many contexts in which technology is applied, such as informational, physical, and biological contexts. Also, the program should provide a balance in the treatment of the various contexts so that one context is not presented as more important or significant than other contexts.

6. **Does the program present technology as an activity where multiple answers are possible?**

   Technology is used to meet individual and collective needs of humans. There is seldom a single, right answer to a technological problem. Technology is developed, produced, and used under social, economic, environmental, time, and technical constraints. Students should learn that technology can be described as "developed, produced, and used under constraint" and that no device or system is perfect, nor are various devices equally successful in meeting the needs of people.

7. **Does the program provide for a range of abilities, interests, and learning styles?**

   It is obvious to anyone who has worked with children and young adults that people have a wide variety of

interests and abilities and that they learn in different ways. Programs must be developed that allow students to find avenues for success without undue dependence on rigid time constraints and predictable methods for presenting the content and activities of the curriculum. Students should not be subjected to a single set of activities and expectations. Instead, techniques must be employed that allow the work to be selected or modified to meet their various abilities and learning styles and to find areas of interest.

8. **Does the program encourage cooperative attitudes and teamwork?**

   Modem society is dependent on people cooperating to reach mutually acceptable goals. This is true in all areas of society including functional families, civic and church groups, business enterprises, and schools. Activities in technology education should encourage group goal-setting, teamwork, shared responsibility and accountability, and group evaluation. The program should allow students to form groups of varying sizes depending on the task to be completed and to manage the progress of the group's activities.

9. **Does the program provide opportunities for open-ended activities?**

   Few technological problems are addressed in a linear path from problem to solution. Technology requires a cyclical approach to developing a solution, trying it out, identifying errors, and improving the solution. Technology activities must be structured so students can develop and redevelop solutions, produce and modify artifacts, and use and evaluate products and systems.

10. **Does the program encourage resourcefulness and initiative?**

    Technological problems and opportunities are met through locating, analyzing, and synthesizing information from a variety of sources. The best solutions are not developed using only personal experience and limited outside resources. The program should encourage students to freely seek information and to move throughout the technology education laboratory and the school in this search. A wide variety of resources, including both print and electronic media, should be available and used.

11. **Does the program use a variety of appropriate assessment techniques?**

    Technological understanding is complex and involves many levels of learning. Students should be acquainted with technological principles and practices, understand their applications, apply them to various tasks, and generalize the knowledge to new and novel situations. Assessing the students' ability to do these things requires a number of assessment techniques including tests, interviews, observations, and portfolios.

Summary

Each technology education program should be analyzed to determine if it contributes to developing a technologically literate person. Using the questions posed in this article is one way of doing this. If any question is answered "no" or if the challenge posed by it is only partly met, areas for concern and improvement have been identified.

Thomas Wright, DTE, *is the George Frances Ball Distinguished Professor of Industry and Technology at Ball State University and past president of the International Technology Education Association.* *This article is published with the permission of the author.*

Technology Education prepares people to actively participate in society as private citizens and productive workers.

Thomas Wright
Ball State University



ITEA Teacher Excellence Award Winners

The International Technology Education Association in cooperation with the Technology Education Association of Maryland selects outstanding classroom teachers and presents awards at the International Conference each Spring. The award is sponsored by Goodheart-Wilcox Corporation.

This award is one of the highest honors given to technology education teachers and is presented in recognition of outstanding contributions to the profession and students.

The Teacher Excellence Award provides public recognition at the state and international levels. On the state level, TEAM presents a plaque and other awards to those selected for recognition at its annual recognition banquet. During ITEA's annual conference, the honorees are formally presented an engraved plaque and other awards.

Candidates for the Teacher Excellence Award must be characterized as providing Technology Education instruction of high quality, learner centered and relevant to the study of technology.

Nominations for Teacher Excellence Awards are made in April of each year. The nomination forms are included in TEAM's Spring newsletter.

The names of Maryland teachers who have received this recognition appear at the right.

Maryland's ITEA Teacher Excellence Award Winners

YEAR	NAME	SCHOOL SYSTEM
1967	James Goodwin	Baltimore City
1968	Alan Brown	Montgomery County
1969	John Bruehl	Worcester County
1970	Amien Joseph	Baltimore County
1971	Robert Norris	Baltimore County
1972	George Haney	Montgomery County
1973	Harley Smith	Prince George's County
1974	Paul Skelchock	Montgomery County
1975	Rod Reed	Prince George's County
1976	John Schuma	Montgomery County
1977	James Bruns	Prince George's County
1978	Eugene Polm	Anne Arundel County
1979	William Hayes	Baltimore City
1980	Roland Phelps	Baltimore County
1981	Frank Cavallaro	Cecil County
1982	David Stowe	Montgomery County
1983	Tim Hugus	Baltimore County
1984	Ron Querns	Harford County
1985	Joshua Barbati	Baltimore County
1986	Edward Wolf, Jr.	Baltimore County
1987	Donald Wright	Baltimore County
1988	Bob Gray	Prince George's County
1989	Paul Dunford	Frederick County
1990	Rob Saunders	Anne Arundel County
1991	Bruce Bowser	Prince George's County
1992	Steve Crescenze (H.S.)	Charles County
	Lee Hastings (M.S.)	Charles County
1993	Quinn Patterson (H.S.)	Prince George's County
	Dennis Hearn (M.S.)	Prince George's County
1994	Ed Stabler (H.S.)	Prince George's County
	Melvin Chase (M.S.)	Prince George's County
	William Falatko (M.S.)	Montgomery County
	James Roberts	Kennedy-Krieger School
1995	David Buddenbohn (H.S.)	St. Mary's County
	Bill Dame (M.S.)	Prince George's County
1996	Rick Avondet (H.S.)	Prince George's County
	Michael Callaway (M.S.)	Montgomery County
1997	Cliff Feldman (H.S.)	Carroll County
	Clarence Brown (M.S.)	Montgomery County
1998	Tom Milans (H.S.)	Montgomery County
	Wendel Matthews (M.S.)	Prince George's County
	Kim Weaver (E.S.)	Charles County

Technology Education provides students with an opportunity to explore, experiment, and, in essence, replicate the ways and means by which people of all times and places have increased their capability by ... innovating, improvising and inventing ...

J. Hammond (1991)
State College System, Massachusetts

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Publication Guidelines

A survey of members at TEAM's Annual Business Meeting at EXPO '97 indicated overwhelming support for a professional journal. In response, TEAM has published this journal. Our primary goal is to create a useful and interesting forum for Technology Education professionals. We are most interested in teachers communicating their ideas.

What might you submit to the journal? Short and practical items will be in greatest demand. Not all ideas need to be original, but the topic and techniques should be treated from your perspective. Each manuscript should include the importance of the idea to the classroom setting. Information and ideas should be interesting and useful to classroom teachers. Student-ready worksheets and activity descriptions are welcome. For classroom activities, be sure to include:

1. your practical experience with the activity,
2. how often you have used the activity,
3. techniques for managing the activity,
4. assessment procedures, and
5. for what grade level it is appropriate.

The maximum length for manuscripts is 1,000 words - about 4 typewritten, double-spaced pages. This guideline will be strictly observed. We prefer short, concise articles. Submit only unpublished original manuscripts. We encourage you to submit an idea for appropriate artwork. All photos must have signed releases for identifiable parties. All sources must be referenced.

After sending a manuscript for publication in the TEAM Journal, you will receive a letter of acknowledgment from the chairman of the Editorial Review Board. Manuscripts will be sent to at least three reviewers. Manuscripts accepted for publication will normally appear in the current year's journal.

When submitting your manuscript please label all parts (pages) with your name and address, including photos and illustrations. Include both school and home addresses, phone number, fax number and e-mail address.

Please join us in this exciting new venture by sending your manuscripts to Bob Gray, 4323 Lord Fairfax Court, Upper Marlboro, MD 20772. If you have questions call Bob at 301-627-0863.

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TEAM
PROVIDING LEADERSHIP IN TECHNOLOGY EDUCATION

The Technology Education Leadership Project

Leon Copeland & Robert Gray

A Significant Opportunity for Maryland Technology Education

- Are there some things I don't know about the Teaching/ Learning Strategies used in technology education programs?
- Is my knowledge base related to the Core Technologies adequate for facilitating my students' problem-solving activities?
- Am I ready for the Information Technology that will soon infiltrate my teaching environment?

These are but a few of the questions that technology educators ask themselves when planning instructional activities. Unfortunately, there are few of us who received much training in these areas as part of our teacher preparation program. To bring Maryland's Technology Education teachers up to speed, the National Science Foundation (NSF) is funding a three-year teacher enhancement project through the University of Maryland Eastern Shore (UMES). The Department of Technology at UMES has taken the lead in providing professional development experiences for technology teachers. Many of you have taken part in a Summer Workshop for Technology Education Teachers hosted by UMES for the past five years.

Maryland has been a leader in the development of technology education. We are held in high esteem by our colleagues across the nation because we have successfully identified what students need to know about technology and have provided programs that address those goals. As the program focus shifted from the processing of materials to the study of the use, assessment, design, and production of technology systems; many teachers have had to "learn-on-the-fly" about the teaching strategies that enable students to achieve the goals of technology education. From the beginning of the process, many realized that a major effort was needed to enhance the skills of our teachers.

Under this grant project, ninety technology education teachers will be selected from school districts across Maryland to become *Teacher Leaders*. The project will involve five components: 1) summer institutes, 2) local planning teams, 3) weekend institutes, 4) local in-service activities for technology education teachers, and 5) evaluation and follow-up activities. Over a three-year period, participants will take part in four weeks of summer institutes and twelve weekend leadership sessions during the school year. The Teacher Leaders will then, with the help of their supervisor, plan and facilitate 10 days of in-service for teachers in their school system. Ultimately, over four hundred Maryland teachers will be affected by the project

This project is part of a long-term effort by Maryland educators to enhance science, mathematics, and technology education for all students.

Previous and ongoing efforts aimed at achieving this goal include:

a. **1985** - The establishment of the Maryland Symposium Series for Technology Education, a state-funded five-year project that established the guidelines for program transition from industrial arts to technology education.
b. **1992** - The adoption by the State Board of Education of a graduation requirement in technology education that ensures that all students are technologically literate upon graduation from high school.
c. **1992** - The adoption of the *Program In Technology Education* by the Maryland State Department of Education that placed into state law the outcomes that define technological literacy for Maryland students.
d. **1993** - The development of a framework document titled, "Technology Education: A Maryland Curricular Framework," that identified the expectancies or indicators for student performance in technology education.
e. **1993-1998** - Five years of state-funded regional workshops in which over 400 technology teachers were introduced to the content and instructional strategies related to the newly adopted (1992) state program in technology education.
f. **1994** - The publication by the International Technology Education Association of the "Technology Education Graduation Outcomes - The Donald Maley Monograph Series — Volume I," written by Maryland technology educators, provided an in-depth analysis of Maryland's eight learner outcomes for technology education students.
g. **1995** - The development of state facilities guidelines for technology education.

h. **1996** - Development of "Quality Indicators for Technology Education Programs in Maryland," a standards document for assessing programs.

i. **1996** - The development and dissemination to every technology teacher in Maryland of a set of 30 posters and an accompanying video describing the "Core Technologies." (Note: the poster series was reproduced by the Virginia Department of Education and distributed to all technology teachers in Virginia.)

j. **1996** - The establishment of the Maryland Center for Career and Technology Education Studies at the Baltimore Museum of Industry, a joint effort by the University of Maryland Eastern Shore, the Maryland State Department of Education, and a number of local school systems, that provides professional development opportunities at locations accessible to teachers across the state.

k. **1994-1998** - Statewide summer workshops for technology educators held at UMES that focus on the core technologies and the problem solving teaching/ learning strategy.

At each step in the process delineated above, Maryland technology educators analyzed needs and identified products and services that would promote achievement of our main goal. Each year from 1993 to 1997 the Maryland State Department of Education surveyed supervisors of technology education to determine professional development needs. The results of those surveys consistently indicated:

- A need for technology teachers to enhance their knowledge base in technical areas and specifically their understanding of the building blocks of the technology systems identified in the State Curricular Framework as the "core technologies."

- A need for teachers to enhance their skills in facilitating problem-solving activities that enable students to apply mathematics and science concepts to real-world problems.

- A need for teachers to be able to use educational technology effectively.

- A need for teachers to utilize performance-based assessment in evaluating students.

Although attempts at meeting these needs have been made over the last several years, it is the belief of state leaders that a more intensive, focused, and long-term effort is needed to make substantial progress. They also indicated that this new effort should take greater advantage of the outstanding faculty and laboratories of the University of Maryland Eastern Shore's (UMES) Department of Technology. The need for a statewide project was reiterated in responses from every school system for assistance in providing professional development for technology educators.

The unique and innovative aspects of the Technology Education Leadership Project (TELP) are instruction based on the core technologies and the utilization of six teaching/ learning strategies that enable students to achieve the outcomes identified above. In addition, the project includes instruction regarding information systems and facilitative leadership skills for professional development. The project provides training and resources for teachers that enables them to more effectively deliver instruction that will result in all students achieving the technology education outcomes identified by the State of Maryland.

... the history of technology is the story of man and tool — hand and mind — working together.

M. Kranzberg (1986)

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Engineering Education For Everyone

W. Harley Smith

Much is being said about strengthening our school programs in science as a way of enhancing our nation's competitiveness in the world economy, and indeed our standard of living. There are some, I believe, who have seen the solution to our economic security dilemma with a little more clarity. One such person is J. Myron Atkin. Writing in Education Week, September 26, 1990, Atkin indicated that science is not the basket into which we should put all of our educational eggs.

> *The public is often told that science education in the schools must be strengthened if the country is to maintain and improve its position economically. But while there are plenty of good reasons to improve science education, enhancement of America's global competitiveness is probably not one of them.*
>
> *Economic competitiveness is about serving human needs and wants. It is about conceiving, designing, manufacturing, and distributing products or ideas that have direct impact on how people get things done. That is not the central job of science, and claims to the contrary by advocates of science education can be misleading. ...If we want to get serious about using the schools as an agent for maintaining and improving the American standard of living, let's consider placing greater emphasis on technology in schools.* (1)

Atkin's choice of the word "technology," as opposed to "engineering," is insignificant when we consider the relationship between technology and engineering. The word "engineering" is almost always interpreted as a career title. Of course, it is a career title with a multitude of specializations. However, in the larger picture, engineering is not just a career. **Engineering is a basic human activity** in which problems of all magnitudes, great and small, are solved by **developing and applying technology**. As such, it is a process by which most of our human needs and desires are met, or at least attempted to be met. The chairman of Sony Corporation, Akio Morita, describes the relationship between technology and engineering, and adds to it a clarification of their linkage with science.

> *Basic scientific research provides us with information which, though previously unknown, only offers hints at the future. It is the engineer who can take these theories and basic building blocks and from them create technology. I believe that technology comes from employing and manipulating science into concepts, processes and devices. These in turn can be used to make our life or work more efficient, convenient and powerful. So it is technology, as an outgrowth of science, which fuels the industrial engine. And it is engineers, not scientists, who make technology happen.* (2)

It is interesting to note that even after the emergence of technology education in the public schools across the nation, significant leaders in the engineering community were unaware of its existence. Yet, many were advocating that a curriculum like technology education should be developed. Roland W. Schmitt, president of Rensselaer Polytechnic Institute, proposed in 1990 that an engineering-based liberal education is needed.(3) Addressing the Sixth Convocation of Professional Engineering Societies and the National Academy of Engineering on May 31, 1990, Schmitt said the following:

> *...educators should be challenged to devise an engineering-based "liberal education" for students of the next century. Engineering principles and modes of thought should be the centerpiece of what the*

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liberally educated person should be expected to know in the world of the future.

An engineering-based liberal education will have many advantages. First, we will produce many more leaders— in politics, banking, industry, law, medicine, education, administration— with an education attuned to the issues and challenges of the century, most of which have dominant technical themes. Second, with the vastly larger number of students that such an orientation would undoubtedly attract, many will emerge who want to pursue professional engineering as a career. Women and minorities, especially, might find a "liberal engineering" education more attractive than the traditional one. (3)

Schmitt's message reveals that he was unaware at the time of the emergence of Technology Education in our public schools. Yet, his vision of what is needed is in complete harmony with what we know as Technology Education.

The Maryland State Board of Education has also recognized the significance and importance of Technology Education. It has adopted a credit requirement in Technology Education in order to graduate from high school. Maryland is the first state to have such a requirement. The Board has specified the following outcomes which students must meet in fulfilling the technology credit requirement. The Technology Education learner outcomes describe what students should be able to do, think and feel as the result of a technology education experience.

1. **Application of Technological Systems**— Students will apply knowledge and skills regarding diverse technological systems, including their functioning and applications.

2. **Nature, Impacts, and Evolution of Technology**— Students will demonstrate knowledge of the nature of technology and the relationships and impacts among technological achievement, the environment, the advancement of science, the individual, and society. The context for this knowledge shall be historical, current, and futuristic.

3. **Problem Solving Using Technology**— Students will demonstrate the ability to solve problems with technology using a systems approach, higher order thinking skills, individual and collaborative ingenuity, and a variety of resources including information, tools, and materials.
4. **Informed Decisions about Technological Issues**— Students will make ethical decisions about technological issues, including the development and use of technology, and technology resources.

5. **Use of Technology Resources**— Students will demonstrate in an experiential setting the safe, effective and creative use of technological resources— including tools, machines and materials—in performing technological processes.

6. **Application of Science, Mathematics, and Other Areas**— Students will apply science, mathematics, language arts, social studies, and technological concepts to solve practical problems and extend human capabilities.

7. **Career Information**— Students will apply knowledge of and perform tasks representative of technology-based careers including engineers, technologists, technicians, and craftspersons.

8. **Multicultural and Gender Diversity**— Students will recognize the multicultural and gender diversity included in past, present, and future uses of technology.

Technology Education is the "engineering education" connection in the public schools. The engineering process

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is an appropriate focus in Technology Education. More than that, it is an important emphasis for this program. In addition to engaging students in the application of technology, it facilitates the teaching and practice of thinking skills. Furthermore, it enables students to apply concepts and skills learned in science and math. It involves collaborative effort in learning on the part of students and it can be a great stimulus for learning. Engineering activities provide a rich opportunity for students to explore by firsthand experience that vast group of technology-based careers ranging from trade, to technician, to technologist, to professional engineer.

Two teaching-learning strategies are employed in Technology Education for engaging students in problem-solving and the engineering process. One is called the "Ingenuity Challenge" the other is called "Engineering Design and Development." In these activities, students are required to employ their creativity and ingenuity to solve problems using technology. Some problems are designed to be solved through individual effort and others through team effort. Student solutions to problems are usually performance-tested in a competitive setting. As in all engineering activities, feedback from testing becomes the basis for students to improve their problem solutions. Student participation in an Ingenuity Challenge fosters confidence in the employment of those higher-level thinking skills that are required in solving problems, especially when technology is involved. These two teaching-learning strategies differ in one respect. Problems in the "Ingenuity Challenge" are defined by the teacher for the students, while problems in "Engineering Design and Development" are defined by the students who also prepare their own design specifications.

It is vitally important to our young people that they have the Technology Education advantages that have been discussed so far. But, the engineering community also derives benefit from the emergence of Technology Education as the engineering connection in the schools. Consider the following three points.

1. Engineering enterprises need increasing numbers of people to lead and support their productivity. Demand is expected to grow in the years ahead. Of these additional people, many will be engineers. Others will be scientists, technologists, technicians, and trades persons. Interest in and aptitude for all of these careers must be nurtured while students are in elementary, middle and high school. The delivery of a public school curriculum relating to engineering processes and technology systems through the application of

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IS TECHNOLOGY.
WHAT STUDENTS LEARN
IS HOW TO THINK.

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technological resources, math skills, science concepts, and ingenuity represents a viable way of initiating the development of the human resources needed by engineering enterprises.

2. The increasing complexity of decision-making concerning the selection of technology resources, and the development and use of technologies in a democracy requires a technologically literate citizenry. This is necessary to avoid the willful relinquishing of democratic control by an electorate which feels inadequate to decide. It is also necessary to avoid obstruction of necessary technologies by an electorate acting out of fear derived from ignorance. The delivery of a public school curriculum relating to technological systems and issues represents a viable way of developing the technological literacy of our citizens and assuring appropriate freedoms and controls for engineering enterprises.

3. There is great misunderstanding and lack of understanding among high school students concerning engineering professions. Many students who would have interest in engineering are unaware and do not consider it as an option. Some students who decide to study engineering in college find that their interests and engineering are not a good match. The delivery of a public school curriculum relating to engineering processes and technological systems represents a viable way of developing awareness of and interest in the engineering profession.

Technology Education has received a great boost from the engineering community across the nation. Professional engineers under the auspices of institutions of higher education, government agencies, private enterprise and professional societies have given great support to the advancement of this new curricular area. Many of us in the community of technology educators are grateful to the community of professional engineers for their support.

In many respects, Technology Education is in its infancy. The engineering community is needed to play a significant role in nurturing it to fulfill its great potential. We, as technology educators, can take advantage of significant relations with the engineering community by informing them about who we are, what we do, and by seeking their input and assistance with program development and delivery. Through a strong engineering and education alliance, both professions can be winners. More importantly, shareholders of the winnings will be our young people, our communities, and nation.

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Technology Education provides people with self-educative skills such as problem-solving, critical thinking, and analytical abilities.

Walter B. Waetjen

. . . ignorance of science and technology is becoming the ultimate self- indulgent luxury.

E. L. Boyer

The Technology Educator's Bookshelf

Thomas Wright, the George Frances Ball Distinguished Professor of Industry and Technology at Ball State University and past president of the International Technology Education Association recommends that technology educators develop a way of thinking and an accumulated body of knowledge related to technology. They should be aware of the people and milestones that mark the development of technology as humans have progressed.

To gain this understanding, technology teachers should be familiar with the standard works on the subject including the eight-volume *A History of Technology*, By Charles Singer et al. (Oxford: Clarendon Press, 1954-84). One-volume histories include Donald Cardwell's, *The Fontana History of Technology* (London: Fontana Press, 1994), Arnold Pacey's, *Technology in World Civilization* (Cambridge: MIT Press, 1990), and Trevor William's, *The History of Invention* (New York: Facts on File, 1987).

Another source of information on technology is the ever-increasing number of current books on the topic. TEAM's newsletters have for the past year featured reviews of some of the best of these new books. Doctors Angelo and Lynne Gilli have graciously shared with us book reviews they have done for other publications.

We are proud to present another of their reviews in this inaugural edition of the Maryland Technology Teacher. Guns, Germs, and Steel: The Fates of Human Societies by Jared Diamond New York: Norton, 1997, 480 pp., $27.50

Diamond brought the central topic of this book to the attention of the reader early on in the Prologue section. He pointed out his theme when he described the three kinds of development that have gone on since the end of the last Ice Age 13,000 years ago: 'some parts of the world developed literate industrial societies with metal tools, other parts developed only nonliterate farming societies, and still others retained societies of hunter-gatherers with stone tools.' From that he proceeded to gradually reveal why these differences in various parts of the world evolved in the way that they did. Early on, he cautioned the reader not to look for discoveries in differences in human intelligence that might account for differences in technology from one region to another. He stressed that such evidence has never been found. Next, he proceeded to answer his own question: If not that, then why have these differences in technological progress come about? He clinched his stand on the matter when he declared: 'History followed different courses for different peoples because of differences among people's environments, not because of biological differences among peoples themselves.'

The book was divided into four parts, in addition to the Prologue and Epilogue. Part I consisted of three chapters. The first of these addressed, in a survey-like fashion, human evolution from seven million years ago to the termination of the last Ice Age of about 13,000 years ago. This was followed in the second chapter with the effects of continental environments on history since that last Ice Age. And in the third chapter, the author described, through thoughtful extractions from observers at the time, the collisions between peoples from different continents.

The second section was made up of six chapters. This was where Diamond dealt with the most significant reasons why different civilizations varied from one another in their progressions. For example, food production varied from one part of the world to the other. This helped to lay the foundation for certain societies to become stronger, which placed them in a better position to conquer others. Food production was developed by some of these societies on their own, whereas others acquired it from the leading societies. There were also the laggards who failed in this regard and remained hunter-gatherers right up to recent times. The author devoted three chapters, seven through nine, to show how certain crops and livestock back in prehistoric times became domesticated. In a most interesting and unique manner, Diamond was able to show that the orientation of the continents' axis largely determined the rate of spread of domestication of crops and livestock. He cited that the predominately west-east orientation of the Eurasia land mass placed it at a distinct advantage in this regard as compared to the Americas and Africa.

More specific treatments of the fates of human societies from region to region were provided in the third part. The author began by revealing that Eurasian germs killed more non-Eurasian peoples than were destroyed by Eurasian guns or steel weapons. A second cause of more rapid technological progress in some places over others was the development of writing. This was considered by some as the most important single invention of the past several millenniums. An interesting aspect of this development was that writing had 'evolved de novo only a

few times in human history'. Furthermore, it occurred in the areas where food production first came about.

And what about the advancement of technology? Diamond pointed out that it had much to do with the rise of agriculture. How so? Societies where farmers generated food surpluses were able to support full-time craft specialists. Thus, these specialists, not having to devote their lives to growing their own food, were then able to devote their attention to developing advances in technology. Another outcome that came about due to the rise of agriculture was that it permitted the rise of politicians and establishment of stable forms of government in place of the mobile bands of hunter-gatherers.

In several places Diamond made the important point that 'Writing marched together with weapons, microbes, and centralized political organization as a modern agent of conquest.' Another interesting point made was that the acceptance of new inventions was largely contingent on four factors: economic advantage over existing technology; social value and prestige; compatibility with vested interests; and the ease with which these advantages can be observed.

The author drew upon the famous first sentence out of Lev Tolstoy's novel 'Anna Karenina' to point out the differences between livestock that had been domesticated from those that had not. The Tolstoy statement was: 'Happy families are all alike; every unhappy family is unhappy in its own way.' He called this the Anna Karenina Principle. He extended this principle to explain why only 14 of the world's 148 big wild terrestrial herbivorous mammals (candidates for domestication) passed the test. He put it this way: 'Humans and most animal species make an unhappy marriage, for one or more of many possible reasons: the animal's diet, growth rate, mating habits, disposition, tendency to panic and several distinct features of social organization.' In order for there to be happy marriages between an animal species and humans, they must be compatible on all those counts.

Overall, the book was well written, although Part IV seemed almost unnecessary because of the fine job done in the earlier pages. It was relatively free of jargon and easy to read. Some parts, such as the treatment of the history of writing, went into more detail than many readers would care to read about. The back part in which the author provided 'further readings' was done on a chapter by chapter basis, making it easier to know where to look for those so desiring more material on any of the sub-subjects treated. The Index was well done and highly usable.

Lynne M. Gilli
Angelo C. Gilli, Sr.

Note: If you have read something that you think is worthy of review in this journal, please forward that information to the Maryland Technology Teacher editor.

The brighter tomorrow will be there only if a bridge can be designed that would span the gulf of technological ignorance which exists between the vast majority of the populace and the technological elite.

Donald Maley

Because technology education encourages one to think and do at the same time, ... the student becomes an active participant in learning ...

Walter B. Waetjen

Commentary: What's in a Name?

Roland A. Phelps

Sixteen years ago, I attended an American Industrial Arts Association (AIAA) National Conference in Hartford, Connecticut. During my visit to the vendor exhibits, I recall being intrigued by the new titles on many of the textbooks I had used. What had previously been titled Woodworking was now Woodworking Technology. What had been Machine Metalworking was now Metalworking Technology. However, as I examined these textbooks, it soon became apparent to me that little, if anything, had been changed in the actual content of the books. Only the names had been changed on the covers.

Many of the names in our profession have been changed since that conference as well. The American Industrial Arts Association (AIAA) is now the International Technology Education Association (ITEA). The American Industrial Arts Student Association (AIASA) is now the Technology Student Association (TSA). The Maryland Industrial Arts Association (MIAA) is now the Technology Education Association of Maryland (TEAM). All of the many name changes are intended to reflect the change in focus and direction of our profession.

So, how effective have these name changes been in reflecting reality? Those of us deeply involved with Technology Education know that the profession has changed dramatically--and for the better! Carbon-copy birdhouses made from worn-out patterns have given way to open-ended, problem-solving activities. Memorizing countless parts of a lathe has been replaced by student-generated computer programs to "operate" the lathe. Unlike the textbooks I saw at Hartford, our name changes are not just "on the cover."

But, does changing a name automatically change the way those "outside" the profession perceive it? William Shakespeare wrote in Romeo and Juliet,

"What's in a name? That which we call a rose
By any other name would smell as sweet."

Fortunately, Technology Education is not merely a new name for Industrial Arts! Shakespeare's rose has not just been renamed; it has been re-engineered. While it still maintains much of its "sweet smell," it looks, feels, and performs better than it did. Unfortunately, many outside the Technology Education profession are still confused over this name change. How many times have we had to explain to others that Technology Education is not Educational Technology. Or, that Career or Vocational Education and Technology Education are not the same. And, of course, there are those who want to know what happened to *Practical Arts* in Maryland. Thus, it would appear that instead of establishing a clear, new identity with our name change, we have merely succeeded in "muddying the waters."

What can be done to help clarify this confusion? For starters, I suggest that the International Technology Education Association (ITEA) use some of its revenues and resources to spearhead a public relations campaign to "reeducate" the public. Let them know what Technology Education is, why the profession changed its name from Industrial Arts to Technology Education, and how Technology Education differs from Educational Technology, Career and Vocational Education, and, of course, Practical Arts. ITEA could generate "mini-ads" and audio and video tapes to be used by state and local boards of education to put in their publications and share with their board members. These ads and audio and video tapes could also be sent to state technology education associations for placement in their journals and then channeled to the local news media to be broadcast to the general public.

If such a public relations program can be initiated at the national level and followed through on the state and local levels, I believe we can clarify the confusion in the minds of the public and fellow educators alike. Obviously, just changing the name of the profession from Industrial Arts to Technology Education did not do the job. After all, keeping a lighted candle under a basket does not "enlighten" anyone. It could, however, burn up the basket! It's time for those in Technology Education to work together to finally "highlight" our profession and clarify its name rather than "conceal " it by confusion.

Second Annual

Donald Maley Excellence in Education Teacher Recognition Program

November 19, 1998
Wyndham Garden Hotel
Annapolis, Maryland

Commentary: ITEA Executive Director's Response

Kendall Starkweather

The article, "What's in a Name?" makes some very good points about where we are in the process of advancing the field of technology education. School reform is not something that seems to happen suddenly and the field of technology education is no different from any other field when it comes to creating change. Technology education has been successful in producing as much change as any subject area in the last decade. Hopefully, the progress will continue.

The call for ITEA to provide resources in terms of videos and materials has been answered through various decisions made by the association leaders during the past decade. ITEA has a whole series of videos and advocacy brochures that have been produced for use to further the work of promoting technology education. Some of these materials are in their second generation or are in the process of being revised at this time. The availability of these materials has been noted in newsreleases, publications catalogs, and verbally at various meetings/ conferences.

ITEA could spend millions of dollars (if they had it) to promote the field. However, that would not be enough because one component would be lacking - the technology teacher! The professional technology teacher has to be a part of the promotion through what they do as a teacher, communicator to the parents and publics, and just about anyone else who is a decisionmaker when it comes to education. Knowing that resources are available and where to get them is important. However, utilizing them and having a consistent, concerted effort to inform the various publics of the good work being produced from the technology education area is just as important. We have fallen down in that area and need to address our work as public relations agents for our field. ITEA cannot do that for the teachers. TEAM cannot do it! They can only provide help and support. Let's help each other in using the materials available and doing the best job that we can in our local situations to better inform others of our good work.

We live in a technological world, rapidly growing more complex and more sophisticated. Each of us needs to know more about technology in order to participate in its development, use, and control.

J.R. Johnson
"The Urgent Need for Broad-Based Technology Education" TIES

ITEA

International Technology Education Association

ITEA promotes excellence in technology teaching. By helping to increase the effectiveness of educators in this field, the association helps to increase the understanding and application of technology in the world.

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The Core Technologies: Why Are They Important To Technology Educators?

Harley Smith & Robert Gray

In 1993, Maryland identified the "core technologies" as a major content organizer for programs in technology education. Technology Education: A Maryland Curricular Framework, published by the Maryland State Department of Education states :

> *"The learner demonstrates knowledge of the core technologies from which all technology systems are derived, which include: mechanical technology, structural technology, fluid technology, electrical technology, electronics technology, optical technology, thermal technology, bio technology, and materials technology."* *Expectancy 1.2.5, page 22.*

The *Technology For All Americans* project which is currently developing national standards for technology education has, similarly, included the core technologies as contexts for the study of technology. Identifying these core technologies as "physical and biological systems" they are part of the "intellectual domain of technology." Why are they so important?

What are the core technologies? The core technologies are the "basic building blocks" from which all technology systems are created. Engineers, technologists, technicians, and craftspersons create technology systems for the purpose of providing hardware (materials, devices and structures), software (information media), and energy to meet human needs and desires. The number of technology systems possible seems infinite. New systems will continue to be created so long as there are resources to do so and there are problems to be solved.

We see from our daily experiences that individuals are great users of technology systems. Enterprises and institutions are also great users of technology systems. The right hand block in the model (below) identifies some of these enterprises and institutions.

Core Technologies:

The building blocks of all technology systems

TECHNOLOGY CAREER TEAMS

including:
Engineers
Technologists
Technicians
Craftspersons

COMBINE THE CORE TECHNOLOGIES

including:
Mechanical
Structural
Fluid
Electrical
Electronics
Optical
Thermal
Bio
Materials

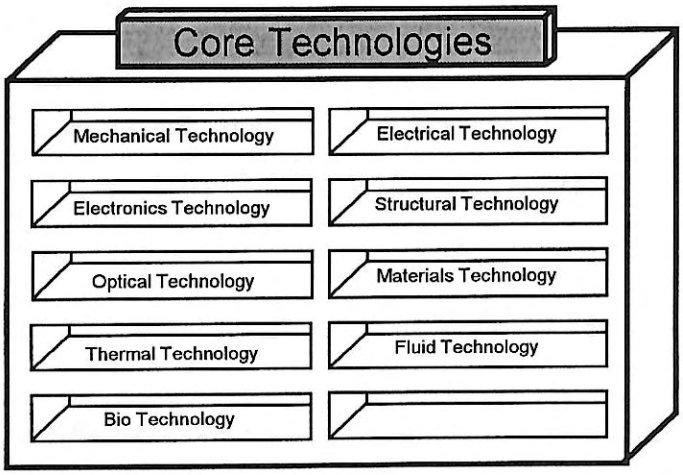
TO PRODUCE TECHNOLOGY SYSTEMS

such as:
Cars
Telephone Systems
Water Filters
Highways
Telescopes
Drill Presses
Exercise Equipment
C-D Players
Computers
Microwave Ovens
Furnaces
Refrigerators

THAT SUPPORT HUMAN ENTERPRISES & INSTITUTIONS

such as:
Manufacturing
Construction
Transportation
Health & Medicine
Communication
Energy
Recreation
Entertainment
Finance
Commerce
Law Enforcement
Public Safety
Military
Education
Hospitality
Government
Personal Services
Family & Household

Imagine that we could store the "core technologies" on shelves. We could go to those shelves and use technologies according to our needs in solving problems. For example, if a need was to be satisfied by developing an airplane, one of the technologies we would have to take from the shelf would be structural technology. It would serve us in creating the airplane body, wings and various other parts. However, the same structural technology shelf would serve us to solve a problem that could be satisfied by developing a chair. Each of the "core technologies" could be described as "generic" within its own category, or "shelf", until it is employed in the creation of a special technology system. The "core technology shelves" represent all the technologies we use to create technology systems that solve problems and extend human capabilities.



The core technologies are fundamental to the understanding of technology systems. People create technology systems to satisfy their basic needs and desires. These systems may be as simple as a paper clip or as complex as the space shuttle but they all are produced by people creatively combining core technologies. The paper clip is a combination of mechanical, structural and materials technology. An understanding of how it effectively meets our need to hold papers together is gained through an analysis of mechanical and structural design concepts and the properties of the materials used. Likewise, an understanding of how the space shuttle does its work can be attained by identifying and examining the numerous applications of the core technologies in this complex technology system.

What is it that students need to know about the core technologies? Obviously, a person could spend a lifetime studying only one tiny facet of one of the core technologies, but there is some general information that students should be aware. After an introduction to the definitions of each core technology, elementary school students should be able to identify the core technologies present in a particular example of technology. When presented with a toaster, they should readily describe where they see examples of thermal technology, electrical technology, mechanical technology, and structural technology at work. Middle school students should be able to apply knowledge of the core technologies to the solution of practical problems. They should make decisions about the use of various technologies based on cost, performance, environmental impact, and safety considerations as they design and construct problem solutions. To do this they will demonstrate knowledge of the science concepts applied in core technologies and the use of mathematics to measure, analyze, describe and predict system performance. High school students should be knowledgeable about the common components used in each core technology system, basic system design, simple controls, and system performance evaluation. They will use this information to assess, manage, design, and produce technology systems.

What do the core technologies do for technology educators? The core technologies offer technology teachers a science and mathematics-based content that supports the activities in which their students are already involved. These technologies are the bridge between science concepts and real-world technology. They provide numerous opportunities to describe, analyze, and predict physical phenomena using mathematics.

The core technologies provide a relatively stable taxonomy by which to analyze technology systems. As technology systems evolve, they will most likely continue to be combinations of these nine technologies. This means that technology teachers can develop activities that will be relevant to whatever technology systems arise.

The applications of technology by individuals and by human enterprises and institutions are many and diverse. Individuals make use of technology in personal and family life on a daily basis to make life easier, better and more enjoyable. On a different scale, our enterprises and institutions depend on technology systems for their functioning and productivity.

The dominant manner of structuring curricula for technology education has been to organize courses around applications of technology systems in selected enterprises such as manufacturing and communications. Many technology educators believe that such a model is neither the most desirable basis nor the most practical basis for curricular structuring in technology education.

It is recognized by those familiar with technology education that manufacturing, construction, transportation, and information and communication represent the

enterprises most frequently used as a basis for organizing technology education curriculum. An important question to ask is, "Why do we not organize our curricula in such a way as to include all of the other enterprises and institutions such as education, health and medicine, law enforcement, recreation, commerce, and the military that are also major users of technology." The answer to this question relates to practicality.

Two major reasons are presented for not organizing technology education curricula to account for so many enterprises.

1. There are too many human enterprises which make applications of technology systems. It would be impractical to offer courses which relate to all of them.

2. There would be considerable overlap and repetition. Many of the technology systems applied by one enterprise are also applied in others.

While it seems impractical to organize our curricula around the applications of technology in an extensive variety of human enterprises, choosing only a few enterprises seems arbitrary. Our choices of manufacturing, construction, transportation and communication have roots in the late evolution of industrial arts. As organizers, they have carried over into technology education. When considering the significance of technological systems applied in other human enterprises, our focus on these four areas is artificially limiting.

These points in opposition to organizing curricula around human enterprises is not intended to suggest that enterprise applications of technology are unimportant. Such applications by specialized enterprises are important for students to know about as examples. They serve as examples of ways in which technology systems solve problems to meet human needs and desires. Enterprise applications of technology should serve as examples, rather than serving as curricular organizers.

Summary The core technologies are the bridge between science concepts and real-world technology. They provide numerous opportunities to describe, analyze, and predict physical phenomena using mathematics. Technology education activities that require students to create technology are enhanced by instruction related to the core technologies. Students planning careers in technical areas will find that an understanding of the core technologies is applicable to all engineering-related endeavors.

Incorporating instruction on the core technologies does not preclude programs based on technological processes such as "engineering design and development" or those based on enterprises that utilize technology such as "manufacturing." It is unique in that it is a body of knowledge that is recognized by the science and mathematics communities as a logical and valuable enhancement to their disciplines. The core technologies offer technology teachers a precise, mathematics-based, content that supports the activities in which their students are already involved. Including the study of the core technologies in all technology education programs is relevant, practical, and complimentary to the general education of all students.

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Core Technologies

What do students need to know about the Core Technologies?

- ***Common components***
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- ***System performance evaluation***
- ***Science concepts applied***
- ***Mathematics applications***
- ***Safety practices***

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The role of President of the International Technology Education Association for the Year 2000 will be to continue the progress that has occurred over the past 50 years and lead the profession into the 21st century. I believe that technology education must prepare students to be lifelong learners in a global society. Technology education is the one program capable of providing students with resources and opportunities to explore the study of technology through hands-on activities.

As a curriculum coordinator and supervisor, I have firsthand experiences in implementing elements of the ITEA strategic plan. In order to strengthen the profession for the 21st century I will work to:

- Position technology as a basic area of academic study for grades K-12.
- Pursue extensive recruitment strategies for new technology education teachers.
- Support classroom teachers in the implementation of their programs with resources, workshops, and the integration of technology.
- Provide leadership in curriculum development that parallels the Technology for All Americans Rationale & Structure.
- Enhance the participation of women and under-represented racial/ethnic groups in technology.

Achieving the technology education graduation requirement in Maryland has provided me with the opportunity to work closely with teachers, administrators, and the science/technology community. It is through these experiences, and those on the ITEA Board and committees that I am qualified and committed to accomplish the goals of the organization. I will work to provide the voice, guidance, and support necessary to continue to bring about positive changes in our profession.

For more detailed information, visit my website at

http://www.mcps.k12.md.us/curriculum/teched/burke.html

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Sailing Smoothly Into Elementary School Technology Education

Kim Weaver

Watching children at the elementary level, I observe that they are constantly busy. Their hands, minds, bodies are on the move all the time. Children love to experiment with their world by building "real life" objects using Tinker Toys, LEGOs, K'NEX and any other manipulatives they can get their hands on. It is easy to lay the groundwork for technology as part of the curriculum when we take this enthusiasm and use it to have students build a structure in the classroom. One technology unit I have used successfully with first graders is based on sailing. To help you sail smoothly into this unit, here are some ideas for lessons in various content areas.

Social Studies:
Introduce cardinal directions (Compass Rose) to students. Have students construct a map, identify and locate land forms, and discuss current events dealing with sailing

Mathematics:
Set up a store and sell the materials the students need for building a model sailboat. Have them graph the quantities of materials they buy. Have students measure the various parts of their sailboat. (Hull, boom, sail, and mast.)

Science:
Allow students to experiment with air and wind concepts. Introduce sink and float concepts. Using sailboat materials, have the students investigate the properties of color, shape, size and texture.

Health/Safety:
Teach students the importance of wearing life preservers while boating. Using magazine pictures, have students prepare a healthy meal for a sailing trip.

Reading/Writing/Language Arts:
Read various books on air, wind, sailboats, water forms, and land forms. Have the students keep a journal of their building experience and identify rhyming words to go with sail, boat, etc.

Careers:
Introduce a broad range of careers dealing with sailboats: shipbuilders, scientists, engineers, sailmakers, and salespeople.

Sailing Tips:

The challenge for this unit is for the students to build the fastest sailboat. During the two week experience, students are encouraged to experiment with building and testing various hull and sail shapes to see which move more quickly through the water.

I begin by setting up a store in a corner of my classroom providing the building materials that are listed below. Each item is marked with a price ahead of time. I divide the students into teams of two. Each team is given $12.00 (Play money is duplicated on construction paper.) The students use this money to purchase styrofoam to build their hulls and other materials to build sails, masts and booms. The teams are welcome to buy from the store at any time during the building process. The recommended building time is 45 minutes each day.

The "river" where the boats sail is a 10 foot piece of plastic guttering with end caps. It should be placed on desks near the store area. Put a large box fan at one end of the gutter to provide the wind source for your students' sailboats! Do not allow anything to sit behind the fan because it will block the air flow. The low speed should be used. Use a stopwatch to determine how long it takes for each team's sailboat to travel the length of the "river." Have the students record their times so they can compare results. I invite parents for the *Grand Finale Race*. Prizes are awarded for the winning team and certificates of participation to all engineers!

As you can see, technology can be the basis for integrating content into real world situations. Through these types of activities, learning becomes more meaningful for your students in the elementary years.

Recommended Materials:
Tape, construction paper (5" x 7" pieces), straws, craft sticks, index cards, styrofoam (5 1/2" x 3" x 1"), fine sandpaper (Used to shape the styrofoam hull), wooden coffee stirrers

Classroom Management and Discipline

W. Harley Smith

Every teacher has had discussions with other teachers on the subject of class management. You probably have heard teachers say, "Don't smile for the first two weeks and everything will go well." This is the "Come Down Hard" theory. Another theory that you may have heard expressed is the "Show Them You're On Their Side" theory. It suggests that if you don't make a fuss about stupid bureaucratic rules, you won't have any serious problems. Jacob Kounin conducted research on these techniques and found they have no bearing on whether or not a teacher experiences discipline problems.

Kounin later conducted research on what he called "desist techniques," or the corrective responses teachers make to inappropriate behavior. The variables he investigated were clarity, firmness, intensity, focus, and attitude toward students. At a point following all of this research, Kounin concluded that desist techniques and such desirable characteristics as establishment of rapport, love of kids, and understanding make no difference to successful classroom discipline. (These characteristics are important, however, to facilitating the students "feeling good," a major element in learning achievement.) Kounin's work has indicated that some popular ideas about discipline are only myth.

Successful classroom management, like teaching in general, is an art with a scientific base. Understanding the scientific base and practicing to develop the art can be instrumental in improving a teacher's abilities in class management and discipline.

The following discussion will emphasize five elements which represent the art and science of successful class management and discipline. Those elements are:

1. teacher "With-itness,"
2. student motivation to participate in learning activities,
3. teacher understanding and recognition of the purposes of behavior,
4. an appropriate system of class management, and
5. effective response to inappropriate student behavior.

"WITH-ITNESS" OR PROJECTION OF CONTROL

Kounin continued his research to identify factors which contribute to successful discipline by reviewing his collection of video tapes from earlier research. In looking for the keys to success, he discovered a factor he calls "With-itness," or "Projections of Control."

"With-itness" is being very observant, which causes students to realize misbehavior will be noticed. "With-itness" is also being responsive to inappropriate behavior so that students know the teacher is persistent in having behavior standards met. Being active, energetic, and enthusiastic— showing confidence and alertness— are other "With-it" traits. Another is being skilled and knowledgeable, as this establishes the teacher as an authority without demanding it in an autocratic fashion.

Being "With-it" is also being able to overlap and to make good transitions. Overlapping is the ability to help one student with a task and answer another's question at the same time. Good transitioning is keeping momentum in a lesson and moving from one instructional phase to the next without fumbling or delay. Teacher preparation and planning are critical to good transitioning.

MOTIVATION

Motivation is the willingness to strive. It may be seen as having three factors— "Pulling" factors, "Pushing" factors, and "Competing" factors. The teacher's ability to influence motivation is linked with an ability to manipulate the student's environment.

"Pulling" or attracting factors provide the most effective motivation. They create good feelings and tend to build a positive self-concept. The result is the courage to strive. The teacher must build on the student's strengths to

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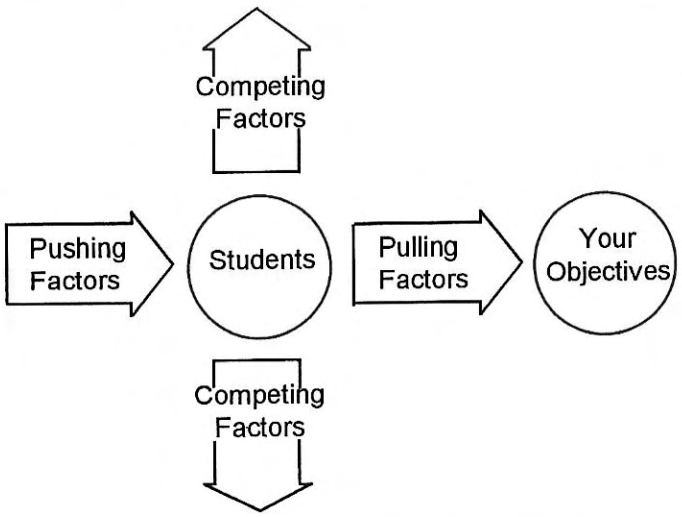
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enable success, must draw on established interests and stimulate new ones, and must provide encouragement. Following are ways of creating "Pulling" factors of motivation.

- Give encouragement—commend efforts, emphasize prospects for success.
- Facilitate success—instruct the necessary skills and knowledge, challenge within the student's reach, provide an environment which enable students to meet objectives.
- Provide an attractive and stimulating environment—colorfully and neatly decorate, display items to stimulate curiosity and interest.
- Provide a degree of freedom and independence—encourage democratic participation in appropriate aspects of the class operation and management, permit students to make some decisions affecting them as individuals and as a group.
- Communicate trust—give privileges and responsibilities.
- Give feedback—emphasize what was done correctly and well.
- Give demonstrations—create interest.
- Display project examples—create interest and curiosity.
- Communicate the values of class experiences—career value, consumer value, and avocational value.
- Communicate your enthusiasm and interest—it's contagious!

"Pushing" factors include anxiety and unpleasant feelings. Unpleasant feelings are second to pleasant feelings in effectiveness at motivation. However, they can have other very undesirable effects and should be rarely used.



Anxiety is a good motivation, up to a point. Beyond a critical point which varies for different individuals, anxiety generation is counterproductive. Following are important instructional procedures which also tend to produce anxiety within normal tolerance.

- Make grading criteria and course requirements clear—communicate what is expected.
- Monitor student progress in meeting requirements—reinforce a sense of accountability.
- Remind of responsibilities—assignments and their due dates.
- Give feedback—convey aspects of the work needing improvement without criticizing the student.

"Competing" factors are those which can work against the teacher when trying to engage students in the instructional activities and process. These factors may yield student behavior that interferes with their progress toward meeting course objectives. Some of these factors are created outside the control and influence of the teacher or class environment and may only be approached indirectly by giving the student encouragement.

One "Competing" factor may be addressed directly by the teacher. It is a conflicting student objective or desire to do something other than class assignments. Socializing during independent work time and doing homework from other classes are among the more common diversions. (These kinds of behavior may not be a simple preference for doing something other than class activities. Other possible goals of this behavior are discussed in the next section). The teacher may strive to curtail or redirect conflicting objectives by:

- avoiding times where class start is delayed—prevents socializing from getting started,
- allowing socializing only when accompanied by productivity toward class objectives,
- permitting no work on assignments from other classes, and,
- creatively linking conflicting objectives and interests with class objectives.

UNDERSTANDING AND RECOGNIZING PURPOSES OF BEHAVIOR

All behavior is goal centered and is directed toward achieving that which the individual values. Mosak and Driekurs (1973, p.39) stated that these valued goals are often unconscious or non-understood by the individual.

The Adlerian schema for goal-centered behavior identifies four "mistaken goals" which persons may pursue. The mistaken goals are falsely presumed to lead the individual toward their valued goal or goals. These mistaken goals can lead to misbehavior in the classroom.

Misbehavior should be handled differently according to the mistaken goal on which the individual is working. The Adlerian schema for goal-centered behavior offers great potential to the classroom teacher in determining appropriate ways of responding to student misbehavior. Following are a description and a graphic representation of the Adlerian schema for goal-centered behavior. Two continuums are represented on the schema—one across the top of the graphic representation (below), the other vertically on the left.

Across the top is the continuum of "Social Interest." Adler believed that people have a basic inclination toward being a part of the larger social whole, a striving to feel belongingness, a willingness to serve the greater good for the betterment of humankind. This natural inclination of which Adler spoke has come to be known as "Social Interest." On the schema, the social interest continuum goes from negative at the right toward more positive at the left. At the midpoint on this continuum is the breaking line between "Useless" and "Useful" activity. The second continuum, on the left side, is that of "Psychological Courage." It runs from a felt minus (discouraged) position at the bottom to a more positive or more encouraged position at the top. Psychological courage represents the degree to which a person is willing to strive.

Listed at the right side of the schema are the four mistaken goals—attention getting, power, revenge, and assumed disability. Behavior resulting from mistaken goals is either active or passive. This is true whether the behavior reflects low social interest (useless activity) or higher social interest (useful activity). Discussion on each mistaken goal follows.

Attention-getting individuals are expressing through behavior that they feel they count only when they are being noticed or served. They seek proof of their acceptance or approval by getting reactions from the teacher and/or peers. Attention-getting will cause an observer to consider the individual as either lazy, a nuisance, charming, or successful. Rarely would a teacher be concerned about the successful or charming student's behavior because it is useful and constructive. However, the attention-getter who is a nuisance or lazy is of concern.

This behavior usually causes the teacher to feel annoyed and irritated. The teacher feels compelled to remind the student of the behavior expectations, to coax conformity, or even to scold.

Higher ← **Social Interest** → Lower

Courage ↑ / ↓ Lower

Useful		**Useless**		
Active	**Passive**	**Active**	**Passive**	***Mistaken Goals***
Success	"Charmer"	"Nuisance"	"Lazy"	***Attention Getting***
Politics Business	Withdrawal-Non-Violence	"Rebel"	"Stubborn"	***Power***
"Crusher" "Insurgent"	"Martyr"	"Vicious"	"Withdrawal-Violent"	***Revenge***
		"Runaway"	"Hopeless"	***Assumed Disability***

In addition to being aware of these feelings, the teacher may confirm that the student is seeking attention. If the disturbing behavior subsides, at least temporarily, after attention is given, then it is fairly certain that the student's behavior is aimed at attention-getting.

Power-seeking individuals seem to feel that they count only when they are dominating, when others are doing only what they want them to do. They want to be the boss and have things their way. Power-seeking behavior will come across as either stubborn, rebellious, nonviolent withdrawing, or as competitive.

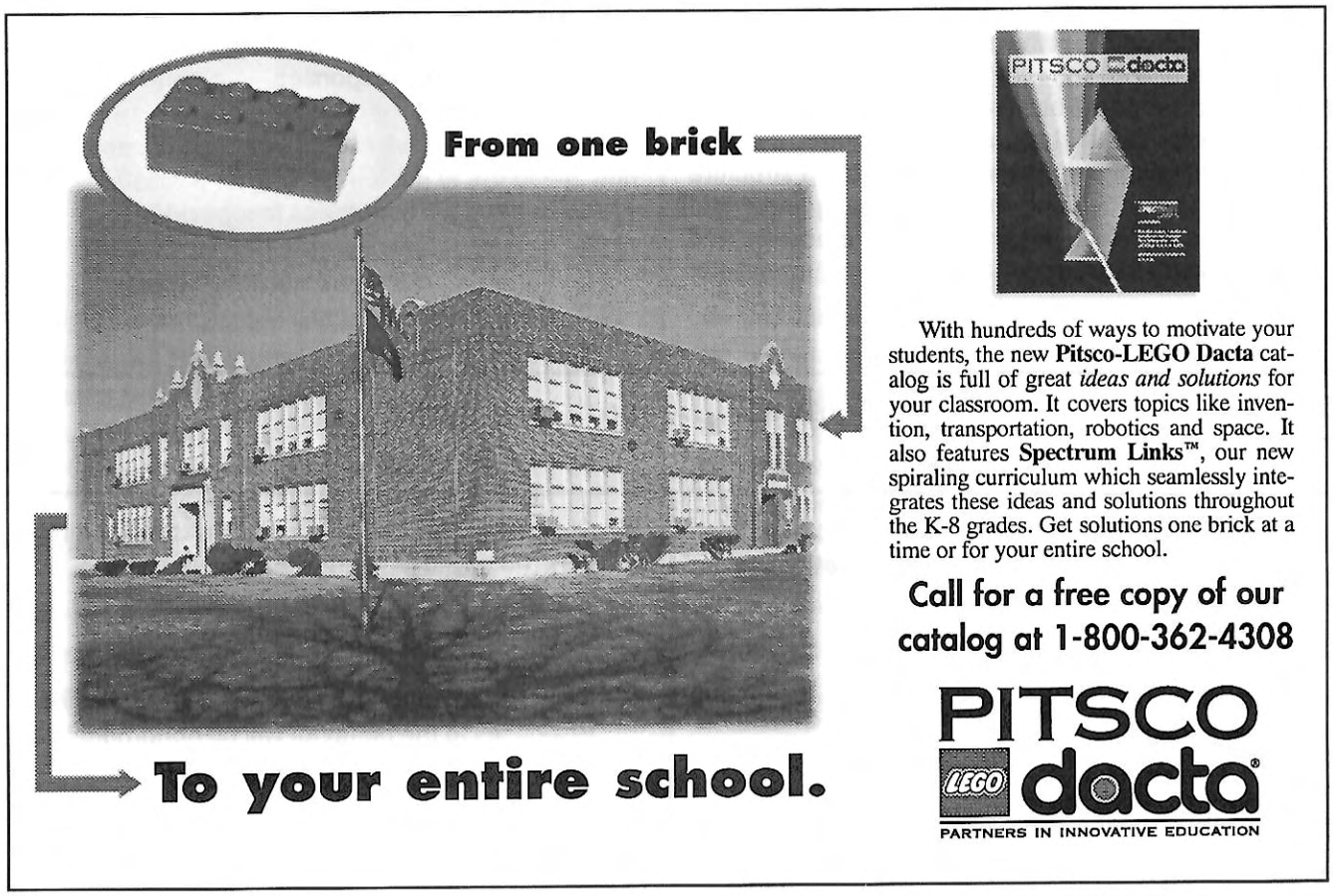
This behavior in students may cause the teacher to feel angered, provoked, and challenged. The teacher may feel the leadership of the class is threatened, and may feel compelled to regain control.

Power-seeking can be differentiated from attention-getting by the student's reaction to the teacher's coaxing or reprimand. Disruptive behavior of power-seeking students will intensify, rather than subside, when reprimanded because the student wants to win and be boss.

Revengeful persons indicate the feelings that they can't be liked, that they don't have power, and that equal status will be achieved by hurting others as they feel hurt. There seems to be a compulsion to "get even." Revenge-seekers will impress the observer as being either violent withdrawers, vicious, martyrs, or as insurgents or unauthorized enforcers. Revengeful student behavior could make the teacher feel hurt ("How could they do this to me?"), resentful, outraged ("How can they be so mean?"), or even hateful and revengeful toward the student. In response to reprimands, revenge-seeking students will continue to display revengeful behavior by violently withdrawing, acting viciously, or assuming the role of a martyr or of an insurgent.

Persons who convey inadequacy are assuming disability. Their feelings say that they are no good; that they can't do anything, so why try; and that they are hopeless. Efforts are made to be left alone because they feel that they don't want others to know how "stupid" they are.

The teacher will typically feel helpless and unable to get achievement and participation from the student who is assuming disability— even to the point of giving up on the student. The child will appear to be either hopelessly passive or show "runaway" tendencies. Such students have inferiority complexes. Their behavior may not be disruptive, but their lack of participation and achievement



is of great concern to the teacher.

Interfacing the mistaken goals with the psychological courage continuum, it is noted that the person with the mistaken goal of assumed disability is deeply discouraged. Contrarily, the attention-getter is high on courage.

On the social interest continuum, the "lazy" attention-getter and the "stubborn" power-seeker are low in social interest. Higher social interest is shown by the success-oriented attention-getter and the politically-oriented power-seeker.

AN APPROPRIATE SYSTEM OF CLASS MANAGEMENT

An autocratic system of class management is not appropriate in a democratic society. It operates on the premise that social inferiority is dominated by social superiority. Our democratic society (our youth included) has become more and more sensitive to and insisting upon a system of social equality and mutual respect. We should no longer think of discipline as an authority figure who rules with an iron fist. We need to think in terms of a leader figure who permits freedom within certain limits. Thus an appropriate system of class management is democratic and is characterized by the following.

1. An organized system of rules and procedures—
   The rules should be as few as possible, be clearly and specifically stated, say what behavior is acceptable as well as unacceptable, not relate to academic requirements of the class, and be supported by good reasons. The procedures should provide a structure for entering and leaving the room; for opening and concluding the class session; and for procuring and accounting for tools, materials, safety equipment, etc.
2. Students knowing the rules and procedures—
   These expectations are known by all.
3. Students having a say in formulating and amending the rules and procedures—
   The students participate in a democratic process. The rules are "Ours," not just the teachers.
4. Students having responsibilities—
   The responsibilities should allow students to lead others, make decisions, have accountability, and a democratic voice—all relating to the operation of the class and facility.
5. Mutual respect—
   The teacher respects the students, and expects and encourages them to be respectful toward him/her and other students. Avoid putting students in positions where they must save face.

EFFECTIVE RESPONSES TO INAPPROPRIATE STUDENT BEHAVIOR

The application of the Adlerian schema for goal centered behavior as a diagnostic tool in dealing with classroom discipline enables the teacher to recognize the mistaken goal on which the student is most likely working. Once recognizing the mistaken goal, the teacher may respond to the student's behavior appropriately. Below is a table describing appropriate responses and expected outcomes from those responses.

MISTAKEN GOAL: ATTENTION-GETTING	
Possible Responses	Expected Outcomes
■ When behavior is a rule infraction, employ a logical consequence. Minimize the amount of attention given to the student while assigning a consequence.	■ Students learn "cause-effect" relationship of rule infractions and assume self-responsibility for "effect" rather than declaring teacher responsibility for "punishment."
■ Examine the behavior to determine whose attention is being sought.	■ If peer attention is sought and received, teacher responses to the behavior will be nonproductive. Teacher must curtail peer attention to the behavior.

MISTAKEN GOAL: ATTENTION-GETTING	
Possible Responses	Expected Outcomes
■ Ignore the misbehaving child to the extent possible. ■ Maintain composure and patience. ■ Use the "time-out" technique. ■ Give attention to the student on your own terms and at a time when the student is not trying to get it.	■ Non-reinforced behavior will cease. ■ Minimizes or eliminates teacher attention to the behavior, causing it to cease. ■ Stops the disruption with minimum attention given to the misbehavior. ■ Student's desire for attention will be met without misbehavior and the use of misbehavior to get attention will subside.
MISTAKEN GOAL: POWER	
Possible Responses	Expected Outcomes
■ When behavior is a repetitive rule infraction, proceed in the sequence as necessary: ♦ hold a student conference at a later time--find what is needed to prevent another problem, develop a mutually agreeable plan. ♦ involve school resources-- guidance counselor, special resource teacher, psychologist as appropriate ♦ contact parents-- inform them of the problem, indicate what you have done or are doing, and possibly request assistance if it is not offered. ♦ involve school administration. ■ Maintain composure and patience. ■ Remember the student's message and avoid dealing with its concerns. ■ Use the "time-out" technique. ■ Give student power through responsibility ■ Win child by taking time to help and encourage. ■ Divert the student's attention to another issue. ■ Remove the student from the situation. ■ Use negative assertion. ■ Play the broken record. ■ Discuss the issue later in private when emotions have subdued.	♦ Places student and teacher on the same side of the issue, thus avoiding the power struggle. ♦ Conveys that a mutually agreeable plan is important and brings more resources to assist. ♦ Conveys that a mutually agreeable plan is important and brings more resources to assist. ♦ A last resort to eliminate disruption. ■ Avoids the confrontation. ■ Avoids confrontation, thus eliminating the power struggle and allows the student to save face. ■ Avoids the confrontation. ■ Student's desire for power is met without misbehavior. ■ Reduces the student's sense of competition for power with teacher. ■ Avoids the confrontation. ■ Avoids the confrontation. ■ Takes the argument from the issue, and maintains teacher's position. ■ Maintains teacher's position without debating the issue. ■ Allows communication to develop a plan to avoid problems.

MISTAKEN GOAL: REVENGE	
Possible Responses	Expected Outcomes
■ Responses for the mistaken goal of power are appropriate. ■ Avoid punishment ■ Try to convince student that they are liked. ■ Involve student in group activities of interest and in which they have a significant contribution. (These may not be easily devised.) ■ Use group encouragement (peers).	■ Same as for the mistaken goal of power. ■ Prevents the "feeding" of the student's revenge tendency. ■ Increases psychological courage and social interest. ■ Increases psychological courage and social interest. ■ Increases psychological courage
MISTAKEN GOAL: ASSUMED DISABILITY	
Possible Responses	Expected Outcomes
■ Persistently show faith in the student and encourage. ■ Enlist peer encouragement	■ Increases psychological courage. ■ Increases psychological courage and social interest.

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