

# Technology Education And The 21<sup>st</sup> Century

BY

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As we leave the 20<sup>th</sup> century behind and head into the 21<sup>st</sup>, we will have experienced in this past 100 years the greatest social and scientific advances since the industrial revolution started in the 18<sup>th</sup> century. We have learned to communicate by means never even thought of or imagined before this century. The integration of technologies and systems have allowed for the creation of inventions that have carried us to the moon, brought the world's images into our homes by the flick of a switch, and allowed the deaf to hear; all due to the vision and the knowledge of people using technology to control the «human-made world» and improve their surroundings. People use current technologies in appliances and devices that they don't understand, but have come to trust in the system that created them.

Our students today are going to be tomorrow's scientists, researchers and technologists. Gel plastic batteries and solar cells may power the car they will drive that is controlled by a computer guidance system. There will be no carburetor, no fuel injection, no engine to tune up and no pollution. Even today's cars are computer controlled and need specially trained technicians to operate the analyzers to trouble-shoot and adjust them. Without an understanding of systems, computers, and the ability to relate to multiple systems, the technician of tomorrow will be lost. As our technological world becomes even more complex, these technicians will require interdisciplinary skills that will allow them to analyze, interpret and apply information to vastly different systems. Therefore, the school system of the future must address the need for these interdisciplinary skills by challenging the students and teaching critical thinking and problem solving skills in the curriculum structure today.

## **Subject Correlation - Key to Interdisciplinary Curriculum**

The correlation of subject content, the real backbone of interdisciplinary curriculum, has found solid roots in the middle school movement. That is, they have been able to build appropriate bridges to other disciplines. Without those bridges, such a true interdisciplinary/integrated curriculum structure is not possible and the process is doomed to failure. The collaboration between teachers of all disciplines is absolutely essential to meet the goals of integration. Connecting the curriculum structure as we approach the 21<sup>st</sup> century is no longer an option. It must happen if we are to provide the type of education that our students need to enter the colleges, universities and job markets of the future. Whether they will work at McDonald's, or Boeing, each student will need to be able to apply what they have learned. The work place demands the individual to have communication and

organizational skills. Those same skills will be needed if the student is to succeed at two and four year schools of higher learning

Interdisciplinary or integrated curriculum is viewed, in general by most educators in literature reviewed by this author, as the organization and the transfer of knowledge on a unified continuum from general to specific. There are many valid reasons to integrate curriculum. Listed here are just a few reasons why such a plan should be implemented:<sup>1</sup>

- < Teaches students how to transfer knowledge
- < Involves the community as a learning environment
- < Teaches students how to analyze, explain and apply knowledge
- < It is competency based
- < Students are taught how to make decisions
- < Students learn how to work cooperatively with others
- < Improved student retention of knowledge
- < Students see the value of the educational experience

The whole purpose of curriculum integration is to develop a learning environment that allows students to make connections with knowledge. It develops a student that can see a connection between subject content areas and apply that knowledge and skill to solving real life problems. In an integrated curriculum the concepts taught in math, science, language arts and technology become related and the students start using higher ordered thinking skills such as interpreting, explaining, and making analogies.

### **Activities - Connection to Subject Content Areas**

The activities that are used need to include the logical connections that exist between subject content areas. The technology teacher must be the catalyst that generates the interest for this type of activity. To understand how an integrated curriculum activity might work, let's look at a typical communication project. A project designed around a media production to advertise a school activity can be used to link several subject content areas. If the teachers collaborate and coordinate when they present their instructional material, a project can involve several classes and have a significant impact on the connections made between subject areas. The universal systems model sets up the logical path that can be used to explain how activities linking academic and technological content areas will work. Since society depends on the exchange of information as the cornerstone for all other activities, a media based project brings together common elements found in numerous subject areas. Let's look at how a media production project might take shape.

## Media Production System Model

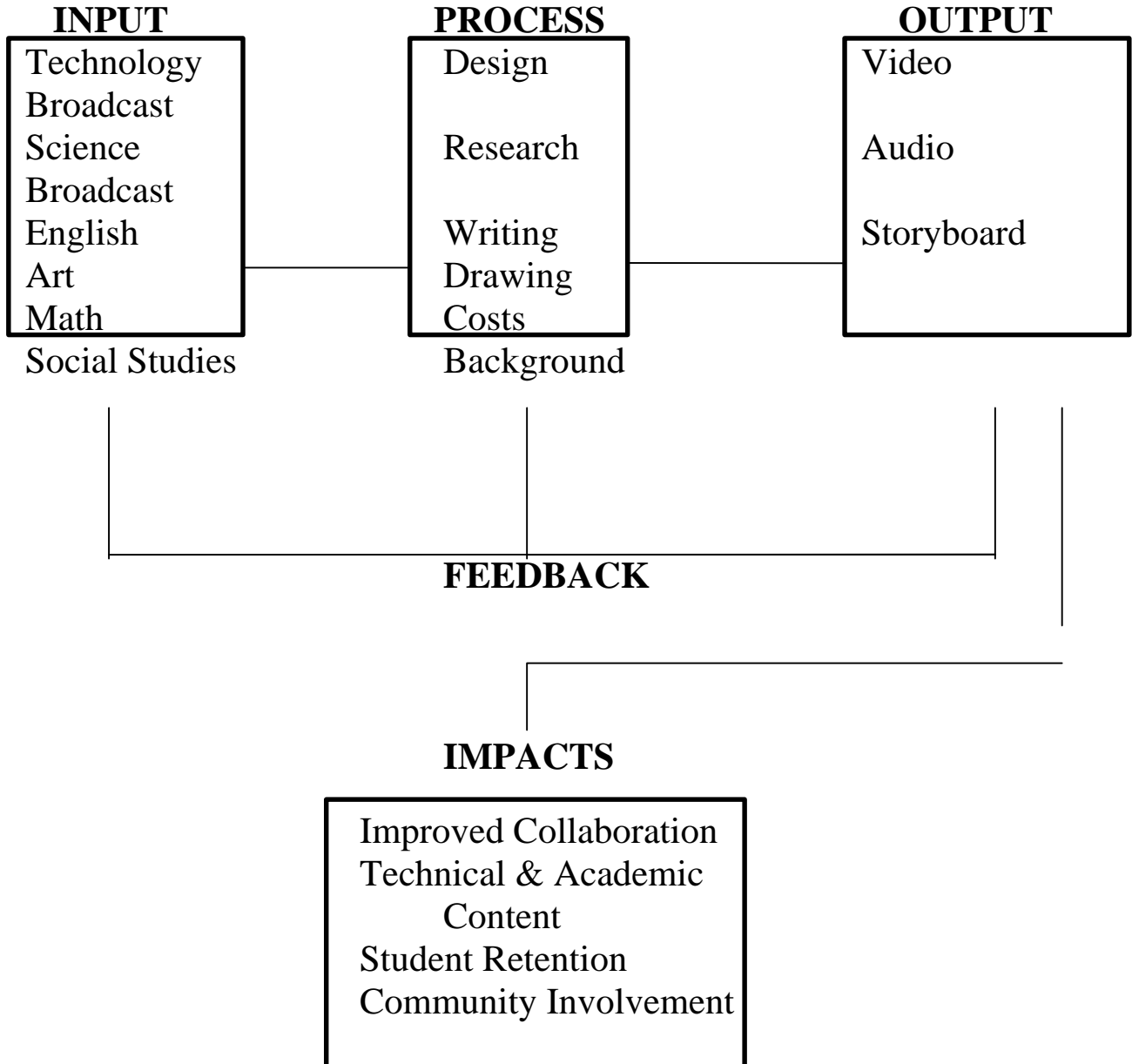


Figure 2 - Systems Model

Using the system model to lay out the initial integrated curriculum makes it easier to see how collaboration of subject content areas can be accomplished. The next step is to put the model into a package that other teachers, and the students involved, can use. These packages, in outline form, are called TLAP's. (Technology Learning Activity Packages) An example follows:

## TECHNOLOGY LEARNING ACTIVITY PACKAGE - Page 1

Communication

**Title: Media Production**

Manufacturing

 Construction**Rationale:** Society is dependent on the exchange of information. This process has now taken Transportation Power &

Energy

on more than writing or talking. This exchange involves all disciplines and uses state of the art technology. From the moment man printed the first document, spoke into the first telephone, and created the first recording, history was forever changed. Today we communicate by more means than Mr. Edison ever imagined. This activity will explore the historical and current state of the art process used for communicating.

 Bio-Related

**Goals:** To involve students in a communication activity that shows the relationship of all subject areas in the research, support, design and technical skills necessary to create and produce an audio and video message.

**Objectives:** The student will:

1. Identify the steps in the communication process
2. Report on the historical development and impacts of a communication device
3. Research the integrated circuit and the impact on audio and videography
4. Identify costs associated with an audio/video production
5. Identify careers and their requirements in the communication field
6. Present a complete audio/visual promotion of a school or community event

**Activities:**

- |                                    |                              |
|------------------------------------|------------------------------|
| 1. Research Event                  | 6. Prepare news release      |
| 2. Prepare outline of system model | 7. Produce audio message     |
| 3. Create storyboards              | 8. Produce video message     |
| 4. Develop production script       | 9. Deliver the message       |
| 5. Write the dialogue              | 10. Analyze message's impact |

## TECHNOLOGY LEARNING ACTIVITY PACKAGE - page 2

### **Title: Media Production**

#### **Requirements:**

1. Students will maintain a design portfolio showing all the steps involved in arriving at their solution. This will include but is not limited to, problem definition, sketches, alternative ideas, problems encountered, materials list and associated costs, notes and scripts.
2. Production of (1) 60 Sec. Audio and (1) 60 Sec. Video Commercial
3. Special effects will be employed

#### **Limitations:**

1. Production teams will consist of 3 to 4 students
2. Two commercials will be produced, each different:
  - a. Audio for radio;
  - b. Video for television & group presentation.
3. Must be a promotion of community or school event

#### **Materials:**

1. Storyboard templates
2. Design portfolio
3. VHS tape
4. Audio tape
5. Other materials as needed

#### **Equipment:**

1. VHS Camcorder
2. Audio tape recorder
3. Props and lighting equipment

#### **Evaluation:**

1. 40% of grade will be on design, research, documentation & portfolio
2. 60% of grade will be on originality, creativity and the finished product

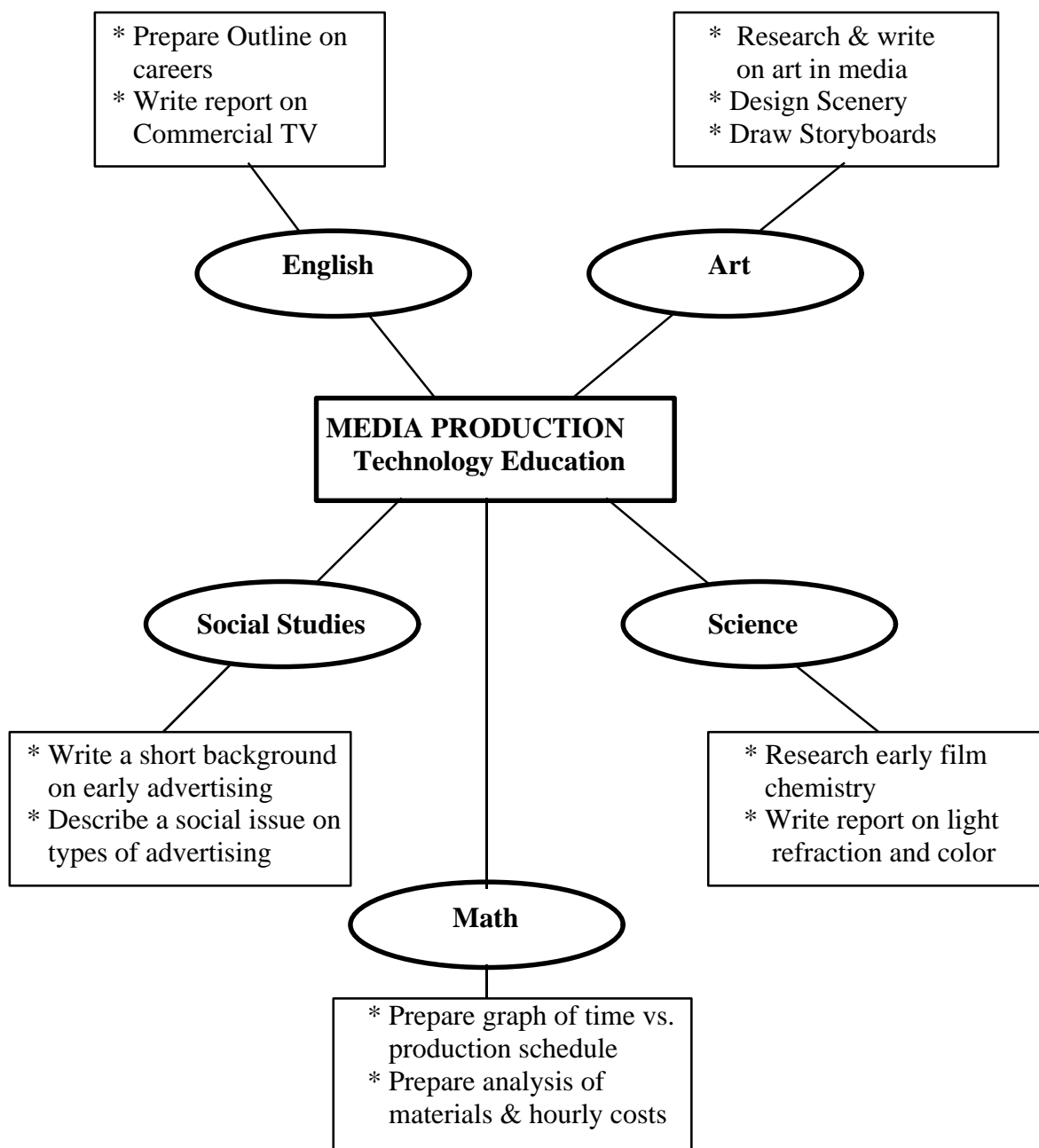
#### **Time Frame:**

10 class days

**TECHNOLOGY LEARNING ACTIVITY PACKAGE - Page 3****Title: Media Production****Student Design Problem Brief**

You and your associates have been selected to develop an advertising campaign based on an event in your local school or community. This promotion will be used to generate support and bring the event to the public's attention over your local radio and television stations. The video portion will also be used to promote the event at local gatherings and meetings to further generate support. In the space provided below list the methods and media that you and your associates through brainstorming can come up with to meet the stated objectives of this assignment. You have 10 days to complete the assignment and present it to the event organizers for final approval.

The previous activity can take many forms in the curriculum setting. From correlated, where each teacher makes minor adjustments in the timing of their course to accommodate the theme of the activity with the material they are covering; to a fully integrated structure where the student may be completely immersed in the project at hand. The danger is to avoid teaching too little so as not to really integrate, or to get so involved that the integration is so complete that the original courses lose their meaning to the student. The following diagram shows how the previous activity could be set up.



**Figure 3 - Correlated Diagram**

**Resources - Materials, Time And Personnel**

The resources needed to implement this type of interdisciplinary structure in most cases already exist. You don't have to replace all the textbooks and equipment you currently have with new. That would be like throwing the baby out with the bath water. Although it would be nice to have a brand new lab, what really must change are our perceptions of

teaching based on our current attitudes. Like the industrial arts teacher that didn't think technology education fit in the wood shop, it is not the wood shop that had to change but the process; from making individual birdhouses, to teaching the students the principles of the production process. Classroom and laboratory instruction would now involve teaching assembly line methods, setting up bills of materials, calculating the cost of goods and what the product must sell for to realize a profit.

Combined with other subject content areas a complete interdisciplinary program can be realized in the existing Industrial Arts lab. The academic and technology courses currently being taught have all the elements needed. The major problem is in restructuring the most valuable resources - teacher and class time! Building a technology lab and purchasing all the modules to teach communication, manufacturing/production, construction, energy, power and transportation and biotechnology would be ideal in a perfect world. But, a quality technology education program and an integrated/interdisciplinary curriculum structure can exist without it. It takes commitment by both staff and administration to the task at hand. A willingness to approach the curriculum change with an open mind, and taking the time to create the infrastructure to support it, must be present.

Assistance from the community, business and industry is absolutely essential to the success of such a program. Partnerships with business and industry to provide the needed apprentice and intern programs must exist. Banks, manufacturers, retail sales outlets and local government all have proven willing participants in supporting these type programs. They see value in this type of education because they are the beneficiaries of the final outcome. A well prepared and trained workforce will form the foundation to build better businesses and markets in the global community of the future.

## GOALS AND OUTCOMES-THE CHALLENGE

We read a lot about integrating technology, mathematics and science and that our students are falling behind their global counterparts. A recent press release by American Association for the Advancement of Science on their Project 2061, the long-term science, mathematics, and technology education reform initiative found, "Our students are lugging home heavy texts full of disconnected facts that neither educate nor motivate them," said Dr. George Nelson, Director of Project 2061. "It's a credit to science teachers that their students are learning anything at all. No matter how 'scientifically accurate' a text may be," Nelson continued, "if it doesn't provide teachers and students with the right kinds of help in understanding and applying important concepts, then it's not doing its job." (**Erreur! Source du renvoi introuvable.**)

One must not lose perspective when considering the differences in educational systems. In the United States we are operating a system that mandates that we educate all our children to the highest level possible, not the brightest, not those with the best math, science and technical skills, ALL OUR CHILDREN. That is what we must do globally. When we compare one system's outcome against other systems are we really comparing apples, or are we comparing apples and oranges? We need to improve the way we present math, science and technology, but it must be an international imperative. We must provide teachers with the proper tools and text books that relate to concepts learned, not a lot of unrelated facts that the teacher must pull from many sources so that they make sense. We must integrate math, science and technology, but we must also achieve a balance with all subject content areas. Bloom identified six major categories in the cognitive domain in his taxonomy that still hold true today, *Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation* (Bloom, 1956). The effective instruction and application of knowledge requires skills that are learned by seeing, understanding and applying. We have an international imperative to improve our curriculum structure and the methods we use to present it. Business and industry pointed that out loud and clear in the United States in 1991. We all have witnessed the success some middle schools have experienced with interdisciplinary teaching. It is not the books; it is to the credit of the teachers. The students' most common statement on why they do better is that «it is fun». We all do better when something is fun to do rather than drudgery. I'd much rather eat ice cream than take castor oil. The manner in which we present some of our subject content areas is akin to feeding our students castor oil. The time for change to a basic education that includes technology as the base upon which interdisciplinary curriculum is structured is at hand.

There must be a stated goal and an expected outcome with common objectives if we are to justify the change from «business as usual» in our schools. Through organizations like the International Technology Education Association (ITEA), The National Association of Industrial and Technical Teacher Educators (NAITTE) and the Association for Career and Technical Education (ACTE, formally AVA), and others, there has been continual growth, change and pressure brought to improve texts and teaching practices at all levels. This change can be as simple as teaching the student how to transfer knowledge from one subject area to another and apply it, or as complicated as involving the entire community as a classroom learning environment or laboratory through the use of internships and apprenticeship programs. We need to focus on those common objectives from the school board to the classroom teacher. There must be involvement in the process of interdisciplinary curriculum development that results in ownership by the entire school community.

We have a responsibility as teachers, practitioners and administrators of curricula, and the programs they support, to utilize our limited resources and move away from the petty turf issues. We cannot afford to waste effort any longer on issues such as «whose equipment it is», or «It has never been done that way and it won't work», that have so long held us back. It is our responsibility as educators to facilitate change. The needs of all our students, as well as the needs and requirements of the workplace, must be met if we are to maintain a productive social and business environment. Our students must have a full understanding of what the job market expects of them now and in the future. Schools, teachers or parents alone cannot solve this problem. It is a problem that must be addressed as a societal issue. The education we provide our students must provide them with the ability to make responsible career and educational choices. We, along with business and industry, must provide resources and activities that will facilitate this learning process and make education «fun». There are no quick fixes, we must commit to this for the long term. Only then will our students be able to compete in the complex society that awaits us in the 21<sup>st</sup> Century.

### Further Reading

This section presents suggested additional reading materials as well as the material that was reviewed in preparing this document.

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### Footnotes

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<sup>1</sup> Maurer, R. E. (1994). Designing Interdisciplinary Curriculum in Middle, Junior High and High School. pp. 6. Needham Heights, MA: Allyn & Bacon, Div. of Simon & Schuster, Inc.

