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ABSTRACT

School reform increasingly requires curriculum integration of academic and vocational-technical education. The first part of this guidebook presents views held by 17 North Carolina teachers in support of an integrated curriculum at the middle- and high-school levels. Part 2 provides examples of parallel academic and vocational curricula for the following areas: language arts and computer technology; communication skills and business education; and mathematics, science, social studies, and visual arts paired with various vocational-technical courses. The third part offers sample lesson plans for the following courses: language arts and career exploration, science and home economics, communication skills and business education, mathematics and agriculture, mathematics and carpentry, science and agriculture, and social studies and marketing. (LMI)

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Vocational and Technical Education
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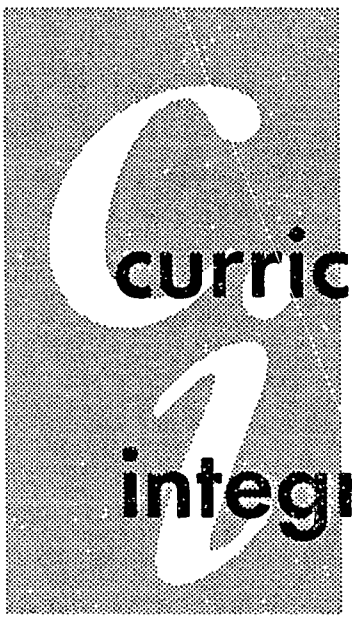

of
academic
and
vocational/technical
education

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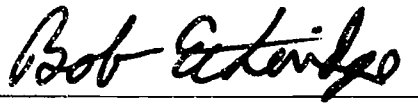
FOREWORD

School reform increasingly requires curriculum integration of academic and vocational-technical education. This guide presents teacher viewpoints and examples of parallel academic and vocational curricula and includes sample lesson plans. All these materials were prepared by teachers who viewed six distant learning satellite broadcasts about curriculum integration. I am grateful to these teachers for sharing their ideas and work. Please use these materials to gain additional insight for your classes.



Bob Etheridge
State Superintendent

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TABLE OF CONTENTS

Section I

Teacher viewpoints about the importance and rationale for integrating academic and vocational and technical education

WHY INTEGRATE VOCATIONAL AND ACADEMIC EDUCATION IN THE MIDDLE SCHOOL

I have recently completed a six-session video teleconference of practical ways to integrate academic and vocational studies. The teleconference also included ideas for planning and implementing tech prep programs at the high school level.

After attending this teleconference I would suggest to our East Wake Middle School staff that we consider implementing an integration of home economics and other vocational classes with our academic classes. Our school improvement plan listed as our goal the raising of CAT scores and improving writing scores. I believe that integration will help us reach our goal. Integration should also help us reach our 3-year goals which include raising math CAT scores.

My position is that integrating vocational education and academic courses of study will improve test scores. Implementing this program at our school would be easier than at a high school, because we are already operating with a team concept. Our teams presently include: math, science language arts, social studies and healthful living.

I suggest that vocational education teachers be assigned weekly to each team to plan and teach integrated academic objectives in the vocational classroom that are a part of the vocational student objectives. This integration would give the team of students an opportunity to relate academic objectives to real life applications. Students need to understand why certain academic concepts are needed and their relevancy to the world of work. Through integrating academics with vocational education, activities can be planned to demonstrate the applications of various concepts.

I will cite some examples of math concepts that could easily be integrated in my home economics class. Math and home economics can be integrated by the use of fractions to prepare a recipe for cookies. Students may be given a recipe and told to half the recipe. For many students, this may be the first time they had a desire to know how to divide fractions. The consumer education unit of study uses the concept of interest and a comparison of interest rates to help students understand percentages. The placement of a fabric pattern and the amount of fabric to purchase are uses of addition, multiplication, use of line. Special concepts such as up side down, reverse, visualization of abstract ideas, place or fold and how the bodies will look when unfolded are important. The use of measuring tools in home economics classrooms can integrate with math, especially standard vs. metric.

Home economics and science can be integrated. Our school has a major emphasis on our environment and recycling. The consumer education unit in home economics can integrate ideas of packaging, quantity, waste, the use of wattage and conservation of energy. At East Wake Middle School science classes plant gardens. Home economics classes can integrate objectives of food preparation. They can prepare garden vegetables, with an emphasis on preserving nutrients and preserving foods through freezing and canning. Color schemes and light systems can be integrated with the use of decorating and clothes selection. The preparation of fudge can show igneous rock formation. Evaporation concepts can demonstrate with food preparation, such as yeast breads to demonstrate carbon dioxide. Preparation of various foods can demonstrate various boiling points and density of foods/materials.

Home economics and social studies can be integrated in studying one's personality and value system in relation to culture and other cultures. Also, the comparison of values to responsibility of citizenship manners, morals, the rules and expectations of various societies can be emphasized.

My classes prepare chocolate suckers for Valentine's Day. The suckers can be used as a production of a product to teach concepts of creativity, current trends, mass production, decoration, entrepreneurship, and cost/profit margins. Projects that students make in home economics in groups can be developed to produce a product and to share supplies, materials, and tools. Leadership roles are assigned, or voted or just emerge as in our government. Preparation of foods from various cultures or the study of clothing can be explored.

Writing can be integrated with home economics in many activities. I have students write a descripitive paper "Who Am I" using the areas from child development for the types of growth-- social, emotional, mental, and physical. The paper also includes the type of family, goals, and interests. Writing and home economics can also be integrated for giving directions in writing a recipe and the sequencing of instructions or steps. The understanding of directions for using appliances can be rewritten to include more instructions, drawings, etc., for better understanding. These same concepts can be integrated for reading, with emphasis on reading for content.

Home economics can easily be integrated with concepts in health, particularly with nutrients in the preparation of foods, the storing, growing, and selecting.

I believe that we can raise scores in reading, writing, math, social studies and science if we integrate our academic classes with home economics and other vocational classes. By integrating these classes, we give our students more opportunities to experience hands-on activities. These activities are relevant to the objectives of the academic classes which are often abstract. Students are eager to participate in hands-on activities. Through integrating we can increase students' desire for more knowledge. This integration of vocational education and academic needs to be carried from the classroom to the home and community through homework assignments that further stimulate their desire for more knowledge and application of facts.

Studies show that integrating academics and vocational education raises test scores, particularly in reading. Employers want students to have more application of facts. Our high schools are going in this direction through the Tech Prep program. My belief is that East Wake Middle School can best achieve our three-year school improvement plan of improving test scores in reading, writing, and math through the integrated course of study of vocational education and academics.

INTEGRATION OF VOCATIONAL AND ACADEMIC EDUCATION

There are many reasons for integrating vocational and academic classes. The most important of these reasons is related to the creation of a classroom environment in which all students learn to solve problems and share ideas with each other. This environment nurtures personal growth and self esteem. Integrating classes makes it easier when mainstreaming exceptional or handicapped students and can reduce tensions and differences.

Another obvious reason, especially with regard to todays' economy, is the tremendous cost to industry to retraining high school graduates who are untrained or unprepared to be effective in business and industry. A high school diploma no longer gets one a good paying job. At least 2 years of technical preparation is necessary for gainful employment in many industries.

Many high school graduates have completed the academic courses or requirements with some thought toward college; then they realize college is an expense beyond their means. Their alternative is to work wherever job openings exist, but many of them lack vocational skills needed for this. Competition everywhere, especially now, is great; those who have a good foundation in both vocational and academic skill will be the ones lucky enough to enter the workforce. The others will spend years either retraining, or working at menial or low paying jobs.

Statistics show that 50% of high school students are not completing the pre-college curriculum or may be ending up with more than 20 units of credit in a general curriculum. The integration of academic and vocational curriculum would eliminate the need for 4 or 5 different courses of study throughout high school. It would provide opportunity for the "middle student" to have higher expectations and achievements. It would help develop responsible citizenship in all students.

The best argument for the implementation of this integrated curriculum would be the elimination of these questions often asked by students: "Why do I have to learn this?", "When will I ever use this?", "Why do I need to learn this?". With a more practical approach or with the opportunity to actually utilize vocational skills while studying academic content, students asking the above questions would see the need to use certain skill and information in future situations. All students would be able to reach a higher educational level. This would eventually lead to greater economic growth for an area.

Most suggestions made toward integration are practical. They consist of teachers studying models or surveys of business and industry; of teacher and students spending time in a small business setting (on-site); industrial teams sitting in on classes with academic content and coordination of effort from both groups to not only acquire, but to apply knowledge. Guidance and counseling would be provided to develop educational plans for all students. Staff training sessions and vocational workshops for teachers would be arranged with both types of training. Long range educational plans would be made for students to lead toward two year associate degrees, apprenticeships, military careers, or some education in a technical area beyond high school.

Solutions to the need for acquisition and application of both technical and academic skills are needed.

These solutions need to extend to all students with emphasis on teaching thinking skills and counseling services to encourage higher graduation requirements. The integration of academic and vocational education merges skills and content in a vocational setting, or applies vocational skills within an academic setting. Both fields must work closely together to integrate the two curriculum tracks and to improve academic, vocational, and social performance.

THE IMPORTANCE OF INTEGRATING ACADEMIC AND VOCATIONAL EDUCATION

There is definitely a need for integrating vocational courses with reading, science, math and social studies.

Before beginning the process, it is essential to define integration. To integrate means to interweave academic content into vocational courses and to integrate applied learning activities from vocational courses into academic courses.

The process of integration is a two-way street. Academic staff and vocational staff both have to be committed to the idea that integration is necessary and that integration will work successfully. The curriculum has to be reviewed and readjusted where necessary. There also has to be a program of study developed so that students will know what they must take in grades 9-12 in order to be prepared for employment and further study. Students will need constant guidance so that help can be given when needed. An annual review of the program should be conducted in order to see where changes would be beneficial.

Reading and writing skills can easily be integrated into vocational courses. The student has to be proficient in these skills in order to communicate in a chosen field of study. By combining a writing exercise into a class of keyboarding, the students will see the correlation and be able to apply what has been learned in English classes. Critical thinking skills are exercised and expanded when students transfer knowledge from one class to another.

Math skills are critical to success in all vocational courses. For instance, the Pythagorean theorem is used in planning construction. When students apply this theorem, they understand the application of information they otherwise thought had no use. Higher order thinking skills are incorporated when integration is used as a teaching technique.

Social studies classes are also combined in many vocational courses. Legal and political issues affect the marketplace, as regulatory agencies affect the job market. The social studies teacher and the marketing or home economics teacher can coordinate a unit about starting a manufacturing plant. Students would study the legal issues and discuss their impact on the new business, the local economy, prospective employees, and the environment.

The integration of vocational and academic education has the potential to improve student achievements. By repetition and application, the student will be able to retain what is learned.

Superintendents and school principals need to be involved in the integration process. It is also necessary to invest in-service training and materials so that teachers can integrate. Teachers also need to be given time to plan together. All of these elements are essential if the integration process is to be successful.

INTEGRATION OF ACADEMIC AND VOCATIONAL EDUCATION WRITING

Writing assignments can be easily integrated into any business or vocational education course. Communication is essential for success in today's rapidly changing high tech society. People must be able to adapt to these changes. Probably, the most difficult part of writing is the thinking process. Students must develop higher order thinking abilities. This will enable them to adapt to the constant changes that they will deal with in today's society. In the past, students have not been encouraged to write effectively while in school.

Higher order thinking skills involve evaluation, synthesis, analysis, and application. Evaluation involves making judgments about something based on evidence, criteria, and/or a set of standards. Synthesis involves putting information together in a form that is new. Analysis is seeing the underlying ideas that make up a body of information. Application is using knowledge to deal with new situations or problems. These skills help support the writing process.

Basic skills of understanding the meaning of information and the identification of facts are essential. In-service training can help teachers to integrate writing skills into their courses. Workshops should involve various phases for teachers to teach writing to students. Forms of writing and ideas for writing assignments can be shared and explored.

Integration of writing skills will require involvement of administrators, academic, and vocational teachers. Teachers need in-service training to help overcome the traditional separation between vocational and academic teachers. Support and commitment is needed from principals and other administrators so that everyone can remain focused on objectives for integration of writing. New materials and improved counseling, along with common preparation time for teachers, is essential for effective integration.

INTEGRATION OF VOCATIONAL AND ACADEMIC EDUCATION

Should there be a integration of academic and vocational education? Before one can make this decision, he must first look at the differences between the two curricula.

Traditionally, there has always been an underlying air of superiority by some instructors. Academic courses are even weighed more heavily in some school systems. Many times even the physical structures are separate.

For years, this seperation has been allowed to continue and increase. Only recently have administrators and educators decided to take another look at this, and have begun to realize that rather than being two separate entities, the academic and vocational curricula are related.

How are they related? The most obvious relationship is that the same members of the student body take both kinds of courses, unless the schools have two separate tracking programs. So the dilemma is, for example, how does an "abstract" grammar/composition course fit in with auto mechanics or horticulture?

Academic teachers are continually being asked to justify the curriculum. "When will I ever use English literature or algebra in real life?" students often ask. In order for learning to be significant to a student, instructors need to be able to answer meaningfully that question rather than giving the usual dogmatic answers. We need to help students see the relationship between abstract and applied learning.

That brings us back to the need for integration. The more unified a system, structure, or even a group of people is , the more powerful it/they can become. The more intellectual the graduates, the stronger they will be in the workforce. Just learning to maintain relationships in a cooperative environment can be useful. When students sense discord among academic and vocational teachers, what message are we sending?

There are many ways that teachers can integrate courses. For example, the drafting teacher and computer education teacher can design a unit in computer aided drafting (CAD). Teachers writing grant proposals can let students have a hand in it, and then let the composition classes proof the proposals and the computer classes type them. English teachers can ask students to choose research topics that would apply to other classes. Literature teachers could have students read fiction selections such as Shirley Jackson's "Charles" or Sherwood Anderson's "The Stolen Day" to enhance the students learning in a vocational child development class. Math teachers can consult with accounting teachers and have students fill out tax returns. Geometry teachers can integrate assignments with carpentry teachers. Since writing is relevant in academic and vocational areas, assignments can be coordinated among the English, keyboarding, computer and other teachers.

These are only a few of the ways that the academic and vocational curriculum can be integrated. The first step in realizing this goal is to convince more educators of the need for integration.

We plan to incorporate integration into our programs next year. We have already been discussing it in our planning meetings for next year.

During the course of natural resources and management, students are expected to define and distinguish between renewable and non-renewable resources. In order to do this, it is necessary that they have good backgrounds in English. Reading and writing skills are also essential skills helping students understand the information.

Students are expected to explain the importance of natural resources and distinguish between renewable and nonrenewable conservation. A historical development of this country serves as an example of the waste and destruction our country's natural resources have encountered.

Surveys, population studies, and statistical problems require math. Students must solve problems related to the availability of habitats for population counts needing housing and goods and services in the future.

Reports must be given by each student on local natural resource problems and current events that affect natural resources. The reporting requires English and mathematical data relating to past problems. Research and data are necessary before a solution can be formulated. Students in a natural resources class are expected to apply English, history, and science knowledge to complete their report. This is a natural integration of several subject areas.

These components of the curriculum help to prepare students for the world of work. Hands-on experiences give them a marketable skill when applying for a job.

Once students graduate and entered the work force, they will be expected to prepare reports. The quality of these reports will justify the continuance of their employment.

The experiences and knowledge from school will be applied to their job. The employer expects employees to be able to solve problems and to project and make recommendations for improvement.

English, math, history, and science are all integral parts of the training process of the student. By integrating these subjects into vocational courses, a student can evolve with marketable, transferable skills, not just an assembly-line training skill.

INTEGRATING ACADEMIC AND VOCATIONAL EDUCATION

We need to give serious thought and consideration to the importance of integrating academic and vocational curriculum. The rationale for such integrating can be divided into two questions.

A college bound youth is provided a complete program of study clearly outlining all the courses he/she should take year by year for four years of secondary education in order to qualify for college/university admissions. The first question is why shouldn't the same be provided for a youth who is planning to enter the workforce or continue his/her education at a technical school to specialize in such fields as business or electronics?

Surely we do not believe that the majority of today's students will pursue a four-year college degree. Each year we become more aware of the increase in the number of graduates who enroll in two-year community college programs to prepare themselves for careers in specialized fields such as respiratory therapy, air conditioning and electrical work, child care attendant, medical-office assistant, welding, and others. There they find that the very same courses avoided in high school, such as algebra and geometry, are required for the vocational fields of study they now wish to complete. Suddenly, they understand the benefits that studying these courses in high school would have given them. We need to provide our students knowledge of the courses they should take because the technical schools require them for entry into a technical field of study. In other words, integrate the curriculum.

Now give consideration to the second question. Since virtually all students will go to work someday, wouldn't they find the content of the courses they must take for graduation more meaningful if academic and vocational teachers could coordinate the content of the subjects they teach? It is not enough for us to say that they need to learn the material we are teaching in order "to get a better job someday." We must show them that this is true, whether they are planning to enroll in a technical school or enter the workforce immediately following graduation. It is particularly difficult for today's students to relate academic courses to their plans where they seem to relate in no way to the vocations to be pursued after graduation. Many of them simply endure the four years of these courses, choosing instead to enter the workforce early, unprepared not only for a vocation of choice, but for any vocation at all. They will accept the first jobs offered them, entering a field almost by coincidence. Their chances of succeeding in those jobs are poor; and their chances for advancement and promotion are equally as poor.

Students then need to be able to recognize how courses correlate to vocations. The material being covered in their courses, whether academic or vocational, are integrated parts of a puzzle which will become a complete picture for the preparation of future careers.

Perhaps you are thinking that we do not have enough time to coordinate adequately the material to either academic or vocational courses . You are correct: Such planning takes a great deal of time. However, if the time were to be provided, can't you easily see the advantages for both you and your students? Academic and vocational teachers might be assigned the same group of students; year-long projects could be assigned to students with assistance being provided by all their teachers. Staff development activities for teachers, counselors and administrators could be developed to coordinate learning activities for students. More time could be provided at the beginning and end of a school year and throughout the year. The key to the success of any venture is good planning and teachers should be willing to plan the integration of academic and vocational courses once time is provided.

THE IMPORTANCE OF INTEGRATING ACADEMIC AND VOCATIONAL EDUCATION

With each new year, it seems that we in education hear louder and louder public outcry about the quality of education our youth are receiving. The complaints come from parents and people in the business community. Parents worry about their child's ability to get and hold a job after graduation. Employers tell us that people must be extensively trained on the job. This training consists of not only specialized skills which the job demands, but skills which should have been mastered in the school setting. These skills include the ability to communicate effectively when writing or speaking. Students who cannot write or speak effectively will have a difficult time when their jobs require that they write or articulate clear notes, instructions, or explanations for themselves, their co-workers, or their employers. Lack of reading comprehension skills create large barriers to students trying to enter the work force today.

Today's jobs often require reading and comprehension of complex training and operational manuals. This is especially true in the computer industry. The inability to apply basic math concepts in the everyday, on-the-job world can and does bar students from entering jobs in such areas as the construction trades. Students who do not have good listening skills will create problems on the job and make mistakes which may cost employers money. Poor communication skills may also result in being fired.

Quite often, a job is connected to working collaboratively with others. Our young people must know how to work in a team situation. Education as it is designed today is very much an individual endeavor with a stiff measure of competition thrown in. It doesn't teach people how to cooperate and coordinate in order for each job to be done better. This lack shows up especially when problems surface on the job that an individual can't solve alone. Unsolved problems translate into poor job performance and perhaps a job lost.

Too often the majority of today's high school students see no point in taking academic courses. They feel that courses such as English, the advanced sciences, and the higher mathematics, such as algebra, geometry, etc., will not help them in the world of work after they graduate from high school. As a result of this type of thinking, a majority of students slip through high school taking only the minimum requirements to graduate. When they do graduate, they find that they do not possess even the most rudimentary skills for entry into the job market. They tend to find low paying or minimum wage jobs that offer neither opportunity for advancement, nor a decent standard of living.

Integrating academic and vocational education means to infuse academic content into vocational courses and to integrate applied learning activities and methods into academic courses. There are three models for integrating academic and vocational education. They are: reinforcement, coordination, and a thematic approach.

The reinforcement model incorporates more academic content into vocational courses and enhances academic content by infusing occupational examples and applications. The coordination model can be team-teaching, horizontal and vertical curriculum alignment, "schools within schools", and/or magnet schools. The thematic approach results in students being assigned to the same group of academic and vocational teachers for an entire year. The teaching team decides the content and sequence of the course, usually focusing on a single theme.

Students who are exposed to this type of program should begin to see how concepts taught in advanced science, math and English classes will affect their everyday lives at home and at work. They will be able to see a direct connection between skills learned in high school and benefits to them on the job.

THE INTEGRATED CURRICULUM

We all remember those math problems back in high school or junior high. They tended to involve two trains going at different speeds in two different directions. Or someone wanted to build a fence around his yard or to sew some grass seed. We did those problems because we were told to do them. Maybe we even realized we might need to know how to solve them - someday. But we were never more than mildly interested in them. What did we say when our parents asked us what we had learned in school? "Nothing."

Society is different now. Students will not do work just because we tell them. With television, Nintendo, drugs, and guns, it is getting harder to find educational activities that can rise above their pitifully low boredom thresholds. An integrated curriculum can at least show how the skills they learn today can be used today, not sometime.

Consider, for example, those math problems. Maybe they would care a little more about how to figure the perimeter of farmer Brown's yard if the fencing materials were really going to be used by them in their agriculture class. Or maybe they have been studying the types of machines in physical science; and they get to take apart a small engine in their vocational class. How about the dreaded English term paper? How many of us sat up late at night in tears, because that old manual typewriter's keys were sticking; and we did not know how to set the margins? Imagine taking your rough draft into your keyboarding class where you are learning to type a manuscript. Heaven! (Or as close to it as you can get with an incomplete term paper in your hand, anyway.)

What will these fortunate students benefiting from such an integrated curriculum say when their parents ask them what they have learned in school today? They will say, "Nothing." We cannot have everything. After all, they are still teenagers.

WAYS OF INTEGRATING THE CURRICULUM

Today in many high schools, education is like an egg with two yolks; one academic and the other vocational. By integrating the two areas rather than working against each other, one will reinforce the other.

To aid educators in integrating, suggested are the following models: fragmented, connected, nested, sequences, shared, webbed, threaded, integrated, immersed, and networked. These ten models give school faculties a solid foundation for designing curriculums that help their students make valuable connections while learning.

The fragmented method is one where each subject looks at a single discipline. Even though there are drawbacks with the model, teachers can use this to rank curricular topics, concepts, or skills. This is a much needed first step.

The connected model focuses on making, explicit connections within each subject area. It helps connect one topic, one skill, and one concept to the next.

The nested model of integration views the curriculum through three dimensional glasses, targeting multiple dimensions of a lesson.

In the sequenced model the topics or units are rearranged to coincide with one another.

The shared model is when two areas can overlap concepts or ideas into a single image.

The webbed model is when one main theme is selected and several subject areas study how it applies to them.

In the threaded model of integration the "big ideas" are enlarged throughout all content with a metacurricular approach.

As in the shared model, the integration model is a result of sifting related ideas out of a subject matter content. The integration sprouts from within the various disciplines, and teachers make matches among them as common.

Based on the materials in ***The Mindful School, How To Integrate The Curricula*** *by Robin Fogarty.*

INTEGRATING ACADEMIC AND VOCATIONAL EDUCATION

The need to integrate academic and vocational education is very evident. Teachers are not accomplishing what they wish. Students say they are bored in many academic classes. They need to work with "hands-on" projects and use thinking skills rather than pure memorization. These are the lessons students remember for life. They do not remember the lectures; they remember the experiments, the deductive teachings, the projects. Then again, students must not only learn to practice skills in the vocational area, but they must also acquire the necessary skills to function effectively. To educate the whole student, we must prepare each to lead a productive and enriching life as each demonstrates proficiency in academics and in a specific vocational interest.

How does one define "integrating academic and vocational education?" There are two definitions: "Integration means 1) to infuse academic content into vocational courses; and, 2) it is the linking of academic skills instruction to vocational application to enhance learning. " This is what we want--to enhance learning.

Most vocational teachers believe that students' chances to improve basic skills would increase if vocational education and academic teachers worked together. One reason is that some vocational teachers do not know how to incorporate basic skills, such as teaching their students to become better readers. If they teamed with academic teachers, progress could be made. Teachers could use team or tandem teaching, or groups of teachers could coordinate. If the school is not prepared to do this, teachers could at least reinforce each other.

The courses which could be taught through coordination or reinforcement could be: drafting, electronics, or forestry; algebra and graphics, accounting, business planning, secretarial skills, computers, sales, or marketing; science and health occupations, home economics, agriculture, auto mechanics, or forestry; or social studies and agriculture, child development, fashion production, sales careers, or the arts. Students would enjoy the versatility and enjoy learning. Of course, integration cannot happen overnight.

Teachers, counselors, and administrators must be dedicated. Efforts must be made to coordinate and plan instruction. This takes time. Teachers must also have time to work together. Workdays could be earmarked for this effort. Joint planning periods could be scheduled. With the possibility of the extension of the school day, there could be a period for curriculum alignment. Also, participants could be offered a summer position or workshop. If the school year is extended, more workdays would provide the necessary time for organization. Preparing for integration is worth the effort required and the time needed. It could bring teachers closer together as they work on teams or groups. It could possibly save school funds as teachers share equipment and materials required for projects and experiments. It could build self esteem and defeat apathy as students and teachers work, learn, and "play" together for a common goal.

Life is a collage. When students graduate, they do not concentrate only on just math, science, social studies, or English. They live in a world that is "overlapping." It takes one skill to accomplish another. They cannot put a lawnmower together if they can not read the directions. They cannot half or double a recipe if they know no math.

In conclusion, one might agree that the integration of academic and vocational education is in the best interest of the students. The student is what is important, and this is the best way to ready high school students for lifelong learning.

THE NEED FOR INTEGRATING ACADEMIC AND VOCATIONAL EDUCATION

More and more, the citizens of the United States are hearing that we need a competitive work force to compete with other nations. As educators, we are going to have to expect more from our students than just the "basic" skills.

Academic and vocational teachers share approximately 60% of the students in any given school. Even so, academic and vocational teachers do not have a "common language". The integration of academic and vocational courses will give us that "common language", while giving our students the skills and confidence needed to attain the competitive edge our country so desperately needs,.

Integration does not happen overnight. The following points are essential for successful integration of academic and vocational courses:

1. administrative commitment
2. staff orientation
3. curriculum alignment, articulation, and review
4. development of educational plans
5. training of staff
6. comprehensive career guidance program
7. special assistance to students needing help
8. external and internal marketing
9. keeping score (i.e. end-of-course tests, VoCATS)
10. annual review and revision
11. belief that all students can learn and can complete either a tech prep program or a college prep program.

These points highlight the investment that our traditional educational system needs to make in order for change to occur. We will have to allocate resources for teacher in service and instructional materials. We must also realize that a program of this magnitude will take five to seven years to fully implement.

As educators, we must remember that we need to do what is best for students, which sometimes involves extra work and change for educators.

The groundwork for integration has already taken place; our students are studying the same concepts in more than one class. Some examples are:

1. horticulture and science classes studying a diseased tree
2. margeting and social studies classes studying supply and demand
3. vocational student organizations, working on leadership development and a civic class, studying citizenship

As wonderful as integration sounds, it will not work without the cooperation of teachers and principals. Every one involved has to be flexible, be willing to take a challenge; and, most importantly, be willing to make changes and do things a different way. Our main goal is to prepare students for their future-a **very successful future!**

Section II

Examples of parallel curricula

PARALLEL CURRICULUM

COURSE(S):	**Language Arts and Computer Technology**
GRADE LEVEL:	**7**
CONTENT AREAS INTEGRATED:	**Computer Technology and Language Arts**
DURATION OF CONTENT AREAS:	**2 weeks**
UNIT TITLE:	**Computers in Our Lives**
KEY QUESTIONS:	**What are some common uses for computers?** **How can word processing be used by a seventh grader?** **How is a computer used to create graphs?**
OBJECTIVES:	**The student will:** **identify some common computer applications** **use a word processing program** **prepare graphs from data collected** **define with some common computer terms** **explain how the computer is used in the areas of robotics, graphics, and music**

ACADEMIC COURSE (Language Arts)	VOCATIONAL COURSE (Computer Technology)
Reading 1: Increase vocabulary to aid in comprehension 2: Prepare to read by setting purposes for reading. 2.1 Set purpose for reading.	1: Identify and evaluate current issues and new technology in computer technology.

ACTIVITIES:

Conduct a Directed Reading activity using computer textbook. After looking through the pictures and the subtitles, the students (as a class) will compile a list of questions based on the information they previewed. They will then read the material to find answers to those questions. The terms that should be covered include artificial intelligence, natural language processors, technology, electronic mail, teleconferencing, and telecommuting.

Provide students with a list of terms before they read the chapter. Ask them to formulate sentences, using each term as they "think" it means.

After students have read the chapter and found answers to their questions, have them reread their sentences and then rewrite sentences, using the terms with their accurate definition.

ACADEMIC COURSE (Language Arts)	VOCATIONAL COURSE (Computers)
Writing 3: Write a rough draft based on prewriting. 3.1 Write a first draft with emphasis on context. 4: Edit the revised draft (s) with a focus on conventions: grammar, complete sentences, spelling, usage, capitalization, punctuation, and handwriting.	2: Identify and evaluate current issues and new technology in data processing. 3: Properly care for equipment and materials, identify the advantages of and use applications software. 4: Enter, edit, store, retrieve, update, and print files using a word processing program.

ACTIVITIES:

The students will use software to learn the basics of word processing. Through guided practice and classroom activities (examples attached), they will learn to create documents, edit, save files, load files, and print documents. Through the directed reading assignment, viewing a video, and classroom discussion, the students will realize how our society has been changed and continues to be changed by computer technology. The negative impact of computers will also be included.

Students will then be prepared to do some writing of their own. Using their imaginations and the information they now have, they will compose a story at the keyboard about how they think life will be different 20 years from now. They should include new technology and inventions that would affect their home life, their children's school life, and means of transportation. The stories will then be saved on disks and printed. Working with a partner, they will proofread and check for errors in grammar, punctuation, and sentence structure. The story will then be edited on the computer and a final copy printed.

MAKING ADDITIONS AND CORRECTIONS

Adding a Character

Now that you know how to move the cursor from one place to another, you can make changes in your text on the screen. Type the sentences just as they are. Then add letters where they are needed.

1. Your heart bets more than 87,000 times a day.

2. Sylvia's broken leg is in a cat.

3. I ate tree eggs for breakfast.

4. He had a large path on his jeans.

5. There were thunderlouds in the sky.

6. We waited for ours and ours.

7. Can you pare a dime?

8. FOR SALE: House in the country - six rooms, one and a half bats.

Deleting a Character

Type the sentences just as they are. Then delete the unneeded letters.

1. She wore a lovely string of beards.

2. The boat tripped over and sank.

3. He has flown overseas a flew times.

4. Noise doesn't brother her.

5. We planted steeds in our garden.

6. The drummer gave us a fast beast.

7. You must go buy the rules.

8. She wants to guilt her job.

9. In the 1800's the mail was delivered by the phony express.

10. He was fined for haunting deer our of season.

PROCESSING WORDS

Matt Matic turned 13 last week. He received presents from both his grandmother and his aunt. Now he has been ordered by his father to write thank you notes to both of them, or else! If that isn't enough, his mother wants the notes typed neatly, without any mistakes. Matt informed us that he has only one day to finish these notes or he will be grounded for the weekend. You are going to help Matt complete this task by following the steps below. It is very important that you follow the directions carefully.

STEP 1:

Matt composed this note to his grandmother. Type the note exactly like it is below. Read your work carefully and correct any mistakes you have made.

(Today's date)

(return 4 times after the date)

Dear Grandma,

Thank you very much for the sweatshirt you sent me for my birthday. It is really neat and I enjoy wearing it a lot. How did you know that was just what I needed?

Thanks again, and I hope to see you soon.

Love,

(Your name)

STEP 2:
Save the letter you just typed. Give it the name GRANDMA. Do not erase this letter from your screen.

STEP 3:
Using the letter you have already typed, make changes that are needed to send this letter to Aunt Mary. Aunt Mary sent Matt a new basketball for his birthday.

STEP 4:
Save the letter you just changed. Give it the name AUNTMARY. You should now have two letters saved on your disk; one to Grandma and one to Aunt Mary.

STEP 5:
Both letters are now ready to be printed. At the printer, follow these directions:

Start with a new screen by pressing <N>.
Load the letter to Grandma.
Press <P> and print the letter.
Get a new screen again using <N>.
Load the letter to Aunt Mary.
Press <P> and print this letter also.

You only had to type the letter once, but you should have two letters ready to be mailed. Word processing can save you a lot of time.

ASSIGNMENT 1:

The sudden loud nose frightened the tiny baby. He started screamming and crying.

1. Delete the word "loud".
2. Insert an "i" to change "nose" to "noise".
3. Delete one "m" from the word "screamming".
4. Delete the words "and" and "crying".

ASSIGNMENT 2:

Has anyone seen Larry's jacket? He left it on a chair in the lunchroom. His jacket is bright green, with a red and green plaid lining. Please let him know if you have seen it. He is very upset about losing his new jacket.

Change "Larry" to "Allison". Make all the necessary
changes from "his" to "her", "he" to "she",
and "him" to "her".

ASSIGNMENT 3:

Yes, winter is finally here. Then I noticed that the water in the birdbath was frozen solid. First, the days seemed to get much shorter. It was dark by five o'clock. Finally, Mother took down the box with our sweaters, scarves, hats, and mittens.

Move the first sentence to the end.
Put all the other sentences in correct order.

ASSIGNMENT 4:

Pete's brother promised to take care of the class pet.
He brought the home and the probiems began.
First, it ate the petals from the roses.
Then it dropped the leaves all over the new.
Mrs. Brady made him promise never to care for a class pet again, unless it was a goldfish.

1. Replace "Pete's brother" with "Sam".
2. In the second sentence add "lizard" between "the" and "home"
3. In the third line, change "roses" to "daisies".
4. Put "carpet" at the end of the fourth line.
5. In the last sentence, "Mrs. Brady" should be "His Mom".
6. Type your name below the last line.
7. Save your work under "assignments" and print it out.

ACADEMIC COURSE (Language Arts)	VOCATIONAL COURSE (Computers)
Study Skills 5: Use graphic aids to locate and interpret information. 5.1 Make tables, charts, graphs, and schedules to explain information.	5.8 Create, store, retrieve, and print line, bar, and pie chart graphs using graphic software.

ACTIVITIES:

Using a graphics program and guided practice, students will learn to enter data and prepare graphs. They will look at bar, line, and pie graphs and determine which type of graph best shows several different kinds of information. They will prepare graphs that show changes in temperature, that compare basketball scores, and that give survey results.

Students will then work in groups of 2 or 3 to conduct surveys on topics of their choice (favorite tennis shoes, soft drinks, etc.) They must survey at least 25 people and bring the data back to class. Each group will then compile its data, enter it into the computer, and print the graph that best shows the results. One member of the group will present the findings to the class.

PARALLEL CURRICULUM

COURSE(S):	**Communication Skills and Business**
GRADE LEVEL:	**High School**
CONTENT AREAS INTEGRATED:	**English and Business Communications**
DURATION OF CONTENT AREAS:	**Year Long**
UNIT TITLE:	**Composition, Speech, and Writing**
KEY QUESTIONS:	**1. What are some business applications that can be used in English composition, grammar, and writing?** **2. How can Business Education skills reinforce the importance of English?**
OBJECTIVES:	**1. Use practical applications in the development of English skills.** **2. Use a computer to develop composition, writing and form preparation skills.**

ACADEMIC COURSE (English)	VOCATIONAL COURSE (Business)
Writing and Thinking Creative Tone The Writer's Purpose The Writer's Audience Writing Expository Compositions Effective Diction Usage Speaking and Listening Mass Media	The Language of Business English: Tool for Communication Spoken Business English Written Business English Listening and Reading for Business Purposes Using Electronic Communication

ACADEMIC COURSE (English)	VOCATIONAL COURSE (Business)
Writing of Thinking, Tone, Purpose, Audience, Proofreading Expository Compositions Persuasive Compositions Effective Diction Complete Sentences Grammar Usage Spelling Words Frequently Confused Speaking and Listening Writing Paragraphs Writing Four Types of Paragraphs Expository Compositions Writing Complete Sentences Wrtting Effective Sentences Using Modifiers Correctly	The C-Qualities Courtesy, Conciseness, Concreteness, Consideration, Clarity, Correctness, Completeness Units of Composition Sentences Variety and Emphasis Paragraphs

STUDENT ACTIVITIES:

1. Speeches/oral presentations
2. Study of grammar units
3. Study of literature in reading and analyzing tone, purpose, etc.
4. Evalution of newspapers and television programs
5. Yearbook and journalism projects
6. Development of advertisement to appeal to four audiences
7. Listening to a fable and providing the moral purpose
8. Development of exercises demonstrating understandings of different word meanings.
9. Research papers
10. Location of examples of euphemisms, slang and jargon in newspapers, magazines, and books.
11. Location of magazine or newpaper advertisements to illustrate common persuasive devices.
12. Study in literature of comparison/contrast technique
13. Expository writing
14. Creative writing projects in literature/occupation of character
15. Creation of a commercial ad and presentation to class.

ACADEMIC COURSE (English)	VOCATIONAL COURSE (Business)
Writing Business Letters and Completing Forms Speaking and Listening	Writting a Business Message Effective Message Formats Personal Correspondence Simple Messages Claims and Adjustments Sales Messages Oral Messages The Job Application Process

STUDENT ACTIVITIES:

1. Preparation of friendly as well as business letters.
2. Study of styles, envelope preparation, and preparation of letters of invitation, requests, orders, etc.
3. Creative writing activities
4. Recording telephone message
5. Preparation of letters to an editor, business, etc. English skill writing preparation of sympathy note.
6. Interviews with person in a career field.
7. Preparation of variations of a commercial in which you try to sell the product to: a) truckers b) farmers c) bankers d) or college professors
8. Analyis of an oral message in terms of its audience.
9. Preparation of a business letter which includes returning a completed form.

ACADEMIC COURSE (English)	VOCATIONAL COURSE (Business)
Writing and Thinking Writing Process Writing Expository Compositions Writing a Research Paper	Business Reports Business Reports - How and Why? Business Reports - The Preparation Process Business Reports - The Writing Process

STUDENT ACTIVITIES:

1. Preparation of term papers, reports, expository compositions etc.

ACADEMIC COURSE (English)	VOCATIONAL COURSE (Business)
Parts of Speech Phrases Clauses Capitalization Punctuation Spelling	Reference Division Parts of Speech Grammatical Construction Punctuation Capitalization Spelling Abbreviations

STUDENT ACTIVITIES:

1. Study of grammar units
2. Mechanics of research paper preparation
3. Correction of incorrect examples

PARALLEL CURRICULUM

COURSE(S):	**Communication Skills and Business/Marketing**
GRADE LEVEL:	**High School**
CONTENT AREAS INTEGRATED:	**English and Small Business/Entrepreneurship**
DURATION OF CONTENT AREAS:	**1 to 2 weeks**
UNIT TITLE:	**Communication Skills and Marketing/Managing a Small Business**
KEY QUESTIONS:	
OBJECTIVES:	SMALL BUSINESS **1. Explain the importance of decision-making for entrepreneurs.** ENGLISH **1. Engage in task-related problem-solving group discussions.**

ACADEMIC COURSE (Communication Skills)	VOCATIONAL COURSE (Small Business/Entrepreneurship)
Listenting Viewing Group decision making	Problem-solving Decision-making

ACTIVITIES:

1. Individually complete a hypothetical life situation case study. Then participate in a group discussion and offer possible solutions. Explain your reasoning behind the possible solutions.
2. Small Business: Develop a promotional plan for a small business.
   English: Adapt a message for a given audience.
3. Create a radio or television commercial, adapting it for at least two different audiences.
4. Small Business: Evaluate the effectiveness of the promotional plan for a small business.
   English: Gather literal information from viewing by using the following directives:
   a. Express what is seen
   b. Recognize details
   c. Recognize main ideas
   d. Recognize sequence
   e. Recognize comparison/contrast
   f. Recognize cause/effect relationships
   g. Recognize relationships between the parts and the whole
5. Write a paper about the relationships between the major parts of a promotional event and the total production.

PARALLEL CURRICULUM

COURSE(S):	**Business Communications and Communication Skills**
GRADE LEVEL:	**11 and 12**
CONTENT AREAS INTEGRATED:	**Language Skills** **Reading Skills** **Listening Skills** **Writing/Composition Skills**
DURATION OF CONTENT AREAS:	**Six Weeks**
UNIT TITLE:	**Learning and Applying Communication Skills**
KEY QUESTIONS:	**1. Can students read?** **2. Can students listen?** **3. Can students take notes?** **4. Can students clarify and organize ideas and feelings?** **5. Can students write/compose in concise, concrete words, using proper grammar and punctuation?**
OBJECTIVES:	**1. Use a variety of communication skills in different settings.** **2. Apply communication skills to a business setting**

ACADEMIC COURSE (Communication Skills)	VOCATIONAL COURSE (Business)
Analyze and evaluate an author's viewpoint and style.	Analyze a one-page article from a business publication for important points.
Write controlled paragraphs and compositions, utilizing accurate, simple, and complex grammatical construction.	Develop an outline to be used in preparing reports, correspondence, and other types of written communications.
Take notes from lectures, films, or tapes, and write summaries.	Take minutes of a meeting and prepare in correct typewritten form.

ACTIVITIES: (Students will use the computer to prepare final copies of written work.)
Students will:

1. read an editorial from a newspaper, express the author's viewpoint, and underline the words and phrases which led to his/her analysis.
2. read a selection from a biography or nonfiction and write a report explaining why the subject deserves to be written. Students will also write a summary of the information learned from the selection.
3. write a paragraph on an assigned topic, incorporating simple, compound, and complex sentences.
4. read a composition containing grammatical errors, underline those errors, and correct them.
5. listen to a live or taped lecture, take notes, and write a summary.
6. view a full length film and write a summary of it.
7. type a summary (no less than 75 words) of a one-page article from a business publication.

PARALLEL CURRICULUM

COURSE(S): Keyboarding and English II

GRADE LEVEL: 10

CONTENT AREAS INTEGRATED: Writing a report and correctly formatting the report on a computer.

DURATION OF CONTENT AREAS: 4 weeks

UNIT TITLE: Writing, Formatting, and Document Processing.

KEY QUESTIONS:

1. Can students clarify and organize ideas?
2. Can students write a proper report?
3. Can students apply writing skills through use of a computer?

OBJECTIVES:

1. Correct errors skills in a writing sample.
2. Produce a proper report using a word processing system.

ACADEMIC COURSE (English II)	VOCATIONAL COURSE (Keyboarding)
Select a topic.	Develop proficiency in the use of a word processing system.
Clarify and organize ideas.	Type an outline in an acceptable format from a handwritten copy.
Improve language skills relating to sentence structure.	Type textual citations in correct format.
Write a report.	Type a works cited page in correct format.
Identify and compile a reference page.	Format and keyboard a report from rough draft form.
Identify and compile textual citations.	Demonstrate editing and revision of rough draft.
	Type a report in acceptable format.

ACTIVITIES:

Students will:

1. select and research a topic, then prepare an outline and rough draft with textu.. ations.
2. do exercises related to the use of a word processor.
3. keyboard a rough draft of their report.
4. edit and revise report and key in acceptable format.

PARALLEL CURRICULUM

COURSE(S):	**Communication Skills and Business**
GRADE LEVEL:	**10**
CONTENT AREAS INTEGRATED:	**English 10 and Keyboarding**
DURATION OF CONTENT AREAS:	**2 weeks**
UNIT TITLE:	**Writing Process**
KEY QUESTIONS:	**1. Do students have effective skills for writing a variety of communications?** **2. Do students know the proper techniques to produce the written word through use of a computer?**
OBJECTIVES:	**1. Use effective writing principles.** **2. Produce the written word through use of a typewriter or computer.**

ACADEMIC COURSE (English 10)	VOCATIONAL COURSE (Keyboarding)
Determine a purpose for writing. a. description b. argument/persuasion c. cause/effect d. exposition e. narrative Write a letter with a specific purpose to the editor of a local newspaper or the editor of a magazine. Determine a topic. Determine a specific topic and write a letter to an editor. Clarify and organize ideas and feelings. Participate in a prewriting stage in which all members of the class contribute ideas for a topic.	Follow oral and written instructions. Assemble and arrange supplies for easy accessibility Manage time effectively in order to set priorities. Make formatting decisions

ACADEMIC COURSE (English 10)	VOCATIONAL COURSE (Keyboarding)
Write for a variety of audiences. a. self b. peers c. community d. professionals e. children f. other Write an advertisement which might appeal to four distinctly different audiences.	Select a topic and write in appropriate forms. Determine an appropriate form for writing about a social dilemma. Write the beginning and ending of an original short story. Keep journals regularly. Write various types of letters. Write various types of poems. Write minutes for a meeting. Write in a variety of modes. Complete a variety of common forms, e.g., job application, voter registration, library card, etc. Write an opinion paper about a controversial issue.

ACADEMIC COURSE (English 10)	VOCATIONAL COURSE (Keyboarding)
Write a first draft giving primary attention to fluency. Select a topic and write for15 to 20 minutes without stopping. Participate in a peer group discussion to determine whether fluency is present in the papers written by group members.	Compose sentences and paragraphs Compose, edit, and rekey. . . .

ACTIVITIES:

1. Have the student develop writing proficiency by composing with the computer first drafts based on prewriting experiences.
2. Have the student demonstrate consistent and desirable work habits.
3. Have the student compose at the keyboard: sentences, paragraphs, and documents.

ACADEMIC COURSE (English 10)	VOCATIONAL COURSE (Keyboarding)
Revise drafts for a. main ideas b. supporting details with elaboration c. organization d. coherence e. unity f. sentence combining g. consistent point-of-view h. word choices i. tone Revise a draft of an opinion paper about a controversial issue, giving attention to main idea, supporting details, and elaboration of details. Revise the above draft again, giving attention to organization, coherence, unity, and consistent point-of-view. Revise the above draft again, giving attention to sentence combing, word choice, and tone.	Use proofreader's symbols when revising handwritten and hard copy.

ACTIVITIES:

4. Have the learner develop writing proficiency through the writing process by revising first and subsequent drafts.
5. Have the learner demonstrate acceptable methods for correcting errors.
6. Have the student proofread and correct errors in keyed copy.

ACADEMIC COURSE (English 10)	VOCATIONAL COURSE (Keyboarding)
Edit for grammar and language conventions: a. complete sentences b. capitilization c. punctuation d. spelling e. usage f. format Edit the revised draft of your opinion paper on a controversial issue for appropriate grammar and language conventions. Edit a peer's paper for grammar and language conventions.	Recognize and correct errors in the format. Recognize and correct errors in word division, word spacing, abbreviation and number style, and capitalization. Recognize and correct errors in punctuation, grammar, and spelling. Recognize and correct errors in sentence structure, subject-verb agreement, plural and possessive formation, and word usage. Exhibit the use of software package special equipment functions to find and correct errors. Demonstrate correction methods using a computer.

ACTIVITIES:

7. Have the student develop writing proficiency through the writing process by editing revised drafts.
8. Have the student produce a final computerized product.

PARALLEL CURRICULUM

COURSE(S):	**Keyboarding and English 9 and 11**
GRADE LEVEL:	**9 and 11**
CONTENT AREAS INTEGRATED:	**Writing and Typing Research Papers in Modern Language Association Format**
DURATION OF CONTENT AREAS:	**2 weeks**
UNIT TITLE:	**Writing and Typing MLA Format Research Papers**
KEY QUESTIONS:	**1. Can students write a research paper using a widely accepted authority?** **2. Can students use a computer to produce an acceptable research paper?**
OBJECTIVES:	**1. Develop writing proficiency through the use of an accepted authority.** **2. Produce a research paper in acceptable format with a computer.**

ACADEMIC COURSE (English 9 & 11)	VOCATIONAL COURSE (Keyboarding)
Develop writing proficiency through the writing process by publishing revised and edited writing. Locate information, note cards, bibliography cards, footnotes, and bibliography form.	Type from an outline and manuscript, with or without footnotes, in an acceptable format from partially arranged rough-draft material.

ACTIVITIES:

1. Introduce MLA Format
2. Type all reports in typing/keyboarding class using MLA Format.
3. Type individual research papers using MLA Format.

PARALLEL CURRICULUM

COURSE(S):	Industrial Co-op Training and Mathematics
GRADE LEVEL:	11-12
CONTENT AREAS INTEGRATED:	Whole numbers, fractions, geometric figures, decimal figures, area, banking, budgets, consumer credit.
DURATION OF CONTENT AREAS:	3 weeks
UNIT TITLE:	Mathematics – Industrial
KEY QUESTIONS:	1. How well can ICT students perform a variety of mathematical functions? 2. How well can ICT students perform mathematical functions used in business?
OBJECTIVES:	1. Perform operations with whole numbers. 2. Perform operations with fractional numbers. 3. Identify and classify geometric figures and some of their parts. 4. Perform operations with decimal numbers. 5. Solve problems involving perimeter, area and volume. 6. Solve problems related to how banks serve customers. 7. Solve problems related to consumer credit.

ACADEMIC COURSE (Mathematics)	VOCATIONAL COURSE (ICT)
Whole numbers. Fractional numbers. Geometric figures and some of their parts. Decimal numbers. Problems involving perimeter, area and volume. Problems related to how banks serve customers. Problems related to consumer credit.	Development of budgets. Comparisons of various services offered by banks.

ACADEMIC COURSE	VOCATIONAL COURSE (ICT)
	Categories of health insurance and computations for selection. A. Social Security B. Workman's Compensation C. Property Insurance D. Life Insurance Estimates of income and expenditures.

ACTIVITIES:

1. Have students compare insurance and banking services. Use computations in comparing services
2. Have students develop current and future budgets, based on current and projected earnings.

PARALLEL CURRICULUM

COURSE(S):	**Math and Automotive Technology**
GRADE LEVEL:	**9-12**
CONTENT AREAS INTEGRATED:	**Engine Displacement**
DURATION OF CONTENT AREAS:	**Two days**
UNIT TITLE:	**Measuring Engine Performance (Volume)**
KEY QUESTIONS:	**What is the displacement of an engine with a base of 3 $^1/_4$ and a stroke of 3 $^1/_4$, 2 cylinders.**
OBJECTIVES:	**Solve basic engine measurement problems**

ACADEMIC COURSE (Algebra, Geometry)	VOCATIONAL COURSE (Auto Tech I & II)
Engine Displacement = 0.7854 x D^2 x Length of Stroke EXAMPLE: Bore or D = 3 $^1/_4$ in. Stroke = 3 $^1/_4$ in. 0.7854 x D2 (10.563) x Length of stroke (3 $^1/_4$ in.) x number of cylinders (2) = 53.9 cu. in. Using the above formula math and auto tech. students will be able to determine the circular area of cylinder. (Volume)	Basic engine measurement Displacement of an engine

ACTIVITIES:

Determine the cubic inch displacement of an engine from the facts learned in activities above.

PARALLEL CURRICULUM

COURSE(S):	**Geometry and Carpentry**
GRADE LEVEL:	**10-12**
CONTENT AREAS INTEGRATED:	**Pythagorean Theorem**
DURATION OF CONTENT AREAS:	**3 weeks**
UNIT TITLE:	**Triangles: Figures To Forms**
KEY QUESTIONS:	**What is the importance of triangles?** **What is rise and run?** **What is pitch and slope?** **What is the best way to estimate materials for house building?**
OBJECTIVES:	**1. Explain why triangles are the strongest building form.** **2. Figure lengths of the sides of triangles.** **3. Estimate materials for plywood, tar paper, shingles, and common rafters.** **4. Explain rise and run and apply it to pitch and slope.**

ACADEMIC COURSE (Geometry)	VOCATIONAL COURSE (Carpentry)
Pythagorean Theorem Slope Angles Pitch Rise and Run	Estimation – Plywood Tar Paper Shingles Pitch-Slope

ACTIVITIES:

1. Work sheets – figure several lengths of sides of triangles using Pythagorean Theorem.
2. Compare triangles to roof design.
3. Apply the Pythagorean Theorem to house building:
   - Figure the length of common rafters.
   - Figure sq. ft. of roof.
   - Figure estimate for amount of plywood, tar paper, and shingles.

PARALLEL CURRICULUM

COURSE(S):	**Electronics I/Algebra I**
GRADE LEVEL:	**11-12**
CONTENT AREAS INTEGRATED:	**Formulas, linear equations, and algebraic representations**
DURATION OF CONTENT AREAS:	**The concepts studied in this unit are used throughout the year**
UNIT TITLE:	**Using Formulas (Ohm's Law)**
KEY QUESTIONS:	**How do we solve a formula for a specific variable?** **How do we use a scientific calculator for all calculations?**
OBJECTIVES:	**1. Solve formulas for different variables.** **2. Use scientific calculations** **3. Solve problems using Ohm's Law.**

ACADEMIC COURSE (Algebra I)	VOCATIONAL COURSE (Electronics I)
Simplify numerical expression	State Ohm's Law
Evaluate variable expressions	State Ohm's Law for unknown voltage, current, and resistance.
Evaluate exponential expressions	Use a scientific calculator
Evaluate formulas when replacement values are given	
Solve a simple equation (one and two steps)	

ACTIVITIES:

1. Demonstrate the use of scientific calculators for the four basic operations as well as for exponentiation.
2. Illustrate examples of solving formulas for different variables.
3. State Ohm's Law and solve problems for unknown voltage, current and resistance.

PARALLEL CURRICULUM

COURSE(S):	**Algebra I/Electronics I**
GRADE LEVEL:	**9-12**
CONTENT AREAS INTEGRATED:	**Using calculators, reading and drawing graphs, charts, tables, developing problem solving skills**
DURATION OF CONTENT AREAS:	**Used throughout the year**
UNIT TITLE:	**Using charts, tables, graphs to solve problems in electronics.**
KEY QUESTIONS:	**How do we read and draw charts, graphs, and schematics?** **How do we interpret the information for problem solving in electronics?**
OBJECTIVES:	**1. Interpret charts, graphs, and schematics** **2. Solve problems presented in electronics**

ACADEMIC COURSE (Algebra I)	VOCATIONAL COURSE (Electronics I)
Use scientific calculators	Use scientific calculators
Graph a linear equation in two variables.	Draw a circuit and show direction of current flow
Use a graph to find the solution of a pair of linear equations in two variables.	Contruct the circuit from the schematic
Use formulas in problem solving.	Draw Ohm's Law Chart as related to voltage, current, and resistance.
	Solve Ohm's Law problems for voltage, current, and resistance.
	Analyze a series circuit using Watts, Kirchhoff, and Ohm's Laws.

ACTIVITIES:

TEAM CLASS – Using objectives learned in Algebra I and Electronics I, classes will come together to problem solve and trouble shoot an electronics problem

PARALLEL CURRICULUM

COURSE(S):	**Metals Manufacturing Technology 2 – Geometry**
GRADE LEVEL:	**9-12**
CONTENT AREAS INTEGRATED:	**Identifying and solving proportions related to similar triangles, applying trigonometry, and using the Pythagorean Theorem.**
DURATION OF CONTENT AREAS:	**The concepts will be developed throughout the course of study and will be intensely reviewed during the unit.**
UNIT TITLE:	**Solving Triangles.**
KEY QUESTIONS:	**How do we apply similar triangles, trigonometric ratios and the Pythagorean Theorem to Computer Numerical Control programming?**
OBJECTIVES:	**Apply mathematical skills in using computer numerical programming.**

ACADEMIC COURSE (Geometry)	VOCATIONAL COURSE (Metals Manufacturing Tech 2)
Solve a proportion. Use a proportion to solve geometric problems. Determine whether two polygons are similar. Apply properties of similar triangles to find corresponding proportional sides. Use the Pythagorean Theorem to find the lengths of the sides of a right triangle. Apply the definitions of sine, cosine and tangent to solve right triangles.	Solve problems involving triangles. (Use the Pythagorean Theorem)

ACTIVITIES:

1. Review: recognizing similar triangles, writing and solving proportions related to them.
2. Review right triangle, trigonometry and the Pythagorean Theorem.
3. Apply the above concepts to visualizing triangles in a variety of different drawings.
4. Solve the triangles to locate reference points for CNC programming.

PARALLEL CURRICULUM

COURSE(S):	**Metals Manufacturing/Trigonometry and Geometry**
GRADE LEVEL:	**10-12**
CONTENT AREAS INTEGRATED:	**Consolidation of trigonometric principles and their application.**
DURATION OF CONTENT AREAS:	**9 weeks**
UNIT TITLE:	**Computer Numerical Control (CNC) Milling Processes**
KEY QUESTIONS:	**How do you solve basic trig. and geometric problems for CNC?**
OBJECTIVES:	**1. CNC-Comprehension** **2. Use computer numerical control processing.** **3. Explain how trigonometry and CNC are related**

ACADEMIC COURSE (Trigonometry)	VOCATIONAL COURSE (Metals Manuf. Technology)
Three dimensional thinking (number line graphs) Circles: Determining parts of (angles) geometry Definition of right triangles and parts. Trigonometric functions in the right triangle Use of the trig. function table Geometry Plane geometry axioms and definitions Circles (cir., dia., rad., tan) Problem solving of plane geometry shapes	X, Y, Z coordinate axis (positioning tool to part) Interpretation of blueprints Definition of right triangle Trigonometric calculation of coordinates, using formulas for sine and cosine Use of trig. tables Similar axioms and definitions Circles Interpretation of blueprints to solve problems and generation of CNC programs

ACTIVITIES:

1. Interpret from drawings, right triangles; circles, geometric shapes
   a. Solve problems to locate coordinates
   b. Write CNC programs
   c. Produce parts
      example: locate and drill the bolt holes in an automobile wheel

PARALLEL CURRICULUM

COURSE(S):	**Introduction to Agriscience and Biology**
GRADE LEVEL:	**9**
CONTENT AREAS INTEGRATED:	**Plant Science and Advanced Biology**
DURATION OF CONTENT AREAS:	**2 weeks**
UNIT TITLE:	**Plant Science**
KEY QUESTIONS:	**1. What is the life cycle of a plant?** **2. Why are plants important?**
OBJECTIVES:	**1. Explain plant growth and reproduction, including the physiology and nature of plants.** **2. Grow plants from seeds by providing primary and secondary nutrients.**

ACADEMIC COURSE (Biology)	VOCATIONAL COURSE (Introduction to Agriscience)
Demonstrate the ability to classify plants.	Identify and classify plants according to use and economic value.
Explain how plants grow and reproduce.	Identify primary and secondary nutrients requirements for plants.
Explain the physiology of plants.	Identify and describe the funtions of parts of plants.
Explain the nature of plants.	Identify and describe method of plant reproduction.
Explain the nature of seed plants.	

ACTIVITIES:

1. Visit greenhouse to observe methods used in propagating plants.
2. Plant seeds in flats and study the effect of light, moisture, and temperature on germination and growth.

PARALLEL CURRICULUM

COURSE(S): Biology/Health Occupations

GRADE LEVEL: 10

CONTENT AREAS INTEGRATED: Body Systems, Disease Organisms, Health

DURATION OF CONTENT AREAS: 6 weeks

UNIT TITLE: Disease and Wellness

KEY QUESTIONS:

1. How do health-care providers help us deal with disease?
2. How do our bodies defend against invaders?
3. What are the major health threats that we face today?
4. What is the connection between chemical addiction and disease?
5. How do we become and/or stay healthy?

OBJECTIVES: Explain the role of health care providers in dealing with disease and wellness.

ACADEMIC COURSE (Biology)	VOCATIONAL COURSE (Health Occupations)
Lab: What is your blood type? Lab: Blood Smear?	What diseases are treated in what parts of the hospital. Cardiac Care Unit Oncology Unit Pediatric Unit Medical Unit Traumatic Injuries
1. What can cause us to get sick? A. Viruses B. Bacteria C. Fungi D. Protozoa E. Parasitic Worms	1. How does disease spread? A. Sexually transmitted disease B. Diseases spread by bloodfeeding parasites C. Zoonoses-Diseases people and animals share
2. How does the body react to the invader? A. Skin and body linings B. Body Secretions C. The Immune System	2. Disorders of the immune system A. Immune deficiencies B. Acquired Immune Deficiency Syndrome C. Autoimmune Disease D. The overactive immune system: Allergies
Lab: Gram Stain	Lab: Visit to the Medical Lab
1. What part do environmental hazards play in disease? 2. Exposure to environmental hazards.	1. Accidents, homicides, and suicides. 2. Heart disease 3. Cancer 4. Stroke 5. Mental Health
Lab: How is urine used to detect serious disease? Lab: How can we check for lead contamination in our environment?	

ACADEMIC COURSE (Biology)	VOCATIONAL COURSE (Health Occupations)
1. Chemical Addiction 2. Learning about drugs: Scientific method 3. How to recognize drug abuse Lab: How do drugs affect our heart rate? Lab: How are drugs and poisons from a crime scene identified? 1. Role of nutrients in the body A. Water B. Protein C. Carbohydrates D. Fats and other lipids E. Vitamins F. Minerals G. Four basic food groups Lab: How does exercise affect metabolic rate?	1. Street drugs and their effects A. Stimulants B. Depressants C. Opiates D. Hallucinogens E. Inhalants F. Marijuana G. Anabolic Steriods 2. Legal drugs and their effects A. Alcohol B. Tobacco C. Caffeine D. Prescription drugs 3. Treatment for addictive disease 1. How healthy are you? 2. Managing stress 3. Being mentally healthy 4. Warning signs of illness 5. Planning for a lifetime of good health Lab: How healthy are you?

ACTIVITIES:

Conduct Lab experiences as identified.

PARALLEL CURRICULUM

COURSE(S):	**Health Occupations I, Chemistry I**
GRADE LEVEL:	**11th**
CONTENT AREAS INTEGRATED:	**Basic chemical processes**
DURATION OF CONTENT AREAS:	**5 hours**
UNIT TITLE:	**Chemistry of the Human Body**
KEY QUESTIONS:	**What are the basic chemical processes of the human body?**
OBJECTIVES:	**Explain the importance of basic chemical processes to the proper function of the body.**

ACADEMIC COURSE (Chemistry)	VOCATIONAL COURSE (Health Occupations)
Define in simple terms what is meant by homeostasis Explain that individual cells must exit in a balanced condition with materials moving in and out of the cell. Explain how a fever is related to homeostasis Predict what will happen when a potato slice is placed in salty water	Describe processes of diffusion, osmosis, and filtration. Relate fluid and electrolyte balance to homeostasis. Apply terminology to basic chemical processes

ACTIVITIES:

1. Teacher led discussion of homeostasis, diffusion, osmosis, filtration, and fluid/electrolyte balance.

2. Demonstrations:
   a) celery and food coloring
   b) potato slice in salty water
   c) copper sulfate crystals in water
3. Labs:
   a) artificial membrane to study osmosis and filtration
   b) osmosis-travel through a membrane
4. Discuss artificial kidney machine and relate to labs
5. Discuss related careers contact
6. Conduct Terminology Review-Assign each student a related term. They will be responsible for teaching the definition of that term to the class through role-play etc.

PARALLEL CURRICULUM

COURSE(S):	**Biology/Teen Living**
GRADE LEVEL:	**9-10**
CONTENT AREAS INTEGRATED:	**Family Living**
DURATION OF CONTENT AREAS:	**Two days**
UNIT TITLE:	**Analyze Youth Parenting**
KEY QUESTIONS:	**What are risks factors for youth parents? What factors are influenced by hormones? Who should be protected, parents or the children?**
OBJECTIVES:	**Describe the risk factors of teenage pregnancy.**

ACADEMIC COURSE (Biology)	VOCATIONAL COURSE (Teen Living)
Have a general knowledge of human reproduction. Explain the process of human reproduction, including neural and hormonal control of the reproduction process. Discuss the various methods and means of preventing conceptions.	Analyze responsibilities of youth parents Describe risk factors for children of youth parents. Topics to be included: - low birth weight - premature birth - improper pre-natal care - lower immune system - higher chances of birth defects

ACTIVITIES:

Show transparency of statistics of the number of children born with birth defects.
Handout on Teen Pregnancy.
Discuss options of teens besides pregnancy.
Have a guest speaker from Health Department to be shared between classes. Topics to include: pregnancy prevention, abuse, birth defects, etc.

PARALLEL CURRICULUM

COURSE(S):	**Biology and Parenting/Child Development**
GRADE LEVEL:	**10-12**
CONTENT AREAS INTEGRATED:	**Biology/Parenting/Child Development**
DURATION OF CONTENT AREAS:	**7 days**
UNIT TITLE:	**Pregnancy and Child Development**
KEY QUESTIONS:	**1. What are birth defects?** **2. What is infertility?** **3. What is a test tube baby?** **4. Do you know any genetic diseases?**
OBJECTIVES:	**Explain the relationship of genetics and the human body.**

ACADEMIC COURSE (Biology)	VOCATIONAL COURSE (Parenting/Child Development)
Know that genes composed of DNA are responsible for inherited characteristics	Analyze the parenthood decision-making process
Explain genetic mutuation and its possible effect on the cell and the total organism	Identify alternatives to natural parenting
Explain the process of human reproduction, including neural and hormonal control	Analyze hereditary and environmental influences on prenatal development
	Discuss the inheritance of personal characteristics.
	Identify the causes, symptoms, and preventive measure for birth control.
	Discuss the causes and alternatives for infertility

ACTIVITIES:

1. Students will be assigned to research a genetic disease or disorder and write a one-to-two page paper. Brief oral presentation will be made in class. (This assignment gives the students an opportunity to further develop their writing skills.
2. A genetic counselor will be invited to speak to the classes jointly.

PARALLEL CURRICULUM

COURSE(S):	Biology-Food Production and Management I& II
GRADE LEVEL:	10-11
CONTENT AREAS INTEGRATED:	1) Biochemistry 2) Food Chemistry
DURATION OF CONTENT AREAS:	4 days
UNIT TITLE:	The Chemistry of Food
KEY QUESTIONS:	1. What chemicals are found in food? 2. What are the tests dealing with organic materials?
OBJECTIVES:	Explain the relationship of the four basic types of complex molecules to foods.

ACADEMIC COURSE (Biochemistry)	VOCATIONAL COURSE (Food Chemistry)
Describe the structural properties and functions of the 4 basic types of complex molecules associated with carbohydrates, liquids, proteins, and nucleic acids Perform tests to identify the presence of carbohydrates, liquids, and proteins in unknown samples of food	Evaluate the appropriateness of foods selected for various food service establishments in terms of nutrition concepts and basic principles of menu planning

ACTIVITIES:

1. Making models of complex molecules of life (those found in food)
2. Perform tests on foods to identify the presence of the four organic compounds.
3. Using "basic-4" and amount of organic chemical, needed; plan a balanced menu for two days.

PARALLEL CURRICULUM

COURSE(S):	**Biology/Foods and Nutrition**
GRADE LEVEL:	**10-12**
CONTENT AREAS INTEGRATED:	**Biology (study of bacteria) and Foods and Nutrition (Conditions that promote growth of bacteria)**
DURATION OF CONTENT AREAS:	**3 days**
UNIT TITLE:	**"Management In Food Preparation: Safety & Sanitation"**
KEY QUESTIONS:	**What is the relationship between microbiological organisms and food sanitation?**
OBJECTIVES:	**1. The relationship between microbiological organisms and food sanitation.** **2. Identify food-born illnesses caused by certain bacteria in food.**

ACADEMIC COURSE (Biology)	VOCATIONAL COURSE (Foods and Nutrition)
Organisms	Management in Food Preparation
Useful and harmful bacteria	Practices which provide for safety and santitation in the preparation of food.
Conditions needed for growth of bacteria	Causes of food-borne illnesses
Methods used to prevent food spoilage	Prevention food-born illnesses
Diseases caused by salmonella, staphylococcus and botulinum	

ACTIVITIES:

1. Reading
2. Vocabulary list
3. Filmstrips: "Safety and Sanitation in Handling Food" and "Sanitation: More Than Meets The Eye"
4. Preparation of agar plates to grow cultures of bacteria. Have someone cough or sneeze, touch with dirty hands, touch with clean hands, touch with a dirty towel, and place a hair on the five different plates. Check the plates regularly for three days. What happens? (Student will record.)

PARALLEL CURRICULUM

COURSE(S):	**Student Leadership/Foods & Nutrition**
GRADE LEVEL:	**9-12**
CONTENT AREAS INTEGRATED:	**Social Studies/Consumer Home Economics**
DURATION OF CONTENT AREAS:	**Two weeks/with year long follow-up**
UNIT TITLE:	**Leadership and Citizenship**
KEY QUESTIONS:	**How can students learn to belong effectively and display the qualities of a good citizen, leader or follower?**
OBJECTIVES:	**Practice leadership skills.**

ACADEMIC COURSE (Social Studies)	VOCATIONAL COURSE (Home Economics)
Communciations 1. Committee reports 2. Public relations activities 3. Promotion of communications between students and school administration 4. Listening skills 5. Public speaking and formal debate skills 6. Written communication (memos, letters of inquiry, editorial responses, thank-you notes, business letters, reports)	Practice effective communication skills. Explain how communication affects leadership. Prepare a written persuasive presentation. Present a prepared speech. Present an extemporaneous speech.
Parliamentary Procedure 1. Function of **Robert's Rules of Order**, Revised 2. Agendas 3. Class meetings 4. Effective motions and resolutions 5. Debate skills	Demonstrate techniques for conducting a meeting. State purposes for using parliamentary procedure. Prepare an agenda. Describe methods of voting. Demonstrate the steps for making and processing a motion.
Organization and Purpose 1. Student Government Constitution and By-Laws 2. Officer powers and duties 3. Grading procedures 4. Committee structure and responsibilities 5. Election procedures 6. Finances a. Sources of income	Explain characteristics needed to be a productive member of society. Describe the rituals and symbols of an organization. Illustrate effective and ineffective leadership. Identify opportunities for leadership roles and cooperative efforts.

ACADEMIC COURSE (Social Studies)	VOCATIONAL COURSE (Home Economics)
b. Required and optional expenditures c. Budgeting d. Procedures for collection and expenditures e. Record keeping 7. Annual projects/special projects 8. Local, state, and national affiliations **Leadership** 1. Traits and qualities of leadership styles (authoritarian, democratic, laissez faire style 2. Personal leadership style 3. Styles that work best in varying situations 4. Hazards and problems of leadership 5. Responsibility and accountability 6. Community involvement **Decision-Making Process** 1. Problem-solving 2. Career choice a. Applications b. Resumes c. Interviews 3. Dealing with stress 4. Motivating others 5. Solving school-related problems **Group Process** 1. Working together for a common goal a. Group/committee organizations b. Set long-range, short-range goals and find ways to meet them c. learn how to deal with unmet goals 2. Decision-making skills 3. Active attendance at large meetings to watch group process in action a. Attend school board meetings b. Attend county or city commission meetings 4. Evaluation of all projects	Apply decision-making skills in individual/organizational activities. Use the planning process to make decisions Distinguish between long and short term goals. Describe ways to manage time effectively.

ACTIVITIES:

Communications: speech contest, listening skills activities, role play office situations (practice written communication)

Parliamentary Procedure: "How to Conduct a Meeting" – Video, "Parliamentary Procedure" – Video, Role Play meeting situations, Enter student organization competitions, Conduct regular meetings with PP

Leadership: Leadership Style transparencies, Role Play

Decision Making and Organization: budgeting time exercise, field trips: PTSA, school board meetings, county commissioners meetings. Revise student organization by-laws.

PARALLEL CURRICULUM

COURSE(S):	**U.S. History and Marketing**
GRADE LEVEL:	**11-12**
CONTENT AREAS INTEGRATED:	**Economics in a Private Enterprise System**
DURATION OF CONTENT AREAS:	**3 weeks**
UNIT TITLE:	**Economics in Marketing**
KEY QUESTIONS:	**What is the role of marketing in a private enterprise system?**
OBJECTIVES:	**Explain nature of a private enterprise system.**

ACADEMIC COURSE (Economics)	VOCATIONAL COURSE (Marketing)
Understanding of issues and problems confronting the United States economic, legal, and political systems.	Explain the concept of economic activities
Features of the economic system of the United States.	Explain the concept of private enterprise and business ownership
Factors influencing the United States economy.	Explain the concept of supply and demand, of profit/profit motive, risk, competition, market and market identification.
Function and importance of the North Carolina and United States Constitutions.	Explain marketing functions and related activities.
Structure and functions of local, state, and, national governments and understand their relationships.	Explain the relationship of business, governments, and consumers.
Political and legal systems for balancing competiting interests and resolving conflicts.	

ACTIVITIES:

1. Write a research paper about the influence of the United States economic, legal, and political systems on marketing strategies.
2. Conduct class discussions on the impact of U. S. global marketing and its implications for the U. S. economic, legal, and political systems.

PARALLEL CURRICULUM

COURSE(S):	**Visual Arts/Apparel and Interiors**
GRADE LEVEL:	**High School**
CONTENT AREAS INTEGRATED:	**Principle Elements of Design/Color Theory**
DURATION OF CONTENT AREAS:	**3 days to 1 week**
UNIT TITLE:	**Principle Elements of Design/Color Theory**
KEY QUESTIONS:	**See Activities**
OBJECTIVES:	**1. Apply the concepts necessary for understanding and producing art.** **2. Apply the elements and principles of design to create functional and decorative beauty.** **3. Apply the use of color in home interiors.**

ACADEMIC COURSE (Visual Arts I)	VOCATIONAL COURSE (Apparel and Interiors)
Demonstrate an understanding of the basic elements of art.	Identify and define the element and principles of design used as standards for judging
Demonstrate knowledge of color theory.	Explain the relationship between elements of design and principles of design
Use color selecting in own work.	Analyze design elements and principles used in various components of home interiors (walls, floors, furniture)
Use and demonstrate an understanding of design principles.	Apply the elements and principles of design to create visually-pleasing home interiors
Demonstrate an understanding of the design principles.	Define the dimension of color and related terms.
Demonstrate knowledge of the principles for achieving a successful composition.	Interpret how color harmonies are used to create a color scheme.
Apply design principles in one's work.	Describe how color may be used to produce (create) economical, psychological optical, and physical benefits.
	Demonstrate how color in accessories can be used to create a well-developed room.
	Explain how the principles of design apply to the use of color as well as to the use of line, area, and shape.

ACTIVITIES:

In the Art I classroom basic color theory is taught in conjunction with painting a color wheel. The color wheel project enables a student to see how colors are formed and change when mixed with each other. The color wheel also contains sections which allow for the addition of tints and shades of each color.

The Apparel and Interiors class study color theory by using colored acetate to overlap different colors to predict and see what the outcome is. These are cut out and glued down to produce a color wheel. Students in the art room, as well as apparel students, study color theory in conjunction with principles of design.

In art history we look at paintings and discuss the psychological effects that color plays in conveying a mood to the observer. Color theory is also emphasized by looking at the same painting in different color shemes to see how the mood of the painting changes by simply switching color schemes. Students in the art room get to test various color schemes in their own paintings. "Mood" paintings are developed by the students in carefully chosen color schemes.

Apparel students develop color harmonies in home decor color schemes. Color theory is used in conjunction with producing sample interiors using paint samples and swatches of upholstery fabric, wallpaper and carpet samples. Students will work in teams to show interiors representing different areas of the home. In creating their interior color schemes, the students use knowledge of color to show rooms that are warm and welcoming, soothing and quieting, austere and formal.

Design principles and basic elements of art that are necessary for understanding and producing art are quite similar to the elements and principles of design necessary to create functional and decorative beauty. A blank canvas or blank piece of poster board can be compared to an empty room with white walls in a home. Each relies on design principles in order to have a successful outcome. Universal design elements include color, line, forms, texture, proportion, balance, emphasis and rhythm. The elements are combined with special emphasis of some elements to create the pre-conceived outcome for the artist and home decorator.

In the art classroom projects are produced to emphasize the importance of design elements. The class is divided into eight teams. Each team represents different elements of design. Research will be done in the library to locate paintings done by famous artists that show each team's element of design as a crucial factor.

Example: **The Last Supper** - the long horizontal table shows how lines can convey a sense of peacefulness in this world famous fresco.

In the apparel class each team chooses a design principle. By looking through magazines, they produce a poster of home interiors that stress design principles.

Example: Emphasis could be represented by a team choosing pictures that represent a room with a definite focal point. These rooms may have a large case piece of furniture or perhaps a large fireplace.

section III

Sample lesson plan ideas

EXPLORATION OF CAREERS

During a nine day-unit of study, eighth grade students will participate in an in-depth exploration of careers. This study will be conducted by the communication skills teacher and the career exploration teacher in a team-teaching environment. Eighteen North Carolina competency goals will be covered: two in career development education, three in pre-employability, two in study skills, two in reading, three in communication skills/speaking, and six in communication skills/writing. A variety of teaching methods, processes, and activities will be employed in order to ensure active participation and opportunity for success on the part of each student involved. The unit will culminate in the students' publication of their written work and in oral presentations of their work.

North Carolina Competency Goals Covered in Unit of Study

I. Career Development Education

Competency Goal 1:	The learner will investigate the influence of personal interests, aptitudes, career values, and attitudes on career choices.
Competency Goal 2:	The learner will apply the decision-making process to formulate tentative career plans.

II. Pre-employability Skills

Competency Goal 1:	The learner will analyze the influence of personal interests and abilities on the choice of employment opportunities.
Competency Goal 3:	The learner will demonstrate methods of career decision-making.
Competency Goal 4:	The learner will analyze occupational and educational opportunities.

III. Study Skills

Competency Goal 4:	The learner will use environmental sources to locate and interpret information.
Competency Goal 5:	The learner will use study techniques to gain information.

IV. Reading/Literature

Competency Goal 8:	The learner will use literal information and implied meaning to think critically.
Competency Goal 9:	The learner will extend and apply ideas and information gained from reading material.

V. Communication Skills/Speaking

Competency Goal 2:	The learner will demonstrate effective voice control.
Competency Goal 3:	The learner will use standard American English.
Competency Goal 4:	The learner will speak for a variety of purposes.

VI. Communication Skills/Writing

Competency Goal 1:	The learner will use pre-writing as the first step in the writing process.
Competency Goal 2:	The learner will write a rough draft based on experiences.
Competency Goal 3:	The learner will revise rough draft for content clarity.
Competency Goal 4:	The learner will edit the revised draft (s) with a focus on conventions: grammar, complete sentences, spelling, usage, capitalization, punctuation, handwriting.
Competency Goal 5:	The learner will evaluate own writing and that of peers.
Competency Goal 6:	The learner will publish a piece of revised and edited writing.

Unit: Career Research

Lesson: **One**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* Teachers will introduce unit on exploring careers.
* Teachers will provide students with oral and written presentation of goals, objectives, expectations, and assignments.
* Teachers and students will discuss possible careers, career requirements, and decision-making processes.
* Students will brainstorm on sources to use to obtain career information.
* Teachers will provide information on methods of research.

Out-of-Class

* Students will select a career to research.
* Students will do ten minute journal writing on career choice.

Lesson: **Two**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* In informal class discussion, the students will announce their choices of careers to research and will discuss their expectations in the assignment.
* The teachers will provide students with information on steps of interview process and assign students to set up, conduct, take notes from, and evaluate an interview with an individual in the community working in the fields the students are researching.
* Teachers will conduct a question and answer session on the interview process.

Out-of-Class

* Students will work on questions to be used in their interviews.

65

Lesson: **Three**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* The students will evaluate and edit each other's interview questions.
* The students will simulate an interview.
* The teachers and students will critique interview simulations.
* Students will brainstorm on sources to use to obtain career information.
* Teachers will provide information on methods of research.

Out-of-Class

* The students will write a journal entry on feelings about obtaining and conducting personal interviews.
* The students will seek interview time with individual in the community involved in the career that student is researching.

Lesson: **Four**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* The students will give informal reports on status of interviews.
* The teachers will provide materials on the careers being researched and will introduce students to methods of conducting library research.
* The students will spend time in the classroom taking notes from materials provided by the teachers and will spend time in the library doing their own research.

Out-of-Class

* The students will continue reading and notetaking on career being researched.
* The students will conduct pre-arranged interviews.

Lesson: **Five**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* The students will continue to do in-class and library research.

Out-of-Class

* Students will work on tentative outline for organizing and compiling information collected from research and from the interview.

Lesson: **Six**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* Students will work on rough draft for a formal paper to be written on their career.
* Students will peer edit each other's rough drafts.

Out-of-Class

* Students will do final copy of career paper.

Lesson: **Seven and Eight**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* The students will in a formal speech present to the class the information they have researched on their careers.
* After each formal presentation, each student will conduct a question-and-answer session.

Out-of-Class

* The students will do a journal entry on their feelings about the research they have done and about giving a formal class presentation.

Lesson: **Nine**

Competency Goals: Communication Skills/Career Exploration

Activities:

In-Class

* The teachers will evaluate the students' written work and oral presentations.
* Using a 3-ring binder notebook, the students will index and compile their papers-thus making a resource book on careers to be left in the classroom for future reference.
* The teachers will provide review for writing friendly letters and assign each student to write a letter to the person he/she interviewed.

Out-of-Class

* The students are to write and mail letters to people interviewed.

"INTEGRATING AN ACADEMIC AND VOCATIONAL CURRICULUM" SCIENCE AND HOME ECONOMICS

8TH GRADE SCIENCE AND HOME ECONOMICS – FOODS

Production of an Edible Compound

Lesson Objectives

After completing this lab you will be able to:

1. Use proper measuring techniques and equipment in measuring food ingredients
2. Identify changes in physical properties of ingredients
3. Support the Law of the Conservation of Matter and Energy
4. Identify properties of a compound
5. Successfully bake a "cake compound"

The lab experience begins by having the food students demonstrate the proper methods of measuring food ingredients. Using a flow chart the science students practice measuring each ingredient by rotating from one station to another, and setting up the various equipment and ingredients. Food students are assigned to supervise and assist at these stations. This exercise in cooperative learning is successful for all of the students.

The second day the students are assigned to six groups which consist of the following positions and job descriptions: principal, manager (assigns work, checks work, certifies work, question to teacher), materials manager (manages materials-pickup/return/clean, the only person out of assigned area), recorder (collects and records information, records groups' work, certifies work results), reporter (reports results to class, registers group comments before class discussion). conduct a brief review of measuring techniques and methods and then review the recipe to use the following day. Discuss terms, such as greasing and flouring the pan.

The third day, do lab work using the home economics equipment to bake the cake. On the final day, complete lab with critical thinking discussion of parts IV and V. Then consume the experiments.

The lab sheets used to do this experiment appears on pages 67 through 69.

WHAT IS A COMPOUND?

I. Problem:
What is a compound? Do the properties of the materials which make up the compound change? Has matter been created or destroyed? Has the Law of Conservation of Matter and Energy been supported?

II. Materials:
- a. cake pan
- b. measuring cup
- c. measuring spoon
- d. balance
- e. beakers
- f. 2 1/4 cups sifted cake flour
- g. 2 1/2 teaspoons baking powder
- h. 1 teaspoon salt
- i. 1 1/4 cups sugar
- j. 1 1/2 sticks of margarine
- k. 1 cup of milk
- l. 2 eggs
- m. 1 teaspoon vanilla

III. Procedure:
- a. Make a chart for all the ingredients that will make up your cake.
- b. List the physical properties of each ingredient in your cake on your chart.
- c. What is the mass of each ingredient in your cake? Put this on your chart.
- d. Make your class cake:

__ 1. Group 1: measures out and takes the mass of 2 1/4 cups of sifted flour
__ 2. Group 2: measures out and takes the mass of 1 1/4 cups of sugar
__ 3. Group 3: measures out and takes the mass of 1 cup of milk
__ 4. Group 4: measures out and takes the mass of 1 1/2 sticks of margarine
__ 5. Group 5: measures out and takes the mass of two eggs (no shells in the cake)
__ 6. Group 6: measures out and takes the mass of 2 1/2 teaspoons baking powder, 1 teaspoon of salt, and 1 teaspoon of vanilla
__ 7. **"Leader of the pack"** - grease cake pan

1. Sift together flour, baking powder, salt, and sugar.
2. Add shortening, 1/2 cup of milk, and unbeaten eggs, and stir lightly until flour mixture is dampened.
3. Beat vigorously with mixing spoon or in an electric mixer at medium speed for 1 minute
4. Add remaining milk and vanilla and beat for 2 minutes
5. Pour into a greased cake pan.
6. Bake in moderate oven (350 degrees) for 30 minutes or until top of cake is brown and springs back to the touch.
7. Cool pans on cake rack. (10 minutes)
8. Remove cake, and cool on cake rack before frosting.

IV. Data: Your cake may be eaten after it is examined scientifically.

1. Separate your slice of cake into its different parts or the different ingredients which are in it. If there is a problem explain what it is.
2. Compare the physical properties now with those that it originally had. If there is a problem, explain what it is?
3. Do you have a new substance formed? Why?
4. What happened to your flour, salt, milk, eggs, sugar and vanilla? Explain!
5. Has matter been created or destroyed? Explain!
6. How does the mass of the ingredients before cooking compare with the mass of the cake afterward?
7. What is a compound?
8. What effect did heat have on your cake?
9. Look at your chart. Are there any materials in a proportion?

V. Conclusion:

CLASS CAKE

Ingredients	1	2	3	4	5	6	7	8

INTEGRATING COMMUNICATIONS SKILLS AND BUSINESS
OUTLINE FOR RESEACH PAPER UNIT

Competencies: Writing, Reading, Viewing, Listening, Speaking
Writing Competencies:

1. Gathering and using information
2. Using problem solving strategies
3. Communicating with co-workers
4. Participating in groups
5. Following directions
6. Presenting your point of view
7. Improving the quality of communication

Step 1 First Week: (All of these steps may be completed by using a computer and software)

Library and Research Skills - (All exercises to be written in journal. Work in study groups)

Day 1-Reviewing Classification Systems-
Card and Computer Catalogs
Classification of Books
Exercise: Choose a preliminary topic. After searching the card or computer catalog, list at least three available sources for your topic.

Day 2-Locating materials-
Continue researching the topic you have chosen.
Exercise: Visit stacks, periodical section, and non-print section (visual aids) of your library. List the author and title of one source in each section that you find for your research topic. (Write in journal).

Day 3-Finding the Best Source-
Continue researching the topic you chose by finding listings for two related magazine articles in the **Readers' Guide.** List the author, title, and magazine for each article. Evaluate one book from the stacks and note how it relates to your topic (in your journal).

Day 4-General and specialized reference works-
Continue your research on the topic by using the following research sources:
Dictionaries
Specialized dictionaries
Encyclopedias
Almanacs, Yearbooks, Atlases
Biographical reference
Literary reference works
Computerized data bank

Note findings in your journal.

Day 5-Expanding Research Skills-
Redefine your question
Look for additional sources and information in networks. List at least one government publication available in your school or local library.

Subsequent Days/Weeks:

Step 2-Planning the research paper

Choose a topic

Limit your topic to a subject that can be handled in a 10 to 20 page research paper. Have your teacher approve your topic and record it.

Step 3-Beginning your research

Compile a working bibliography for your topic. Use at least ten sources including books, at least two articles and one reference source. Use 3 x 5 note cards with lines. Include information on cards.

Step 4 & 5-Visit local college libraries for additional sources

Step 6-Taking Notes

Take notes from sources on 4 x 6 cards. Follow instructions from an acceptable resource. On back of cards list name of author and pages you gathered information from. Avoid plagarism (Do not use another writer's ideas without giving him or her credit). Have note cards checked. Required: Approximately 25

Step 7-Writing a Preliminary Outline

Using the notes you have taken on your cards, write a rough outline. Then label your cards with the major headings of your outline.

Step 8-Prewriting the Research Paper

Write your thesis statement

Organize your notecards by the outline headings you have made.

Organize your material by main topics and link them logically with transitions.

Step 9-Writing the Final Outline

Write down the major groupings and subgroupings from your rough draft. Thesis statement should be Roman Numeral "I" of outline. See resource for correct form. Have outline checked by teacher.

Step 10-Drafting the Research Paper

Write your first draft beginning with your thesis statement and following your outline. Every Roman Numeral should be a new paragraph. Write your entire paper in third person. You may use maps, charts, diagrams, and graphic aids to present some of your information. End with a paragraph of conclusion in which you restate your thesis and summarize the material you have presented. Have rough draft checked by teacher.

Step 11-Documenting your sources

Document for three purposes:

a. To indicate the source of material that is directly quoted.
b. To give credit for other people's ideas even though you write them in your own words.
c. To give the sources of graphic aids, figures, or statistics.

Use parenthetical documentation from MLA Handbook for Writers of Research Papers.

At end of idea you borrowed from an author write his or her name and the page(s) the material was taken from. Ex. (Watson, 16). If you mention the author's name in the text of your paper (Ex. Watson said), then only list his or her name at the end of the statement. See resource. Have documentation checked by teacher.

Step 12-Compiling "Works Cited"

Gather your bibliography cards for every source you have cited in your paper. Sources should be listed in alphabetical order and indent each line except the first. Follow instructions in acceptable resource.

Step 13-Revising the Research Paper

After you finish drafting your research paper, the next step is revision. Read it through several times. Consideration list: Is it suited to your audience? Will it seem complete and logical? Do the ideas flow from one paragraph to the next? Are there transitions? Do all sentences within the paragraph fit together smoothly? Consider next your writing style: mature vocabulary; variety of sentence structure; proofread-check for errors in grammar, spelling, usage, and mechanics.

Step 14-19-Produce and assemble research paper by using correct report format. Finished product may be produced on typewriter or computer.

Step 20-Turn in final printed copy with:

10 Bibliography cards (3 x 5)
25 Note Cards (4 x 6)
Rough draft and rough outline
Typed final outline
Typed final paper with documentation
Works Cited
Grading Sheet
Large envelope for all contents

(All of these copies may be generated by a computer.)

"COORDINATING AND REINFORCING ENGLISH AND BUSINESS COMPETENCIES"

I. Competencies shared in English and Business Curriculum:

a. Letter writing in English can be coordinated and reinforced in the business curriculum. The most recent business styles can be reinforced through English; students who do not take business courses can benefit as a result of experiences in writing activities other than essays and reports.
Activity: Display a list of competencies for business letter writing styles. Assign students one style on which to write and display their completed work.

b. Public speaking, or speaking before a group. People in the business world must be able to make effective presentations. Many opportunities to assign student presentations are available throughout the year.
Activity: Assign topics and periodically give impromptu topics. Students can also write a paper about the assigned topics. Students can also be expected to make audio visuals (using office machines) that make their presentation more interesting. These could be finalized on the computer. Students could evaluate other students' work in the area.

c. Punctuation and capitalization is emphasized in both English and business competencies. Many basic rules never change. Samples used in business classes can also be used in English classes. Knowledge of the rules will enable students to do better in all classes. They will feel more confident with written communication.

d. Group work allows students to express themselves and to share with others. Leadership and teamwork qualities, as well as the ability to follow instructions are enhanced. Responsibility is valuable to English and business; effective communication skills can't be stressed too much.
Activity: Role playing in English can be done by using situations that are business related.

e. The use of library resources such as encyclopedias and other reference materials will benefit both areas. Trips to the media center and assignments made in this area will aquaint students with diverse material.

f. Conducting interviews and working with introduction etiquette are important to both areas.
Activity: Students can work in pairs. They can role play famous writers or characters in literature. Students can also role play telephone etiquette. They can role play incorrect and correct telephone etiquette through situations assigned by the teacher. Students can write scripts in advance of the role playing, or the exercise could be impromptu.

g. Social skills regarding invitations and thank you notes are of value.
Activity: Students could practice with the various forms. People in the business world should know the proper manner to respond. Advancing in life depends upon the "meaning" of many skills.

h. Throughout life, students learn much about people. These lessons can be utilized in the day-to-day business world. Students who learn to be kind, thoughtful, responsible and respectful of the rights of others will be better employees in the business world. Relating to others is a skill.
Activity: Students can role play interaction with other people (students and adults) to build relating skills.

i. The English teacher has many opportunities to make students feel special; self-worth will carry over to all curriculum areas. Students who feel good about themselves will do better in all areas. Wanting to excel and accomplish goals is important in English and in business.

MATH - AGRICULTURE

Length of Lesson: 5 class periods

Class: Horticulture I

Competency: Computation of areas of squares, rectangles, and triangles

Objectives: Compute areas of squares, rectangles, and triangles.
Make application of this competency to agricultural situations.

Agricultural Applications:

1. Determine the number of acres in a measured field using both square feet and chains.
2. Knowing the number of acres or square feet the student needs to be able to do such things as:
   a. Determine the number of plants or seeds needed when given the rate.
   b. Compute the amount of fertilizer when application rates are known.
   c. Anticipate yield of various plants/crops.
   d. Determine the expected income of areas when other information is given.

Assumption: Students are able to use developed math skills to make applications as in **a** through **d** above when the competency is achieved.

Competency Development

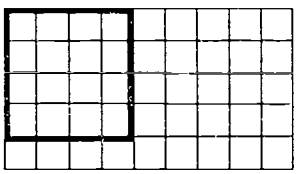
a. Compute the area of a square
b. Compute the area of a triangle
c. Compute the area of a triangle

(Steps 1, 2, 3 to be taught in math)

Step 1

Present the shapes and formula for determining the area of each using chalkboard or overhead.

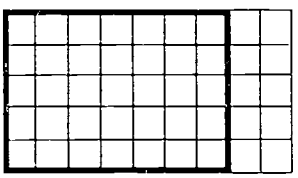
Square



Formula

$A = S^2$ or $A = S \times S$
$A = 4^2$ or $A = 4 \times 4 =$ 16 Sq. ?
These dimensions are always expressed as square measure

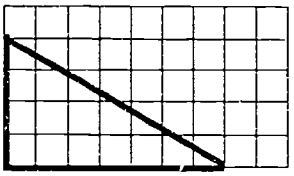
Rectangle



Formula

$A = LW$ or $A = L \times W$
$A = 4 \times 5$ $A =$ 20 Sq. ?

Triangle



Formula

A = 1/2 L W or A = 1/2 L x W
A = 1/2 x 6 x 4 = 12 Sq. ?

Step 2
Students draw 5 examples of each shape, assign measurements to each, and compute the area of each one. This exercise is discussed, correcting mistakes and strengthening weaknesses.

Step 3
Teacher prepares a quiz in which students have to compute the areas of each shape.
Students failing to show they have developed this competency will be given individual instruction.

Application: (This exercise to be directed by the teacher of agriculture)

Students are to use the measures as determined above and compute the number of acres.

One acre = 43,560 square feet
Students will also use a chain tape to measure.
(This tape is 66 feet long and 10 square chains is equal to one acre.) This tape is divided into 100 links and greatly simplifies the math in determining the number of acres.

Example: A field is 6 chains, 50 links wide and 10 chains, 25 links long.

Using the formula

$$A = LW$$

$$A = 10.25 \times 6.5 = \frac{66.625}{10} \text{ sq. chains}$$

$$= 6.66 \text{ acres}$$

Exercises

1. Students will be divided into groups of four. Each group will measure the football field, compute the area, and determine the amount of fertilizer to apply when given soil test recommendations.
2. Students (again divided into groups of four) will be given a field to measure, compute the area, and determine the number of christmas tree seedlings to plant the field if placed on a 5' x 5' spacing.
3. Students will be given the assignment to measure their homestead or lot at home and determine the number of square feet and number of acres. This information will be placed in notebooks to be used in landscape design and home improvement lessons.

INTEGRATING MATHEMATICS , AGRICULTURE , AND TRADES AND INDUSTRY

Objectives: 1) The learner will be able to apply the concept of ratio and proportion.
2) The learner will be able to transfer this knowledge to the use in technical math as gear and pulleys.

Objective 1

Ratio is the quotient when one number is divided by a second number that is not 0.

3 ways to write this division
a) $3 \div 6$ b) $\frac{3}{6}$ c) 3 : 6

* Ratios used must be written in reduced form.

Examples: $\frac{16}{32}$ or $\frac{1}{2}$

height of a tree 4m tall to a tree 50cm tall.

$\frac{4m}{50cm}$

*Ratios must be quantities of the same kind. Inches to inches, feet to feet.

$\frac{4m}{50cm} = \frac{400cm}{50cm}$ or $\frac{8}{1}$

or $\frac{4m}{.5m} = \frac{8}{1}$

Example: Sam plants alfalfa and wheat on this 160 acre farm. The ratio of alfalfa to wheat is 3:5; how many acres of each crop planted?

$\frac{3}{5}$ (alfalfa) x = acres of alfalfa $\frac{3}{5} = \frac{x}{160-x}$
(wheat) 160-x = acres of wheat

$5x = 480-3x$
$8x-480$
$x = 60$
*So 60 acres of alfalfa and 100 acres of wheat.

How was it that I set those two ratios equal to each other? By using proportion - an equation that states that 2 ratios are equal.

Ways to write proportions: $3:5 = x:160-x$ or $\frac{3}{5} = \frac{x}{160-x}$

In the proportion:
$\frac{a}{b} = \frac{c}{d}$, a and d are the extremes and b and c are the means.

81

To solve a proportion, you multiply getting the product of the extremes equal to the product of the means.

Examples

$\frac{3}{x} = \frac{5}{4}$ $\frac{4}{21} = \frac{-2}{15a}$ $\frac{x-4}{3} = \frac{2}{15}$

$5x = 12$ $60a = -42$ $15(x-4) = 6$

$x = 2.4$ $a = \frac{-42}{60}$ $15x-6 = 6$

$15x = 66$

$a = \frac{-7 \text{ or } -.7}{10}$ $x = \frac{66}{15}$ or $\frac{22}{5}$

5 lb bag of flour can make 120 cookies. How many cookies will a 2 lb bag make?

$\frac{5 \text{ lb}}{120 \text{ cookies}}$ $\frac{2 \text{ lb}}{x \text{ cookies}}$ so $\frac{5 \text{ lb}}{2 \text{ lb}} = \frac{120}{x}$

$5x = 240$

$x = 48$

At this point there are several types of algebra skills that need to be practiced. That practice would follow here as guided and homework.

After an assessment, we could extend ratio and proportion into the technical math field.

Objective 2

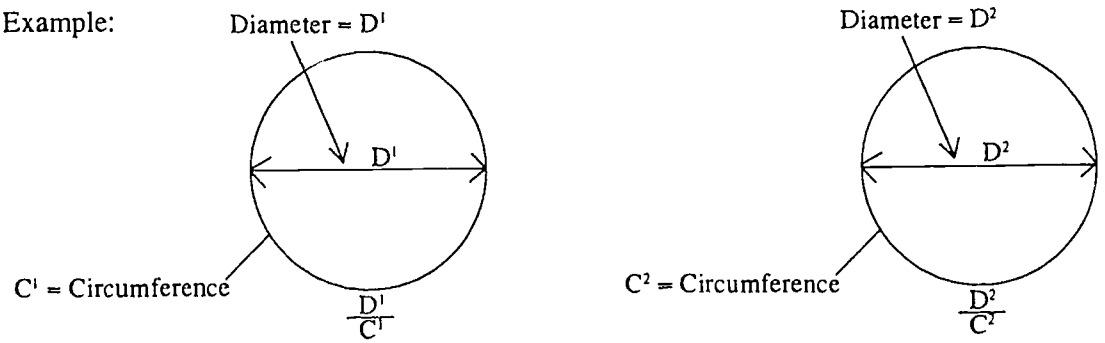
We know that two equal ratios form a proportion and that a proportion may be solved by cross-multiplication. In many trade problems, four related quantities are involved in which a proportion can be formed by writing two equal ratios (same as algebra); but first we must consider the fact that there are two types of proportions.

Lesson

Proportion type #1: Direct Proportion

Definition - Direct proportion exists when two "like" quantities are always in the same ratio to each other as two other like quantities.

Example:



Two circles with diameters and circumferences. Ratio for each is $\frac{D^1}{C^1}$ and $\frac{D^2}{C^2}$. Because the definition says "like quantities we'd arange them like $\frac{D^1}{D^2} = \frac{C^1}{C^2}$.

Example:

Gear No.	Diameter	Teeth
1	7"	x
2	10.5"	54

"Like Quantities" $\frac{\text{Teeth}}{\text{Teeth}} = \frac{\text{Diameter}}{\text{Diameter}}$

$$\frac{x}{54} = \frac{7}{10.5}$$

$$10.5x = 378$$
$$x = \frac{378}{10.5}$$
$$x = 36 \text{ teeth}$$

Wire No.	Length	Resistance
1	2000'	2.04 ohms
2	650'	x ohms

$$\frac{2000'}{650'} = \frac{2.04 \text{ ohms}}{x \text{ ohms}}$$

$$2000x = 1326$$
$$x = \frac{1326}{2000}$$
$$x = .663 \text{ or } .66 \text{ ohms}$$

Proportion type #2: Inverse Proportion

Definition - The opposite of direct. the inverse relation is used to show that one movement has a reverse effect. Such as when a small pulley drives a larger one, the small pulley will revolve faster than the large pulley.
(Let students use round objects and ropes to experiment)

Example - You'll find that the small pulley will make 2 revolutions to 1 for the large one. So if the small made 100 revolutions the larger made 50.

(Show inverse by logic)

$\frac{\text{Diam. small pulley}}{\text{Diam. large pulley}}$ $\frac{\text{Rev. large pulley}}{\text{Rev. small pulley}}$

Pulley No.	Diameter	Revolutions
1	2	100
2	4	50

$\frac{2}{4} \; ? \; \frac{100}{50}$

$\frac{1}{2} \; ? \; \frac{2}{1}$ *If one was reversed the ratios would be =.

Inverse proportions

$\frac{a}{b}$ then $\frac{d}{c}$ or $\frac{2}{4} = \frac{50}{100}$

Examples:

Pulley No.	Diameter	R.P.M.
1	24"	500
2	x"	400

$$\frac{24}{x} = \frac{400}{500}$$

$$\frac{24}{x} = \frac{4}{5}$$

$$4x = 120$$
$$x = 30"$$

Gear No.	Teeth	R.P.M.
1	36	60
2	x	108

$$\frac{36}{x} = \frac{108}{60}$$

$$\frac{36}{x} = \frac{9}{5}$$

$$9x = 180$$
$$x = 20 \text{ teeth}$$

Activities: Problem Solving - guided and independent.

Problems

1. A gear having 76 teeth meshes with another gear having 30 teeth. At what speed is the smaller gear driven if the larger makes 115 r.p.m.?
2. A circular saw with a 6" pulley is driven at 1000 r.p.m. by a pulley making 240 r.p.m. What is the diameter of the driving pulley?
3. A force of 65 lb is applied 5" from the fulcrum of pair of pliers. How large a force is applied at the jaws of the pliers, 1 1/2" away from the fulcrum?
4. A gasoline engine rated for compression ratio of 8.2. If the pressure in the cylinder at start of compression is 22 psi (pounds per square inch), what will be the cylinder pressure at full compression? (Hint let volume at the start equal 1 and the volume at full compression equal 1/82. The compression ratio is equal to the full volume divided by the compressed volume; thus 1 ÷ 1/82 = 1 x 8.2/1 8.2).
5. If ten printing presses can do a job in three hours, how many hours will it take for six printing presses to do this job? (Hint: This is a problem in inverse proportion, since the more printing presses that are used, the less time that the job will take).
6. What force will be required to lift a 200-lb object placed 12" to the right of a fulcrum if the lifting force is placed 5' to the left of the fulcrum.
7. A 24-tooth gear is attached to a 36-tooth gear. If the smaller gear makes 1200 r.p.m. how fast will the larger gear turn?

INTEGRATING MATHEMATICS, APPAREL AND INTERIORS, AND CARPENTRY I

Teacher

Execute

Distribute house plans. Ask students to identify dimensions needed to calculate: area for carpet and wallpaper, total surface area for paint and volume for heating and air conditioning.

Ask students to calculate the areas, total surface area, and volume they were asked to identify

Ask group to share their answers with the class. If groups do not agree on answers, discuss as a class until an agreement is made.

Reflect

Ask students what formulas and dimensions they used to calculate area of a rectangle, and total surface area and volume of a rectangular solid.

Apply

Give students another house plan to calculate: area for carpet and wallpaper, total surface area for paint and volume for heating and air conditioning.

Review

Review formulas and dimensions needed to calculate area, total surface area and volume for rectangular solids.

*Materials: Small model home to demonstrate dimensions, house plans for the home we will actually use to calculate the areas for carpet, roofing, wallpaper, and paint.

Introduce

1) Review previous lesson on formulas (Area of a rectangle included).

2) Introduce new formulas for total surface area and volume of a rectangular solid.

3) Explain the dimensions of a rectangular solid using the small model house and house plans.

Student

Execute

4) Work in groups and verbalize their thinking process.

5) Work together to calculate answers.

6) Groups share their answers.

Reflect

7) State formulas and dimensions.

Apply

8) Work in groups.

Review

9) Provide responses to questions.

*Materials: Small model home to demonstrate dimensions, house plans for the home we will actually use to calculate the areas for carpet, roofing, wallpaper, and paint.

Introduce

1) Work review problems.

2) Put formulas and work example problems in notebook.

3) Listen.

*An example of a lesson plan for using total surface area of rectangular solids, volume of rectangular solid and area of rectangle in the construction of a home.

Objectives:

1) Identify rectangles and rectangular solids and establish how their areas, total surface area of rectangular solids, and the volume of rectangular solids.

2) State the formulas for the area of a rectangle, the total surface area of rectangular solids, and the volume of rectangular solids.

Activity

Use objectives 1and 2 to calculate the square footage for the following home components:

a. roofing shingles
b. carpet
c. wallpaper
d. heat and air conditioning
e. paint

GEOMETRY AND CARPENTRY

Competencies

1) Find scale factors.

2) Apply the Pythagorean Theorem.

3) Find the slope of a line.

4) Find the area of polygons.

5) Find the perimeters of polygons.

Activities

1) Use scale factor to compare similar factors such as triangles, square, and rectangles.

1a) Use scale factors to make blueprints on a one story, rectangle house

2) Use the Pythagorean Theorem to find the rafter length (hypotenuse) of houses

3) Find the slope of a roof by using the slope of a line

4) Use the area formulas to find wall areas, roof areas, and areas of houses

5) Use the perimeter formulas to find the perimeter of a room, and the perimeter of a house.

BIOLOGY AND INTRODUCTION TO AGRISCIENCE

Topic
Spore Plant

Common Competencies
Requirements for moss growth
Structures of moss and reproductive cycles of moss

Activities
Lab testing effect of moisture and sunlight on moss growth
Using microscopes identify structures of moss, including gametophyte and sporephyte and generations

Topic
Seed Plants

Common Competencies
Reproductive cycle of a fern
Distinguish between angiosperms and gymnosperms

Activites
Plant spores from fern frond. Observe alternations of generations in ferns
Obtain samples of both groups of seed plants; let biology and agriculture students compare/contrast characteristics.
Lab that compares the structures in monocot and dicot seed; also observe embryonic development in both of seeds.
In green house, examine leaves and flowers of monocots and dicots taking note of the veining pattern, etc.
Using celery demonstrate the transport system in a plant.

SOCIAL STUDIES/MARKETING/BUSINESS

Free Enterprise Day
Teach the Free Enterprise System in Social Studies and Business classes. (Good time to use team teaching.)
Have groups set up booths representing stores in a town with items for sale. Take classes in to buy items.
Allows for competition between booths.

Speakers from Historical Places
Combine a Social Studies/Marketing/Business Class. Have the speaker discuss the history of the site as well as marketing techniques to attract visitors.

Time Line
Have students develop a time line of major historical events during a period.
Share this time line in the business class and add economical activities to the time line.
Use in both classes to discuss how history and economics affect each other.

Audio Visual
* Select a movie that has both Social Studies and Business/Marketing competencies.
* Show the movie to the combines classes.
* Have each teacher discuss or prepare an activity related to his/her curriculum and team teach to the combines classes.

Resume
Resume writing is a competency of most Business courses. Have the business teacher teach writing the resume.
Have students write a resume about a famous person in history. Students would research the person and create a resume for that person.

Current Events
Have students to bring in a current event. Place some criteria on events to be presented.
Look for specific words.
Look for an article with an error.
Have students summarize the article. Summaries must be written.
Present the article in another class.

Pen Pals
Encourage letter writing skills by encouraging students to become involved in a Pen Pal Program.
Begin this activity early in the year.
Selection of a pen pal could be related to a social studies course they are taking. Ex. Choose a pen pal from a country you will be studying.
Share letters with the Social Studies Class.

FOR MORE INFORMATION CONTACT
Pen Friends, Inc.
P. O. Box 290065
Homecrest Station
Brooklyn, NY 1129-0001:250,000

World Pen Pals
1690 Como Avenue
St. Paul, MN 55108
(612) 647-0191

SOCIAL STUDIES/MARKETING/BUSINESS

Research Paper
Plan your research paper with a teacher in the Business Department.
Make the assignment a grade for both classes.
Have the Business teacher teach formatting for a paper and the Social Studies give suggested topics. The Business teacher can grade the paper for formatting. You may require the student to correct formatting before turning in the paper to Social Studies.
You may also work with an English teacher who may teach the research/grammar skills and also grade the paper.

Team Teaching Approach
Ask the Business teacher to come in and teach your Social Studies students the proper format for a research paper.

Journal
Encourage students to write by having students keep a journal in your class. Suggest topics that will have them write about other courses they are taking. Make sure to encourage "positive" writing about these courses.

History of Industry
Have students research businesses that began during an era in history. They should be prepared to discuss how events in history played a part in the beginning of this business.
Share this information in your business classes.

Exchange students
Ask exchange students to talk with your classes about their countries, the educational system, the banking and economic systems, and to compare the two countries. This is a valuable resource.

End of Unit/Course Project
Have History students research the presidents of the United States. List the type of information you want included in the project. Pair the class with a computer applications class.

1. Have the students prepare a study booklet for the course.
2. Have the students create a data base with the information. Then prepare questions that could be used to query the data base and prepare a booklet of facts about the presidents of the United States.
3. Have the students create graphs representing data and prepare a presentation based on this data.