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An Examplary Course Model on Costruction Technology for the Industrial Education Department, NKTC, Taiwan

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AN EXAMPLARY COURSE MODEL ON COSTRUCTION TECHNOLOGY FOR THE INDUSTRIAL EDUCATION DEPARTMENT, NKTC, TAIWAN

by

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This Independent Study submitted by Liu, Chi- Yu in partial fulfillment of the requirements for the degree of Master of Education in the University of North Dakota, is hereby approved by the Committee under whom the work has been done.

(Chairperson)

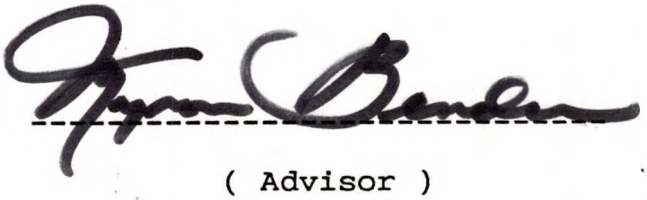

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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CHAPTER I

INTRODUCTION

Under the pressure of technology development, the mission of Industrial Arts Education is directed to technology. The title Technology Education has been suggested by educators to replace Industrial Arts. On winter, 1984, the American Industrial Arts Association (AIAA) was replaced by the International Technology Education Association (ITEA) by a membership vote. Therefore the mission of professionals in the Industrial Arts/Technology Education field must be to increase the understanding of technology among people.

An important project developed by participants indicated some basic philosophical statements and directions. They emphasized the four major technological systems: Communication, Construction, Manufacturing, and Transportation.

The new curriculum standards of Industrial Arts in teachers'education and in high schools of Taiwan were announced in 1983. According to them , Department of Industrial Education (DIE) of National Kaohsiung Teachers College (NKTC) should open a new course, Construction, at the fall semester in 1986. It is a two-credit course, four hours per week, and one semester long. In junior high schools there is a new content "Construction

& Life" involved in the textbook of Industrial Arts. It is a course of one semester, 18 hours in total, and one semester long in Grade 8.

STATEMENT OF THE PROBLEMS

To investigate the implementation of the new course Construction and the new curriculum standards of Industrial Arts in teachers' education and in junior high schools of Taiwan, there are two problems:

1. Do the Industrial Arts teachers in current junior high schools and other teaching measures well prepare for teaching the new course "Construction & Life"?
2. What contents of "Construction" should be taught in DIAE of NKTC?

NEED FOR THE STUDY

Construction is one of the four technological systems, so adding this course into the Industrial Arts teachers' education program and into the junior high schools is a very important and accurate educational policy of Taiwan.

At the beginning of the new course in schools, the research of this study becomes rather important. I hope that the findings of this study would render some contributions to Industrial Arts Education and the Construction education system.

PURPOSE OF THE STUDY

The primary purpose of this study is to develop an examplary course model on Construction Technology that will be used to educate in-service and pre-service secondary teachers of NKTC, R.O.C.

CHAPTER II

REVIEW OF LITERATURE

To notably increase the desired functions of Industrial Arts Education, the Industrial Arts curriculums in Middle School in Taiwan, under the influence of technology education and career education, incorporated the national strategies, social-economic developing needs, and the cluster concepts and were revised in 1982 & 1983, and were put into practice in 1984. The revision was also based on the considerations of Taiwan industrial structures and technological development situations. This is a great educational reform in Taiwan.

The new Industrial Arts textbooks of Middle School include the contents of "Construction & Life". DIE is responsible for the training of teachers in the aspect, and the study is to develop a course model of Construction for it.

In order to design the course model, we have to study the contents of "Construction & Life" of Middle School. The course is for the juniors. It takes 9 weeks, i.e. 18 hours. The contents in the part of Knowledge contain:

1. the contribution of construction to life;
2. a general introduction to construction industry;

3. the process of house construction (including desinging, construction, sale, and service,etc.);
4. an introduction to construction materials;
5. improvement of environment.

And the part of operation contains:

1. plumbing (reparation of faucets, cleaning of u-shape pipes);
2. painting walls;
3. mixing cement and work-processing;
4. reparation of windows, etc.;
5. maintenance of utilities and furnitures.

This is the first time for Construction to be taught in Middle School. It appears in the new textbooks with a type of clusters, which has expanded the teaching field of Industrial Arts. Because this is the first time, some problems are likely to occur. Before the course contents of DIE of NKTC and the relative cooperation projects are decided, it should be first considered and studied what problems would likely to occur. Are the course contents of "Construction & Life" adequate? Do the in-service teachers have the ability to teach it? Are the equipments for Construction sufficient? Are the teaching methods and materials needed to be imporved? and the teaching environment? Can the administration support it? What type of course-designing does it take? Is the course-designing

compatible with the methods and principles?
Do the objectives of new textbooks accomplish the mission that has been shifted on to industrial tecahnology education? Does it reflect the Industrial Arts Education trends? Does it correspond to national strategies? To solve these problems, this study is to analyze the related literature and seek solutions there in: whether the objectives, structure, and contents of new textbooks differ with the development of Industrial Arts Education or theories in the literature. The developing of course model for DIE should take into consideration the course contents of Middle School's "Construction & Life" and the questions mentioned above.

To solve the above problems, and to have the course model match with the objectives of Industrial Arts Education and the theories of course-designing, I am going to study the following literature:

1. Literature related to the development of industry and technology.
2. Literature related to the development of Industrial Arts curriculums.
3. Literature related to the development of consstruction course.

The information of literature was retrieved from the sources below:

1. the Educational Resources Information Center (ERIC)
2. the Dissertation Abstracts International (DAI)

3. Journals:

Middle school Industrial Arts (Taiwan)

The Technology Teacher

Industrial Education

School Shop

Conference: N.I.A.C., I.T.E.A.

The review of literature indicated that no studies had been completed in developing the construction technology course that will be used to prepare for secondary school teachers in Taiwan, R.O.C.

Literature Related to the Development of Industrial Arts Education

Education should change with the need of the age. Taiwan's current Industrial Arts Education reforms were developed out of changing education philosophy. New education trends, current social situations, technology development, economic development and political policies all had great influences on Industrial Arts Education. This part is to study those elements that influenced the development of Taiwan Industrial Arts Education. The current factors should be incorporated into the system of Industrial Arts, and the objectives should react against the spirit of contents and then made certain revisions. Faced with the change of Taiwan Industrial Arts course of Middle School,

DIA of NKTC, responsible for the training of members for teaching in Middle School, should take measures to meet the demand of the situations. This part, based on above theories and contents of Industrial Arts, studies the education objectives of Middle School in Taiwan and NKTC, and then the corrdinationg measures.

The Changing Education Trends

Lin Ch'ing Chiang, director of Department of Education of Taiwan Provincial Government, gave a lecture Education Measures for a Developing Country Moving toward a developed Country in the Provincial Senior High School Administration meeting held on May, 5, 1987. He said Taiwan will become a developed country in 13 years. He urged the schools should have the conception of "planning eduction changes" to make a long-ranged, overall plan in a view to making our country become a developed country, benefitting people to enjoy the welfare of a developed country, and avoiding the disorders of civilization and social maladies.

Change means development, and improvement. Jao Da Ching said that "moderate change" is the direction of education reforms,and the American society is characterized by its 'change'. Americans believed that change is the essence of our world. Change always comes into existence before man could prepare for it. In democratic society, the purpose

of education should be able to meet the demand of people, and when the demand of people change, the objectives of education should change likewise.

D. Michael said that education is essentially important for society. It is supposed to learn how to change quickly and always to meet the changes of surroundings. Dewey and the progressinoists supposed that education is one kind of experience, which means more the change, continous re-assembly of development, and imporvement of experience. The assertion of progressionism in education emphasized change, and the students' learning process. The education idea "learning by doing" lays stress on the coordination of learning and doing. It especially stresses the individual learning experience. Students learn by doing. And it also agrees that education is life itself, which assertion meets the demand of the objectives of Industrial Arts Education. The reason is that Industrial Arts also emphasizes the learning process on the students' part, and learns by means of actual operation the information of industrial materials, tools, production process, industrial products, and consumption, and those skills related to life.

Progressionism is one of the major education currents. It developed out of pragmatism, and took the Greek philosophy, empiricim, naturalism, and Darwinism (Burbacher, 1975, P.8; Brameld, 1971, PP. 95-7). The rules of the development of nature is also applied to education.

Development, Origin, and Future of Industrial Arts Education. Industrial Arts grew out of industrialism and social philosophy of John Dewey. Its evolution can be traced from the the Russian method of technical preparation,through the Scandinavian sloyd system of handicraft education, to the characteristically American movements of manual training and manual arts, and hence to the adoption of a broad industrially-oriented curriculum called "industrial arts." Each of these elements left its indelible mark; each made a distinct contribution to the modern industrial arts program.

In America, World War I created a need for trained and skilled workers. This need was met by industrial arts because vocational eucation was not prepared to develop these skilled workers. At the moment, in order to reflect the current factors, Industrial Arts Education stressed in teaching formation of individual basic working ability, working habits and attitude, the training of individual everyday necessary skills and the cultivation of interests in leisure.

After World War II, because of the change of social structure and the development of industry, Industrial Arts Education tended to understand the industrial society, stressed the adjustment competence, and to solve industrial problems. Since 1960, rapid growth of technology gave education another task; that is, to let the youth appreciate the spirit of technology life. They not only had to adapt

to the changing world, but also had to realize the development of technology in future. Hence the contents of Industrial Arts Education were expanded. In 1970, there rose the trend of career education. It influenced the development of Industrial Arts Education, career, and counseling which became specialized, inclusive, flexible, and the cluster concept was incorporated into Industrial Arts Education. Now technology education is being developed. In 1985 American Industrial Arts Association (AIAA) was replaced by International Technology Education Association (ITEA). The association also initiated the movement of "Technological Literacy Act". And some scholars suggested to change "Industrial Arts Education" to "Technology Eduction" as a means to cultivate technological literacy among people. In future, the challenges to industrial arts include moving science into the studies of technology and moving vocational education into broad clusters that overlap what has been traditionally covered in industrial arts.

Taiwan Industrial Arts Education started in 1927. At the time, Industrial Arts was practiced in Junior High School with the type of manual training. In 1932, the title "Industrial Arts" was replaced by "Manual Arts". In 1955 it was changed to "Manual Arts and Production Work." In 1962, the traditional type of manual work was changed and the Manual Arts course was based on the Industrial Arts course of U.S.A. Middle School and stressed the teaching

of industrial knowledge and skills. The curriculum standards of Senior High School was revised in 1971; of the Junior High School, in 1972. This time is of the second time. The first revision was of little scope, which followed many teaching materials of 1962. It only added the part of teaching little engines. The present revision texts have a larger scope of change, not only in teaching items and contents, but also in the structure of curriculums.

In 1983, in order to make the course contents match more with the modern and future civilization of industry and technology, the curriculum of Industrial Arts of Middle School was revised.

The Current Factors that Influence the Development of Taiwan Industrial Arts Education

Nowadays, Taiwan Industrial Arts Education is faced with many impacts, such as the rapid growth of technology, change of industrial structure & type, and the environment, success of economic growth, and new education trends, etc. All these things form into a education trend, and that directly influences Industrial Arts Education is just these education trends: career education that rose in 1970, and current growing technology educaiton . In order to let the education system, the objectives of Industrial Arts education and the curriculum structure adapt to and reflect these education trends, we have to do education reforms, and

revision of curriculums. Taiwan is pursuing on this way.

The Career Education Trend

The career education trend has been introduced into every grade of education. It only not influences the development of Industrial Arts education, but also influences that of vocational education. It lays the foundation for the education area of life-long-learning.

At the moment, Taiwan economic development is situated in the critical transition period from a developing country to a developed country. In 13 years, the goal would come true. In the future, economic growth is supposed to change the industrial structure. Hence we have to develop actively the capital and specialized technology industry to enhance the promotion of industry. The future assimilation of labor will be turned from the increase of occupation numbers to the enhancement of manual quality. And the employment structure would be changed, too. Predictably, in the future employment structure of Taiwan industry will take the lead, and the supply of specialized technians is supposed to be increased. And the employees' traditional working attitude will be changed likewise. People, living in today's technology development, and in an age of knowledge explosion, have to possess broad necessary living experience. The positive meaning of "career" is to encourage the individual to pursue all the time in life.

"Career development" is of a person's life event. From young to old, everyone has different demand and duty of development in life stages. Career development means that life is always in pursuit of knowledge. The notion of career is widely accepted and applied by various fields in Taiwan. It is called "life-long-education" when used in education.

School education and social education should be connected and coordinated to satisfy the requirement of social changes and the individual needs. The purpose is to help the individual develop his potentials create happy life, and become the major forces that contribute to the future of the country.

In 1971, Dr. Marland, minister of Education of America, pointd out some U.S.A. education weak points, and presentd the idea of career education. He gave the following important points concerning career education:

1. vocational preparation is one of the important stages of career education, but not equivalent to vocational education;
2. it is a life-long education, and should be provided for every student;
3. every teacher should take the duty of career education;
4. it relates education to every day living;
5. its majon purpose is to have students go to higer

education, or into job as they wish;

6. it relates vocational education to general education;
7. it particularly emphasized the function of actual working experience in education;
8. schools, families, and communities should take up the duty of carrying on education functions.

The spirit of career education stresses "life-long learning". As to individual career development can be categorized into the following four stages: (1) career awareness, (2) career orientation, (3) career exploration, (4) career preparation, (5) career placement, and (6) career adjustment.

Career education and Industrial Arts education are closely related. Marland once said: Industrial Arts education is one of the basic elements for the individual career development. Thus the current of career educaton also greatly in fluences Industrial Arts Education. Its influences have two aspects:

1. the prevalence of cluster concepts in Industrial Arts education; and

2.the expansion of service of Industrial Arts education. From above souces, we know Industrial Arts education is one of the links of career education. Industrial Arts education should meet the demand of career awareness and career exploration.

The Tecahnology Education Trend

The development of Industrial Arts education and technology are closely related. As we know, the purpose to establish a modernized country needs to develop modern technology, and educate technians, and the way is to encourage, sponsor Industrial Arts education and improve the course contents because Industrial Arts can cultivate among people basic industrial technology. Hence, how to coordinate Industrial Arts education and technology developlment concerns the rate of modernization of Taiwan.

Technology development incurs a change of human living circumstances. Man has to learn, understand technology to adjust himself to the new situations. And Industrial Arts Education is the only subject that holds the responsibility of transitting technology civilization to the public. Therefore many educational experts positively assert that the title "Industrial Arts Education" should be changed to "Technology Education", and thus the Industrial Arts education would fully exercise its functions. Warner in 1947 had proposed that Industrial Arts education should reflect technology. Olson and others had the same assertion. It is a recently developed notion that the education objectives are to cultivate among people technological literacy, and "Industrial Arts Education" should be replaced by "Technology Education". The idea expands the field of Industrial Arts

Education, hightens its level, lays the foundation of its philosophical ideas and theories, and display a promising picture for its future development.

The purpose of technological education is to cultivate among people technological literacy, which is indispensible for an individual living in technological society, and thus should be one of the most important links of education.

Olson, an expert on Industrial Arts education, said that it is to study the origin, development, and progress of technology, and study the functions and influences that it does on technological, social, economic, vocational, cultural, and leisurely aspects. The method is to learn, investigate, experiment, design, discover, construct, and operate industrial materials, production processing, products and power, etc. The goal is to teach students to know technology, to realize the relationship between man, technology, and society, to use technology wisely, to control and change technology efficiently, and to help discover develop, and actualize the individual potentials.

The new Industrial Arts Education idea, which contents are to study technology, is to cultivate among people technological literacy, to make them possess general technological knowledge and information, to understand the real meaning, contents, and nature of technology, to realize the positive value of technology on the development of human civilization and social changes, to know the negative

influences and impacts, to build up right recognitions, ideas, and attitude to adjust to the requirement of current as well as future rapid technological development, and to employ the positive value of technology to create fuller and more harmonious technological culture and human civilization through universal participation as well as clever choice.

The American National Science Foundation (NSF,1983) held that technology education should be widely introduced and used to cultivate people's technological literacy. Its reason was based on the follwing three things:

1. everyone should know technology to increase the quality of individual and specialized technological decisions;
2. possession of technological literacy enables the individuals to participate in various social activities wisely and actively during the transition period from industrialization to post-industrialization ; and
3. technological literacy can encourage more people to be concerned with revision of public policies related to technological application and through adequate means to influence the decisions and lead them to reasonable development.

AIAA, in order to adjust to social changes, and promote the level of Industrial Arts Education, decided in 1985 to change the name as ITEA, and initiated a program to persuade

Congress to enact Technological Literacy Act, with a hope of exalting public attention on Technology Education, of making technology become one of the important links of education just as math, science, sociology, and arts, etc, and of promoting people's technological literacy through federal appropriation to make research and enrich the teaching of such a course. The reasons that push them to do such a task are as follows:

1. technology has become a center of human civilization development; technological literacy is essential to every modern citizens;
2. no curriculum, except Industrial Arts Education, is adequate for such kind of study; and
3. from the theoretical or practical viewpoint, traditional Industrial Arts.

Education and teaching are most suitable for the task. NSF in Educating Twenieth Century Americans not only emphasized the importance of future education on technological literacy, but also listed the following five basic technological understandings that are considered to be the convient ways to cultivate technological literacy.

1. to understand the historic rule of technology in human civilization developemnt;
2. to understand the inter-relationship between technological decisions and human values;
3. to understand the efficiency and danger of technology;

4. to understand the current developing trend of technology; and
5. to understand present technological assessment in order to thoose the ways for future technology.

Lo Da. Han said that technological literacy should contain following things:

1. to understand the meaning and essence of technology;
2. to know the relation between technological development, human society and change of culture;
3. to understand the present basic framework of various secondary technological systems;
4. to appreciate the present and future influences and impacts of technological development on human & culture;
5. to possess general technological abilities of assessment and choice, related to everyday living; and
6. to coordinate technology and literacy science, and to cultivate technological philosophical view and technological literacy.

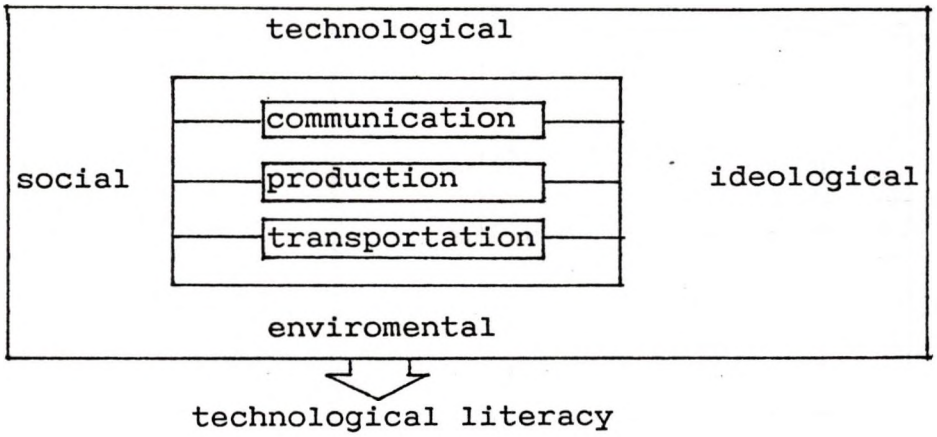


Figure 2.1. The theoretical foundation of technological literacy

Lee, Huan., Minister of Education, Taiwan, gave a lecture present Taiwan Senior High Educational Policies in the Provincial Senior High School administration meeting. He said that Taiwan education at policies should contain the following Four main Points;

1. to embody the educational ideals of Three Principles of the People, I.E. the education of ethics, democracy, and science;
2. the development of education should match with the objectives of overall national construction plan, such as the development of industry, promotion of culture, and national defense construction plan, etc.
3. to keep step with the educational trend in the world, and adjust to the world developing trend: (a)promotion of the spirit of humanism (b) emphasis of the development of technological research (c) formation

of the notion of life-long education (d) appreciation of the tendency of world cooperation; and

4. to satisfy the need of future development. Education not only gives solution to present problems, but also enables the students to adjust themself to future society.

As we found from the message delivered by Minister Lee; at present Taiwan educational policies fully reflect the spirit of career education and technology education mentioned above. For example, to keep step with the educational trend in the world, point and adjust to the world development trend has mentioned "emphasis of the development of technological research" and "formation of the notion of life-long education". Point two "the development of education should match with the objectives of overall national construction plan" clearly states that the development of education should coordinate with national policies, which fully display the need of Taiwan in the age. Two that greatly influence the development of Industrial Arts Education in Taiwan are the policies:

1. prolongation of national education in terms of vocational education; and "strategical industries".
2. development of strategical industries.

"Development of strategic industries" Policy:

Because of (1) vehement trading competition (2) prevalence of protectionism (3) energy crisis (4) deterioration of

pollution (5) high trading reliance, the government decided to center on developing strategic industries, after review of domestic & foreign economic situations. According to the decade-termed economic development plan, Taiwan would take to develop industries in the eighties the following measures:

1. to develop the strategic industries, like mechanics, television, electronics, and informatin etc, to improve the industrial structure;
2. to develop energy, and capital-intensive industry, like metallurgy, petrochemical industry, to supply the domestic market;
3. labor-intensive industries, like textile, plastics need to be installed with new equipments to improve production efficiency and quality, and increase international competitive competence;
4. to employ computers, develop informatin industry in order to improve producation & management efficiency; and
5. to improve equipments, increase energy efficiency, and move production toward the direction of rationalization and automation in order to advance the quality of skills and production

To accomplish the objectives of developing technology-intensive industries mentioned above, we have to fortify the development of following four basic technologies: (1) energy technology (2) information technology (3) automation

technology (4) material technology

In the eighties, Taiwan is being engaged in developing strategic industries to improve industrial structure, to turn the labor-intensive industries to skill-intensive and knowledge -intensive industries in a view to in creasing competitive ability, to promote the other industries through the developing of strategic industries and reach the long-termed goal: economic prosperity.

In the eighties Taiwan's industrial policies are to conserve energy, develop skill-intensive strategic industries for improving economic structures, and facilitate ecomomic growth. Up to 1989, Taiwan's per capital income will reach 6,000 dollars. Taiwan will become an industrial country, then. Education and training would become the major force in developing skill-and capital-intensive industries. It not only trains technigues but also establish new industrial ethics and order to meet the demand of the age. Therefore it becomes one of the imminent topics to emphasize the function of Industrial Arts Education in helping people get accommodated to future industrial society.

From the newly revised texts of Senior High School Industrial Arts, we find that the above four strategic industries are tanght in the schools as basic important technologies.

The "Prolongation of compulsory education in terms of

vocational education" Policy has been one of the important Taiwan construction proposals presented in the Fourth Central National Assembly, In the objectives of technique and manpower education, it is clearly stated that we need "to continue to enhance the educational level, execute the 9-year compulsory education to be completely obligatiry, to prolongate the compulsory education in terms of vocational education, to provide and install the graduate schools and universities & colleges with specialized teachers and equipments, and expand vocational technical training, to reinforce employment counseling, and to increase the number of technicians to one million persons to satisty the need for national construction.

The sketch "Prolongation of Education in terms of Vocational Education" has been completed by Ministry of Education. Its major objectives are, to satisfy the demand of national construction and educational developemnt, to instruct the youth vocational techniques, and to cultivate among them vocational ethics and cultural literacy. In order to reach the above objectives, Ministry of Education will found new specialized voctional schools in the future, and form the educational system for in-service education and reach the goal of overall enhancement of the level of civic education and technique. At the same time, to have the "Prolongation of national education in terms of vocational education" policy base on the foundation of excellent

compulsory education. Ministry of Education will continue improving compulsory education. reinforcing and promoting vocational education to reassure the effects of the policy. From the comparison between the objectives of the policy and those of Industrial Arts education.

We are easy to find that the teaching objectives of Industrial Arts education would no doubt help fulfill the objectives of the policy. Besides, the implementation of Industioal Arts curriculum would lay the foundation for compulsory education. And from the viewpoint of career education, it should be first to effectively enlighten the occupational ideology, instrucation and exploration of occupational orientation, which are all the duties of industrial arts education. So industrial arts education could lay the solid foundation for vocational education.

Industiral Arts education has developed to the phase that industrial technology should be taught in schools. Though many think that Industrial Arts education would finally teach highly noticed technology (high technology & new technology) according to the Taiwan present situations I think teaching of "industrial technology" will be more appropriate. "Industrial technology" might mean "specialized technology", which does not inciude the technology of medicine, agriculture, and biochemistry, but is not like the traditional narrow industry-oriented industries, and become "wide industries" containing technology. The literary

meaning of "industry", "industrial technology", and "technology" might be confusing. I propose to use some simple words to distinguish their differences, industry emphasizes society, skills, organization, and procedure: technology exphasizes cultare, knowledge, principle, rule, method and way . So industrial technology emphasized at the same time society & culture, knowledge & skills, organization & procedure, rule & principle, method & way.

The Mission of Industrial Arts Education

The above two educational trends give Industrial Arts new ccontents and essence, increase its functions, and bring about new missions. Kendall N. Starkweather Indicated:

> "the mission of professionals in the industrial arts/ technology education field must be to increase understanding of technology among all people. To achieve this mission, industrial arts education will provide a comprenensive, contemporary technology educaton for all. This program, by its very nature, will provide insight for learners into the evolution, appropriate use, and significance of technology; the organization, systems, personnel, techniques, resources, and products of industry? and the social and cultural impacts of both industry and technology."

In 1963, Delman W. Olson developed an industrial curriculum based on technology. He proposed an industrial

arts education that could provide six funcions: technical, occupational, consumer, recreational, cultural, and social. The functions are stated as follows:

1. technical: Industrial Arts education teaches the students how to use tools, machines, materials, and gives them the notion of designing & creation, for example, the introduction of the methods in using materials & tools, of the process of production, and of the experience of industrial structure. By means of these experiences and activities, the students can reach a certain level of skills.
2. occupational: Through actual manual operation, and education of working notions, the youth will identify future working society, then explore individual occupational orientation. And we can give them adequate counseling and advices, and they cultivate their potentials for occupational development. Let the students explore various fields of industry, and that would provide them for actual experiences to find their own world.
3. Consumer: Students would get consuming information, cultivate good consuming attitude, when in using materials & tools. The result will bring alive the economic circle, economize manpower. For example, we can teach the students how to wisely buy industrial products and maintain them, and then they would be

a member of good consumers.

4. recreational: The purpose is to cultivate in students various occupational interests, and educate them to participate in constructive recreations, and then obtain the satisfaction of creative life through adequate outlets of sentiment & energy and sustain good habits, use free time well through manual arts, and finally form aesthetic sensitivity through the designing & appreciation of excellent industrial arts products.
5. Cultural: Culture is a term used to describe the distinctive human mode of molding nature to conform to man's desires and goals and the human creations for solving living problems. Today's culture can be called "technology culture". Industrial Arts education is to let the students know the fruit and principles of ancient and modern great scientific techniques, learn the method and procedure for solving problems and the actual applications in life, and finally enable them to take up the great task of acculturation and social reformation in the futrue. It also lets them to understand the deeper level of human technological culture.
6. social: Industrial Arts education enables the students to realize their own role-play in society when they are exposed to the industrial structure from the

learning of technological & industrial knowledge; to appreciate the value of mutual cooperation; and to train their sense of leadership and obedience. They should get to develop reasonable social relation; and use them as basis for adjusting to social circuimstances. At the same time let them know the property of industrial society, know the nature of self-development, self-actualization, and cultivate good social ethics.

From the above paragraph, we find that Industrial Arts education is of general educatoin. It enables the students to know not only industrial civilization, cultural adjustment, but also the mission of technological transmissionn. The following is a further illustration that Industrial Arts education is of general education.

Industrial Arts a phase of general education which serves to familiarize Students with the tools, products, processes and occupations of industry as well as the social and economic phenomena of the technological world in which they live and work sanders painted out:

"Industrial arts will be defined as those phases on qeneral education that deal with industry, its evolution, organization.materials, occupations, processes, and products and with the problems resulting from the industrial and technological nature of society."

Gordon O. Wilber indicaed that the purposes of general

education may be summed up as implying three basic purposes:

1. To transmit a way of life.
2. To improve and reconstruct that way of life.
3. To meet the needs of individuals.

Delmar W. Olson pointed out: Industrial arts education is not vocational education; it is a pre-vocational education because it provides educa-tion for technical, occupational, consumer, recreational, cultural and social functions.

The mission and goals which was indicated by the "Industry & Technology Education project" founded by the technical foundation of America were:

THE MISSION OF EDUCATORS IN OUR PROFESSION IS TO INCREASE EACH PERSON'S ABILITY TO COMPREHEND AND APPLY THE CONCEPTS OF INDUSTRIAL AND TECHNOLOGICAL SYSTEMS.

The study of industry and technology should result in people who (1) adjust to the changing environment, (2) deal with forces that influence the future, and (3) eagerly participate in controlling their own destiny.

Industry and technology education will produce individuals who can participate and adapt to a dynamic industrial and technological society. Consistent with their abilities, interests, and needs, learners will:

1. appreciate the evolution of industry and technology;
2. establish values on the impact of industry and technology and how it alters our environment;
3. develop knowledge and ability to properly use the

tools, techniques, and resources of industrial and technological systems;

4. develop creative solutions to present and future societal problems using technical means;
5. develop human potentials for responsible work, leisure, and citizenship roles in a technological society.

The North Dakota Industrial Arts Curriculum Guide indicated the goals of industrial arts were providing students with an opportunity to:

1. Develop an insight and understanding of industry, its place in our society, and the free enterprise system.
2. Discover and develop individual talents, aptitudes, interests, and potentials as related to industry and technology.
3. Develop an understanding of industrial processes and the practical application of scientific principles.
4. Develop problem-solving and creative abilities involving the materials, processes, and products of industry.
5. Develop an understanding of industrial and technological career opportunities and their requirements and develop those traits which help students obtain and maintain employment.

The result of this form of educaion will be individuals

who can contribute and adapt to a dynamic technological society. Kendall N. Starkweather indicated that consistent with the abilities, interests, and needs of learners, they will.

1. interpret the evolution and relationships of society. industry, and technical means.
2. establish beliefs and values based on the impact of technology and how it alters environments.
3. develop attitudes and abilities in the proper use of tools, techniques, and resources of technical and industrial systems.
4. develop creative solutions to present and future societal problems, using technical means.
5. explore and develop human potentials related to responsible work, leisure, and citizenship roles in a technological society.

Review of the Objectives of Taiwan Industrial Arts Education

Taiwan economic development is on the transition period turning from a developing country toward a developed country. Society is changing. How to improve the quality of industrial arts education in matching with the developing need of national construction is one of the major topics at this critical moment.

There are some originalities in the revised textbooks of this time. For example, in junior high School the past

curriculum structure that centers on the preparation for higher education is changed and from the second school year, in addition to the required courses, there are four elective courses: higher education preparation, practical, vocational and arts to the choice of students. The measure makes the curriculum more flexible, allows the differences of students' interests and ability, coordinate the needs of higher education and vocational preparation, and hopes to reach the goal of healthy national education. Senior high school follows the new programs of " College Entrance Examination", changes its past inflexible teaching, and opens 6 elective courses from the second school year: literature, sociology, math, science, physcial education, and arts, to the choice of students.

In the revised Industrial Arts textbooks of Junior High school, there are many great changes: they not only containt the traditional wood work, metal work, electrical work, drawing, planning, but also add manufacturing industry, construction and life, information industry, graphic communication, audio and visual communication, and energy, etc, all of which appear in the textbooks by the cluster concept.

These changes displayed in the new junior high school Industrial Arts Curriculum following chracteristicts:

1. introduction of new technology;
2. introduction of traditional industries;

3. incorporation of clusters;
4. reinforcement of the function of life education;
5. emphasis of the function of vocational exploration; and
6. co-emphasis of skills, knowledge, and the affective domain

And as to the newly revised senior high school industrial arts curriculum, it has the following changes: it has turned away from the traditional wood work, metal work, electric work, and toward the four basic important technologies: materials, energy, information, and automation as the main teaching mterials. Yang cha'o Hsiang Pointed out its characteristics:

1. introduction of Taiwan major strategic industries;
2. reinforcing of computer related teaching;
3. reinforcing of the teaching of intellectual part; and
4. emphasis of development & research.

From the analysis of the influence of current factors on Taiwan industrial arts education, historic missions of industiral arts education, and the characteristics of new industrial arts theories, we find that industrial arts possesses in fact the characteristics of general education, the functions of technology transmission and career exploration. In order to accomplish the functions and missions of Industrional Arts education, the presentation

of the objectives of Industrial Arts education should reflect the spirit and esence of new materials.

Review of the objectives of industrial arts of middle school and teachers' college according to the junior high school industrial arts curriculum standards issued in 1983, the objectives are:

1. to let the students know Chinese traditional and modern industrial culture and to note the present development and future developing directions of local industries;
2. to give students opportunities for career exploration, then to inspire interests intindustrial skills, and find out the potential students;
3. to cultivate necessary knowledge and skills for every-day living in industrial society;
4. to cultivate the virtue of cooperation, industry, and service; and
5. to cultivate necessary appreciative ability and knowledage, and the habits of using physical and intellectual faculties.

Lo Da Han expressed his viewpoint on the above objectives:

The revised industrial arts textbooks of senier high school are generally based on the present objectives, except for the inclusion of "industrial technology", and the case is all the more obvious in junior high school textbooks. Review of junior high industrial arts textbooks, except for the first

item "to let the students know Chinese traditional and modern industrial culture", the other items center around the cultivation of common sense, skills, working attitudes for individual everyday living, formation of the habits of team work. But the objectives which mean to have the students know the nature of industrial society, form adequate industrial living habits, solve industrial problems, concern the overall influence of technology, development on human society, etc, do not appear in the curriculum contents listed above:

Wang Tso Jung said in "Present Situations of Junior High Industrial Arts Teaching and a Research of the Problems" that according to the survey, ninty ercent of junior high industrial arts teachers thought the following three directions suitable for the general development of the objectives of industrial arts education:

1. introduction of the concept of production, thus enabling the students to realize the structure, organization of industrial production and its related information, and the needs of industrial society and the individual;
2. introduction of the concept of technological development, thus enabling the students to learn the technological environment,have correct ideas to adapt to the impacts of future technological developement on mankind; and

3. introduction of the concept of occupations, thus enabling the students to know the industrial world, develop individual occupational destinations, have correct occupational and career ideas, and a successful vocational life.

Besides, from the revised industrial arts curriculum standards, the objectives of senior high industrial arts are:

1. introduction of industrial technology, and cultivation of industrial arts as to lay the foundation of industrial living and future advanced research on various subjects;
2. inspiring of the interest of designing and creation, presentation of oppurtunities for exploring industrial technology, and encouragement of the spirit of research and invention; and
3. formation of virtuous working habits and attitudes.

The teaching objectives of the revised industrial arts of senior high only presents the introduction of industrial technology, while the cultural meaning of industrial & technological development, the posible impacts of industrial & technological development on society, and the necessary adjusting abilities for the youth are lacking. Therefore it is hard to find the meaning and essence of newly revised senior high industrial arts curriculum.

Summarizing the above literature, I think the major

objectives of middle school industrial arts education should inform the students about "Industrial Technology", and enable them to :

1. learn the knowledge of industry, technology and consumption;
2. possess sufficient abilities to solve industrial and technological problems;
3. adapt to present and future technological living;
4. realize the structure of industrial society, and develop required social relations;
5. cultivate nice occupational arts, virtues, and cultural literacy;
6. know the technological culture in adapting to present & future technological living;
7. know more consuming information, and form good consuming habits;
8. explore career; and
9. apply industrial production processes.

In order to make on overall scheme of the developing directions of deportment of industrial arts (or industrial education) of three Teachers College, and furnish required equipments, Ministry of Education, in Oct., 1983, sent commissioners, experts to the schools to understand their present situations and talked with the concerned executives. After this, they presented their opinion on the cultivation of teachers for vocational clusters:

1. Department of industrial arts of Taiwan Normanal University is suitable for the cultivation of teachers of mechanics, electronical engineering, electrics, and Industrial Arts;
2. Changhua Teachers' College is suitable for the developing of mechanics, and electronical engineering; and
3. Kaohsiung Teachers' College is suitable for that of middle school industrial arts education, and if NKTC means to prepare vocational high school teachers, its present organization and equipments should be reviewed.

From above, we know the chemistry and construction are not included in the covering fields of DIAE of NKTC. These parts should be encouraged to be included. And acccording to college & university curriculums standards issued by Ministry of Education in 1987, the teaching objectives of department of industrial education (DIE) of NKTC are:

1. cultivation of teachers for middle school industrial arts education;
2. cultivation of pre-service teachers' ability & potentials for research and development.

to accomplish these objectives, in teaching DIE of NKTC has to inable the pre-service teachers to:

1. realize the objetives of Industrial Arts eduation;

2. realize the structure of curriculums;
3. be familiar with knowledge and skills for teaching;
4. write teaching plans and apply teaching methods;
5. counsel students; and
6. think, create, and possess the ability to solve problems.

Literature Related to the Devlopment of Curriculum in Industrial Arts Education

In the above paraggraph I have reviewed the plilosophical background of industrial arts education, the influence of current industrial arts educational thinking, and its new essences, missions, objectives. Form these sources, we know industrial arts education cover the field of general education, technoloical culture education, and career education. Therefore the objectives of industrial arts education should reflect the functions and essences of the above three catagories of education. The influence of technology education and career education is on the use of the cluster concepts to design industrial arts curriculums.

Marland ever said: Industrial Arts is one of the major elements for career development. Hence the thinking of career education has greatly influenced industrial arts education, and the most important of all is the application of the cluster concepts in industrial arts eduation. According to the statistics, every american changed six or seven jobs

in his life time.

If the workers just received one industrial trades training in the prepratory stage, they have to receive a new set of training when they changed jobs, but if they received a certern vocational cluster training, the period of training needed for changing of jobs would be shortened because they have gotten basic knowledge & skills applicable to all cluster jobs.

Because of the change of vocational educaion type from industrial trades training to cluster training, the type of industrial arts education is supposed to follow this trend. At present Taiwan middle school industrial arts, though not following up the direction actually, has shown a sign of pursuing on this way.

Besides, because of the rapid growth of technology, which results in the increase of the amount of jobs, of the number of change of jobs, and of the change of professional skills, there appeared the cluster concept in industrial arts education. Though the current of career education resulted in the rise of cluster concept in industrial arts teaching, at the same time owing to the change of skills the industrial arts cluster teaching become necessary.

The rapid change of skills accounted for the rise of new jobs. Some of the old jobs soon passed away. And the number of change of jobs increased. Receiving the cluster vocational exploration, preparation, workers could fit in a short

period of time after changing of fobs. Because the number of jobs increased abundantly and new jobs rose continually, man got more and more trouble in understanding the jobs. jherefore industrial arts education should take the duty of enabling the students to know jobs, explore jobs,and then to make a wise decision on the choice of jobs adequate for them. "cluster" is a kind of concept. A cluster is defined as "a number of things of the same sort gathered or growing together". Used in occupations, it is a vocational cluster; used in industry/technology, it is an industry/tecchnology Cluster.

Donald Maley (1975) states the cluster concepts are good for industrial arts eucation and strong on several points:

1. The cluster concept provides for the important process of awareness as well as the exploration of a variety of occupations.
2. The cluster concept provides for the important process of selfexploration as one engages in a range of experiences associated with a particular cluster area.
3. The cluster concept-whether of the vocational or the guidance-awareness variety-is intended to enable the individual to make effective career decisions.
4. Clustsers in industrial arts programs may be used for general or vocational education purposes.

5. The cluster is actually a form of informantion and skill organization for specific educational purposes.

This study of the construction curriculum model is based on the cluster concept. The structure of designing Industrial Arts curriculum should be based on objectives. What are the objectives that Industrial Arts education should select? According to the last chapter, they are industrial, technological objectives. Following the national policies, this study selects "industrial technology" as objectives. And what is the definition of "industrial technology"? It should be clearly stated first. Many theories pointed out that Industrial Arts education should teach no more knowledge and skills of industrial trades, but pure technology. But at present, Taiwan Industrial Arts education is hard to turn away from the traditional unit industrial jobs to pure technology education as teaching materials. In the meanwhile, there will exist a transition period containing both industrial and technological teaching materials. And this is what is called "industrial technology " which means the wide industrial or specific technology. Following this premiss, the structure of curriculums should base on the industry/technology system as teaching fields. The following is a review of relevant curriculum model of Industrial Arts, the methods, the structure of curriculum, and a review of the defects in the

new industrial arts curriculum designing, and a few personal suggestion.

Curriculum Model

Since 1960, America has developed more than one hundred curriculum projects. Representative of them are

1. American Industry Project (AIP);
2. Industrial Arts Curriculum Project (IACP);
3. Task Analysis Type Project, developed by Robert F. Mager, California and Jerome r. Moss & Brandon B. Smith, Minnesota;
4. Competency Based Type, developed by Resmck, Jelden, Hanham, and Weber;
5. Occupation Clusters Type Project, developed by Pittsburgh, Oregon, and Maryland.

Taiwan Industrial Arts and Vocational curriculum standards of Secondary School issued in 1984 have reflected the influence of the cluster concepts on curriculum projcets. Peng, Ching Yun pointed out in the New Trends in the Industrial Arts Curriculum Projects that the projects of industrial Arts tended toward taking the occupation clusters type. Shemick stated that there were thirty-eight states in U.S.A., which possessed or were developing Industrtial arts curriculum manuals. The contents of these manuals were divided into three fields: (a) industry (38%), (b) industrial and technology (56%), (c) technology (6%).

The curriculum characteristics presented were:

1. industry--traditional unit type curriculums: wood work, metal work, printing, automobiles
2. industry & technology--the classification of curriculums is based on the industry clusters: construction, manufacturing, graphics, enregy and power.
3. technology--the classification of curriculums can be roughly stated as follows when the situation of industrial orientation is not considered: production, communication, transportation, and energy.

The Directions of Curriculum Project

As individuals and groups of industrial arts educators undertook to make revisions in existing programs, four major directions were pursued in the 1960's: (a) Industry as a source of content had been the accepatble model for decades; it seemed logical to extrapolate from the past and move to update existing industry-centered programs (b) As an expanded structure was sought to include the industrial sphere, technology became a logical base; technology could be ordered into taxonomy matrix and studied as a discipline. (c) The individual assumed a high level of priority during the 1960's; as education focused upon individualized innstruction and upon the importance of

individual development for social progress, the individual became a logical focal point for effors in industrial arts program revision. (d) Perhaps the most obvious approach in curriculum improvement is to build directly upon existing programs, modifying them to meet the needs of the times (Househoder, 1979). Briefly each of the four directions will be reviewed to identify their impact on the three cluster vs. four cluster basis for the study of our field.

Peng, Ching Yun stated that from the newly developed Industrial arts curriculum project, we can roughly detect out their general developing trends:

1. The trend moves toward career education. It gives up the traditional division of general and vocational education and develops toward the synthesis of career and life in order to meet the demand of individual economic living and the fouction of self- actualization. This curriculum project is based on career education. But the synthesis of career and life should be overall and meaningful.

2. The trend moves toward individualization. The teaching materials should center on the consideration of the students' ablility and need. Teachers should know the individual needs and presented different studying methods for them.

3. New research directions move toward enabling the students to learn the wholeness of industry, and emphasizing the integral introduction to industry, but not working

methods, materials, tools, and procedures limited.

4. The curriculums tend toward systematization. Every part should be integrated and connected, and the selection of the teaching materials is based on the analysis of the systems.

5. The teaching project tends toward taking occupation clusters type. In the exploring stage, an analysis of the identical parts of techniques and knowledge in the selected occupation clusters is done first, and then raising the level of teaching materials gradually to that of specialized knowledge.

6. The behavior objectives are determined first. They would lead the direction of the teaching. Every activity should be clearly defined, and practical behavior statements. And the evaluation of the teaching effects is dependent on whether the objectives are attained.

7. Stressing exploration & counseling in helping students realize individual competence, attitude, and interest, etc., and providing more exploring experiences in helping them develop suitable career ability.

8. The revised curriculums provide the students with learning experiences for research and development, and the overall ability for solving problems.

9. Stressing the actual operation on science, and techniques, and the function of experiments and trials, thus enabling the students to test individual ideas.

1o. The employment of community sources for people by founding counseling commissions, which would create more oppurtunities for people to take join in activities and to communicate with individual people, and thus keep teaching materials from losing contact with actual industrial conditions.

Methodology of the Industrial Arts Curriculum Project

The curriculum projects shound change with the age, national policies, social need, and the learning objectives. The Contruction curriculum project should coordinate with the trends of industrial arts education, the new curriculum standards, and thus fulfill the aims desired. We should apply cluster models to the facilitate developing projects.

I think we should base the structure of curriculum projects on objectives, organize the materials of the systems of industry/technology systematically, and stress the procedure. Besides, the selection of objectives should be based on sociology, psychology, and philosophy. Having decided the direction of curiculum objectives, we then choose practical learning experiences to achieve the objectives desired, then choose the contents, and finally organize choosed objectives and contents according to the learning theories, and have well-developed curriculums.

In his two publications: " Technology- An Intellectual Descipline " (1964), " Structure and Content Foundation for

Development " (1966), Devore identified four major steps for industrial arts curriculum development:

(1) the establishment of a taxonomy of technology, a content reservior;

(2) identification of basic concepts and principles in the reservior;

(3) preparation of units of instruction;

(4)establishment of course of study grouping by units (Bender 1981)

Devore also stated:

> "the curriculum is the medium through which the aims, purposes and objectives of education are implemented and realized.
>
> The task of curriculum development is not the creation of knowledge but rather the structuring and disseminating of knowledge in the technologies for efficient learning and intelligent use....A curriculum based on organized knowledge fields is better learned and retained than knowledge which is specific and isolated. The discipline structure provides meaningful relation required for efficient learning."

The Industrial Arts Curriculum Project

In order to base the curriculum projects on objectives, we should organize the curriculum systematically.

Industrial Arts education covers a lot of studies: the materials of the cognitive, technical, and affective domain should be all included in every system and curriculum. John M. Ritz stated in Systemtize Curriculum Development for Industrial Education:

"Curriculum development is one of the key factors of a successful industrial education program. A number of recurring structural elements can be identified that are useful in the construction of a curriculum in industrial education. Those who want to develop curriculum should be familiar with the logic and rationale accompanying the curriculum development process."

There was three models for curriculum development presented by Taba(1962) Wright(1973) and Zais(1976) which had the greatest influence. All three models are based on the establishment of foundations, contents, and evaluation procedures (table 2.1)

Table 2.1 Models for curriculum development

Taba	Wright	Zais
1. Diagnosing needs	1. Establishing a basis for the discipline	1. Curriculum foundations
2. Formulating specific objectives	2. Outline the local program	A. Knowledge B. Society C. The Individual D. Learning Theory
3. Selecting Content	3. Establish a basis for each course	2. Anatomy of the curriculum
4. Organizing content	4. Develop each course	A. Aims B. Goals C. Objectives D. Content E. Learning activiti
5. Selecting learning expeniences	5. Prepare teaching plans	F. Evaluation
6. Organizing learning expeniences	6. Implement	
7. Evaluating	7. Evaluate	
8. Checking for balance and sequence		

John M. Ritz, in the paper "systematic Curriculum Development for Industrial Education" indicated the structural elements useful in curriculum development was

Table 2.2 Structural elements useful in curriculum development

1. Curriculum Foundations	C. Unit specifications
A. Definition of the program	1. Unit Goal
B. Rationale for the study of the program area	2. Unit Rationale
C. Content source	3. Unit Objectives
D. Content structure	4. Unit Activities
E. Program aim	5. References
F. Program goals	3. Curriculum Evaluation
2. Curriculum Content	A. Student evaluation
A. Scope	B. Document validation
B. Sequence	

Huan Kuan Hsiang stated in Methodology of curriculum projects that there are 3 curriculum project models: (1) objective model developed by Tyler; (2) process model developed by Stenhourse; and (3) Situational model developed by skilbeck. The objective model emphasizes the "production" of the students' learning; the process model emphasizes the "process" or "involvement"; the situational model could include both the objective model and the process model according to the situations of curriculum projects. The following is a further illustration:

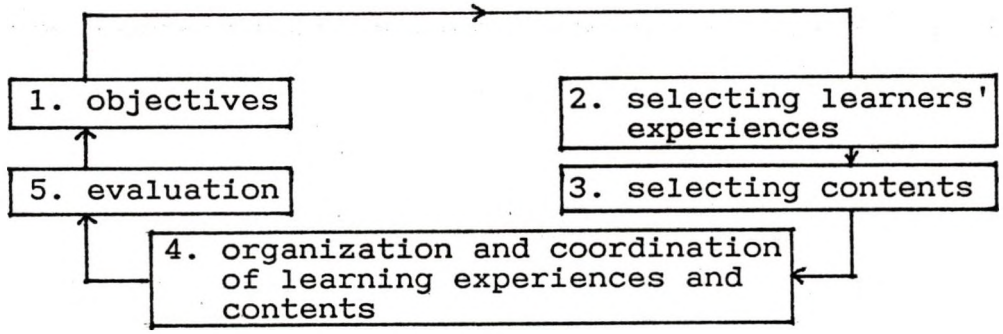
1. The objective model: The representatives are Tyler's linear objective model published in 1949, and Wheeler's circular objective model published in 1967.

   (a) Tyler's linear objective model:

(Figure 2.2.)

Tyler thought to develop objectives out of the learners (development, needs, interests, etc), present social life, nature of subjects, learning psychology, and philosophy or a system of value; then to select the educational experiences that will achieve the objectives; then to organize the selected experiences to be meaningful and facilitate the teachers in teaching and students in learning; finally design evaluational instruments to test the effects of the teaching.

(b) Wheeler's circular objective model: Wheeler revised Tyler's to the circular objective model, enabling the teachers to review and re-design teaching if the results of evaluation fail to achieve objectives desired.



(Figure 2.3.)

2. the process model:

Stenhouse held that if we clearly state the subjects' contents and principles of procedures, then we can design

the curriculums resonably, and do not need to predict and list the results. The materials we select should represent a certain particular knowledge forms containing structure and inner value. The reason for selecting the materials does not lie in the students' behavior that results from the materials, but rather in the degree that reflects the knowledge forms, which need not to be proved externally. From Stenhouse's model, we find his stress is on the process, and the learning materials, not on the prediction of behavior. His stress is on the employing methods and the objectives contained in the activities. The result of learning is not the behavior stated beforehand, but, after learning, we can evaluate the effects by its inner objectives.

3. the situational model:

Skilbeck's situational model has five major elements:

(a) analysis of situations

(b) drawing of objectives

(c) designing of projects

(d) interpretation and practicing

(e) check, evaluation, feedback, and reconstruction

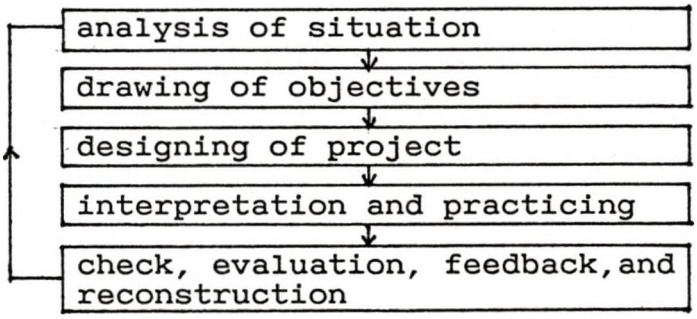


Figure 2.4. Skilbeck's Situational Model

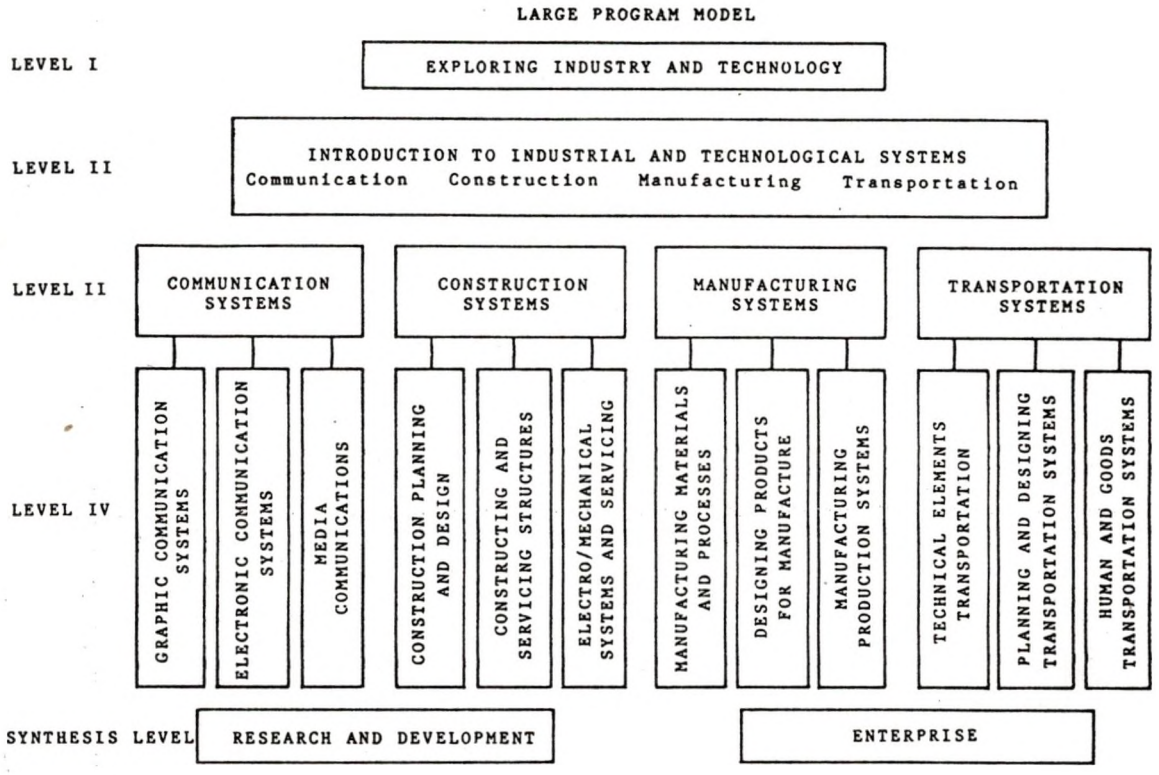
Skilbeck palces curriculum projects on the structure of culture. This model views the projects as a means, by which teachers use to change students' experience through the realization of cultural value, interpretative framework, and symbolic systems. The model stresses the valuational designing process, and the political sense because different pressure parties and ideologies would try to affect the process of cultural transmission.

The participants of the "Industry and Technology Education Project," which was founded by the the "Technical Foundation of America" developed content structures and taxonomies for the four industrial/technological systems: communication, construction, manufacturing, and transportation. Using some assumpations, they developed a series of three model program structures. Each program structure has five common elements:

1. exploring Industry and Technology units
2. introduction to Industrial and Technological systems

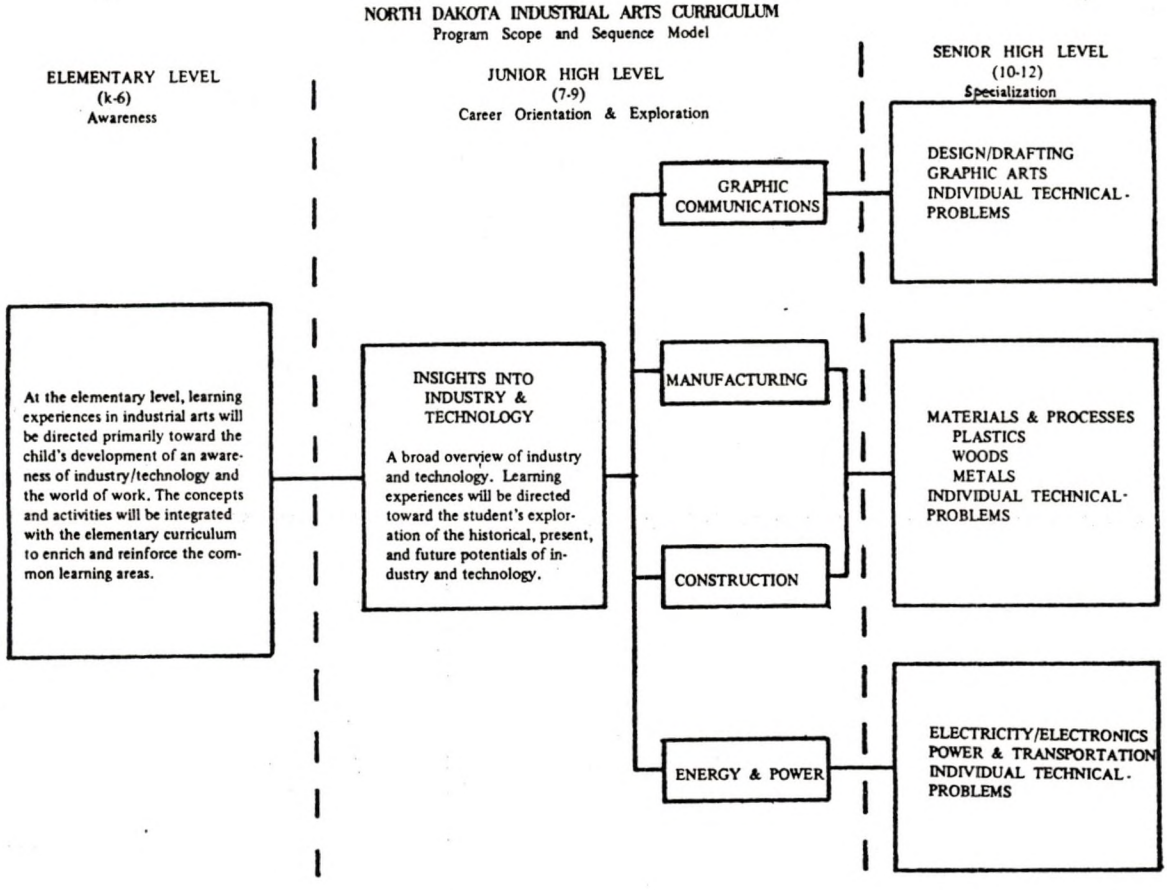
3. communication systems, construction systems, manufacturing systems, trsansportation systems
4. industrial enterprise
5. research and development

We use Large's program model as example. The program structure is given below:



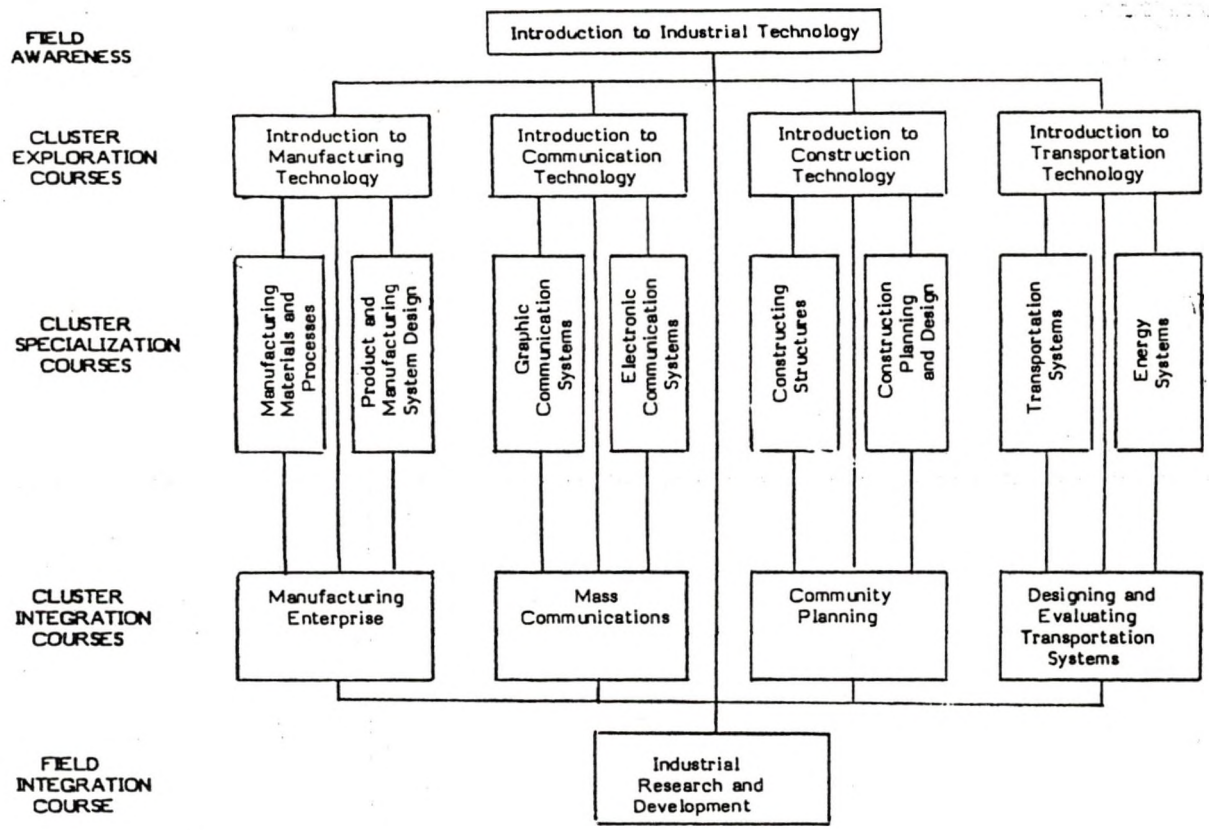
(Figure 2.5.)

Review of Industry Arts curriculum guide of North Dakota, we find the program structure is:



(Figure 2.6.)

Review of the Industrial Technology Education program guide of Indiana, tha program structure is:



(Figure 2.7.)

From the three program structures, we find all of them base their curriculum objectives on industrial technology. Their direction is identical with that of the curricurlum project which this study selects. Besides, review of the structure of Taiwan Junior High Industrial Arts curriculum, we find that it is a mixture of unit and cluster tpyes. And Senior High's takes the materials of important technology which Taiwan is actively engaged in developing. Both levels are connected systematically.

	Junior High Level
grade 7	introduction to industrial arts ; drawing and planning; ceramic work; wood work; plastic work; metal work.
grade 8	wood work; metal work; electrical work; graphic communication; costruction and life.
grade 9	manufacturing industry; information industry; audio and visual communication; energy and power.

	Senior High Level		
grade 10	planning and drawing; material industry; energy industry.	grade 11	information industry; automation .

Figure 2.8. The Industrial Arts Curriculum Standard of Secondary School in Taiwan, R.O.C.

Review of the curriculum structure of DIE of NKTC shows that its curriculums are not developed completely according to the objectives stated by Ministry of Education, and do not contain all of the four technology systems, either. Particularly the "Construction" course, which this study is concerned with, is not presented with the Cluster type, but is an isolated unit course, and takes four hours a week for one semester. Therefore it can not cover broadly knouledge and techniques of construction industry / technology systems. In fact this is a flaw. The curriculum structure is shown as follows:

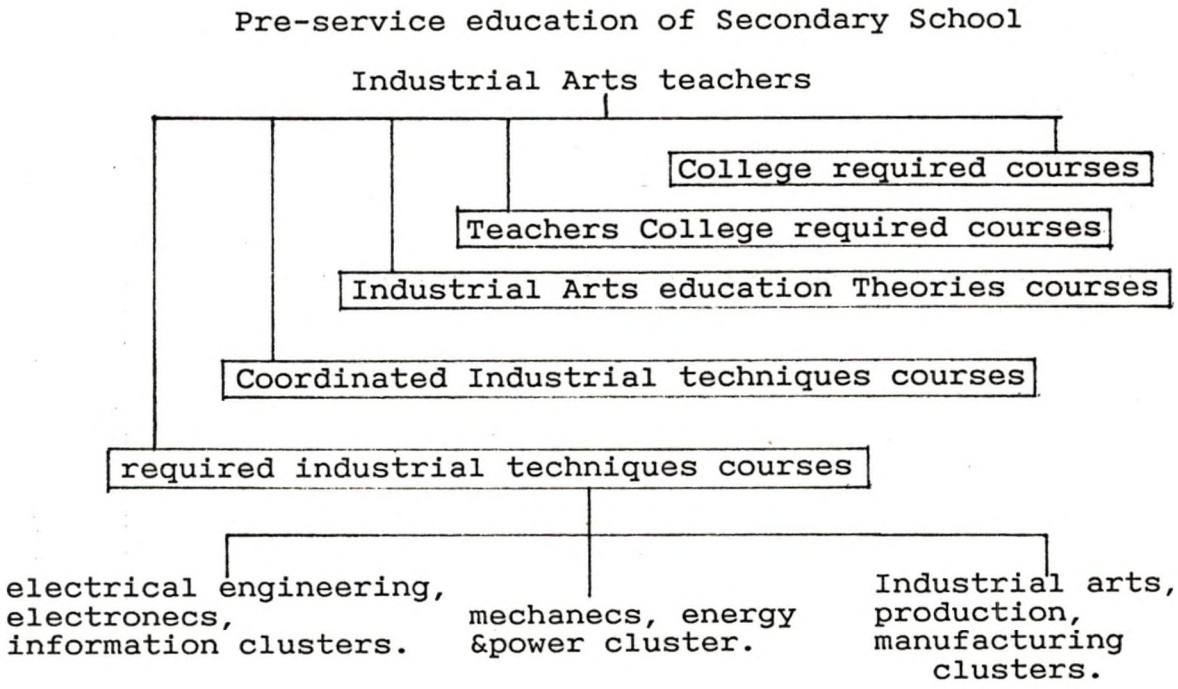


Figure 2.9 The curriculum structure of DIE of NKTC.

Literature Related to the Development of Construction System in Industrial Arts Education

The purpose of teaching Construction industry / technology in the Industrial Arts education system is to provide students with the broad context of the construction industry, the broad concept of construction tech, and career exploration related to Construction, the oppurtunities to learn and practice Construction management, Construction design & drafting, Construction and service, etc. The "Industry and Technology Education" curriculum guide states that the learning of Construction industry / technology system should include all of the key elements associated with designing, planning, and constructing a structure on-site.

The principal purpose of each course is to provide a means for students to learn the major concepts associated with a variety of construction types. These include commercial and residential buildings, bridges and pipelines. The emphasis is on hands-on activities using construction tools and materials. In addition, emphasis has been placed on the relationships between the management and production elements as an integral part of a complete construction system.

North Dakota Industrial Arts Curriculum Guide indicated the primary objectives of Construction Technology are to:

a. Place Construction Technology in the broad context of industrial technology.

b. Provide selected Construction Technology activities for the development of attitudes, appreciation, and under-standing in an introduction to construction, pre-construction, construction, and post-construction.

c. Develop an awareness of self-realization and generate self-activating behaviors.

d. Develop an understanding of construction activities and the tools and materials utilized in their constructio

e. Relate the activities of construction technology to local, state, and national developlments.

f. Utilize knowledge of past, present and future techniques outside the classroom.

Allen, Katheryn R. indicated the concepts and techniques Related to construction Technology could provide the student to:

a. analyze those processes involved in selecting and acquiring a construction site;

b. design and construct a foundation, floor, wall, celling, and roof;

c. research prefabricated systems;

d. participate in electrical systems installation activities;

e. practice simple plumbing techniques;

f. practice trimming and finishing techniques;

g. explore remolding procedurers;

h. practice basic masonry techniques;

i.discuss contracting and subcontracting practices;

j. develop a basic knowledge of landscaping;

k. research new construction materials and methods;

l. explore energy conservation principles involved in construction;

m. explore techniques and processes used in automated production systems; and

n. research the recycling of construction materials.

The Contents area of Construction Course

The selection of curriculum contents within the system of Construction industry / tech. is generally based on content bases. Industry is an institution within society, an economic entity, a social structure, a transforming way (input, process, output), and the major technological elements include social structure and techniques. As Devore pointed out that the elements of techniques include sources, materials, energy, power, tools, machines, skills, information, maintenance, managerial environment, ideological systems, human considerations, and thinking process etc.

Careful review of related literature, we find the following types of division of the contents of the construction curriculum.

The Construction Catagories Classified by the Construction Process:

Careful review of related literature, we find that a majority of curriculum contents are selected according to "process". There are some differences in the details or parts, but the major elements rest on the category of the "process" type. For example, the taxonometric structure of Construction Technology curriculum guide of North Dakota:

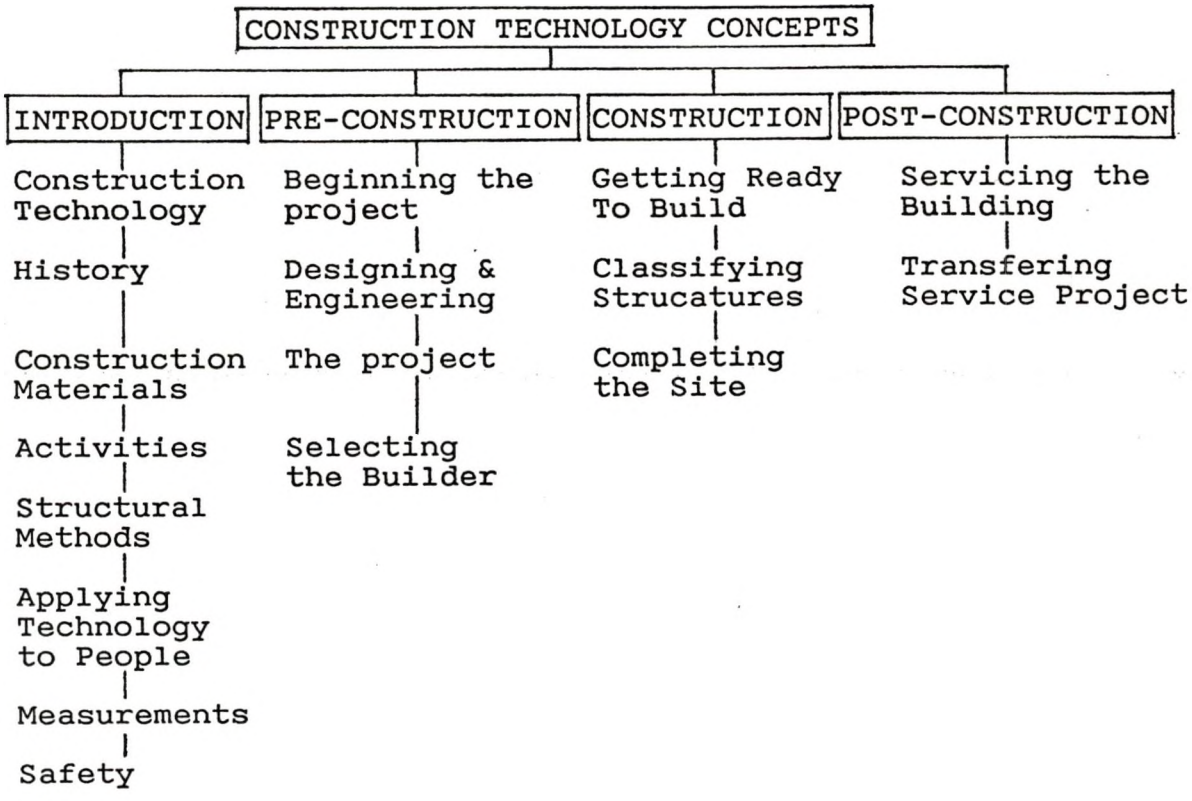


Figure 2.10. North Dakota Texonometric Structure of Construction Technology Cluster

The taxonometric Structure of the Construction course of the "United States mational Lndustrial Arts Curriculum Guide" is as follows:

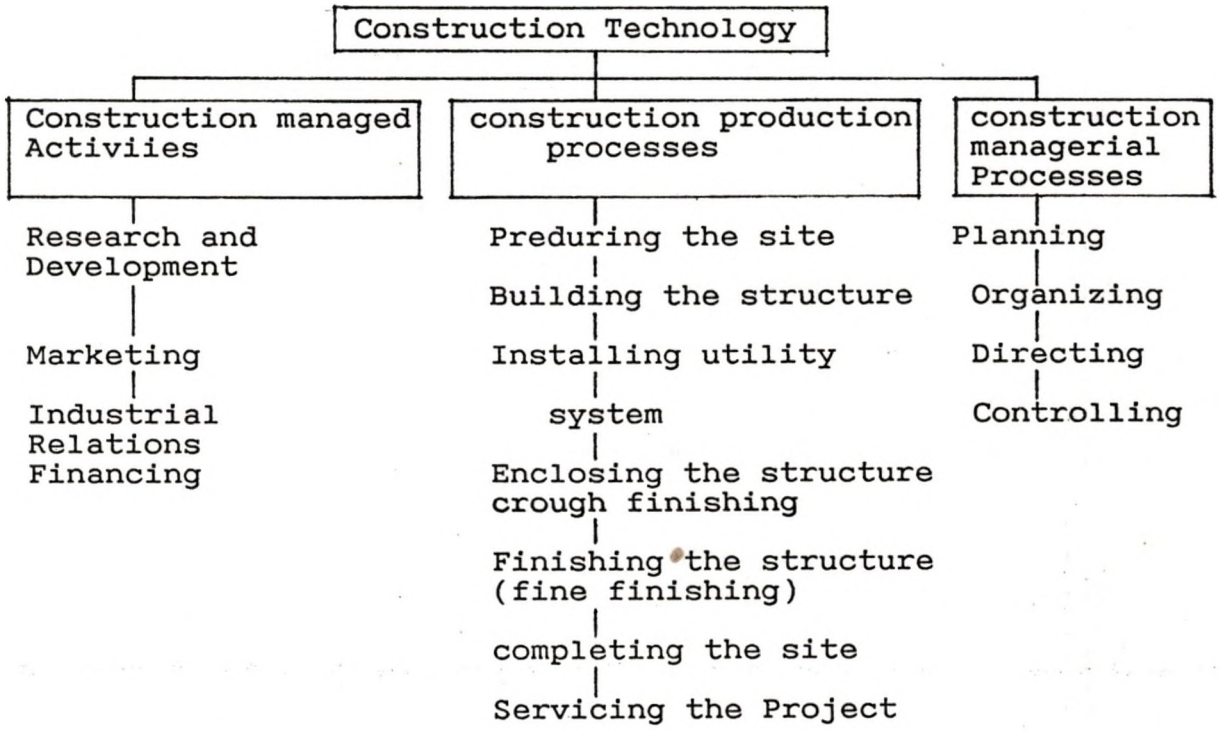


Figure 2.11. The Texonometric Strucure of the Construction Technology of " United States National Industrial Arts Curriculum Guide "

The Construction Catagories Classified by THE construction career field:

Review of the contents of "Construction" by the Construction career field Construction should provide the following basic knowledge and concepts of techniques of the career field, enabling the students the opportunities to explore the career related to construction.

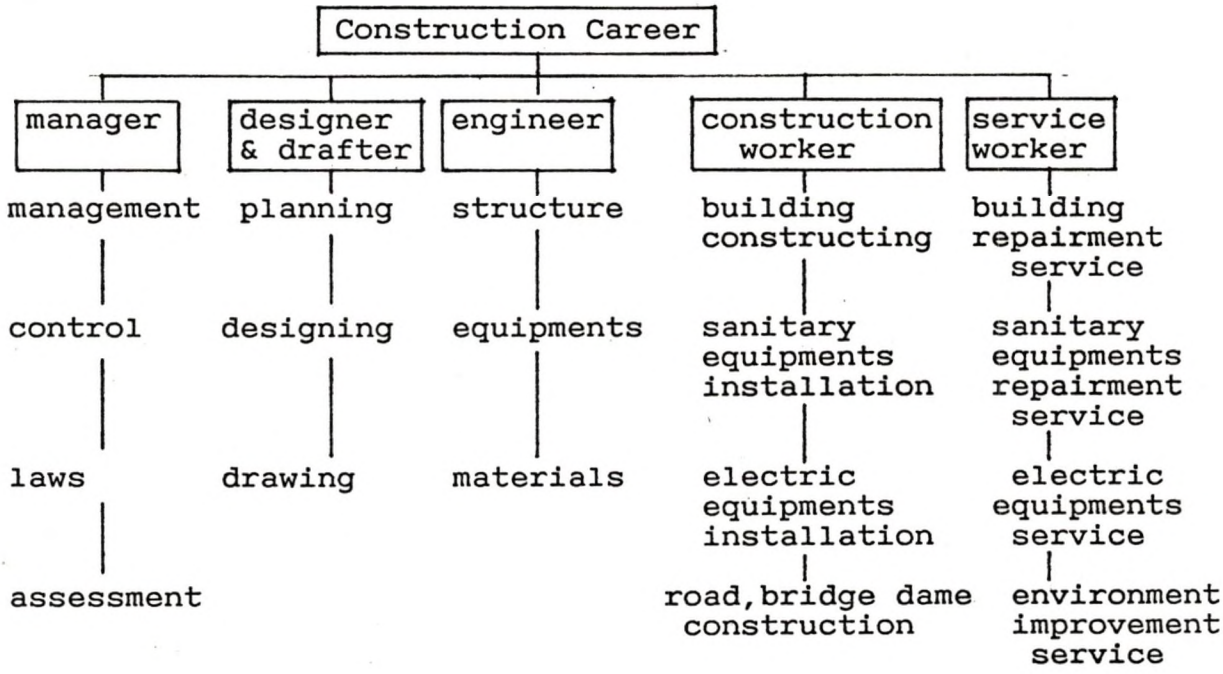


Figure 2.12. The concepts of construction career field

The Construction Catagories Classified by Construction Elements:

a. air conditioning

b. carpentry

c. communications

d. decoration

e. earth moving

f. electrical

g. flooring

h. furnishings

i. heating

j. masonry

k. lighting

l. refrigeration

m. roofing

n. sanitation

o. structures

p. transportation

Besides, Ernest Savage and Mark Morris presented a systematical curriculum model. The model points out:

Each of the industrial technology systems may be studied by following a hierarchical model that would include the following content areas, which are a modificationc and expansion of Mccrory's (1980) model. These content areas are presented in order for the purpose of course development: (a) society and culture, (b) environment, (c) research and development, (d) tools, (e) resources, (f) techniques, (g) maintenanec, and (h) management.

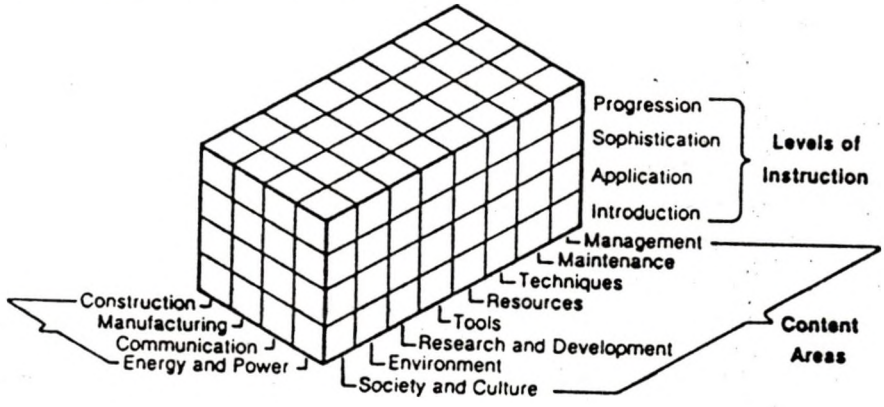


Figure 2.13 First-Generation Technology Systems Matrix.

Besides, the major courses of the construction departments in vocation high Schools, taiwan are:

a.History of Architecture and construction.

b.Construction Material

c.Equipment (construction Mechanical & Electrical)

d.Cost asserrmet

e.Structural Systems

f.Mechanics

g.Management

h.Survey

i.Construction Process

j.Planing & Designing

k.Construction laws

Genereally, architectures under construction include the items: structure construction, sanitary equipments installation, electric equipments installation, and environment construction A furuther detail follows:

a.earthmoving

b.structure

c.woodwork

d.waterproof work

e.cement & concrete work

f.metal work

g.glass work

h.painting

i.sanitary equipment

j.piping

k.plumbing

---

l.outdoor wiring

m.inteior wiring

n.power equipment

---

o.road construction

p.enviroment construction

Summarizing the above analysis, We conclude that the major field of construction curriculum contents is: introduction of construction tech. & construction management, Construciton Designing and drafting, construction process, and construction service.

The reason for my concluding like this lies in its wide covering of 1.the major courses of the construction departments; 2.the field of the construction career, and 3.the principles of the systems of curriculum projects, which include the major construction processes. Based on these, an examplary construction course structure of DIE of NKTC is:

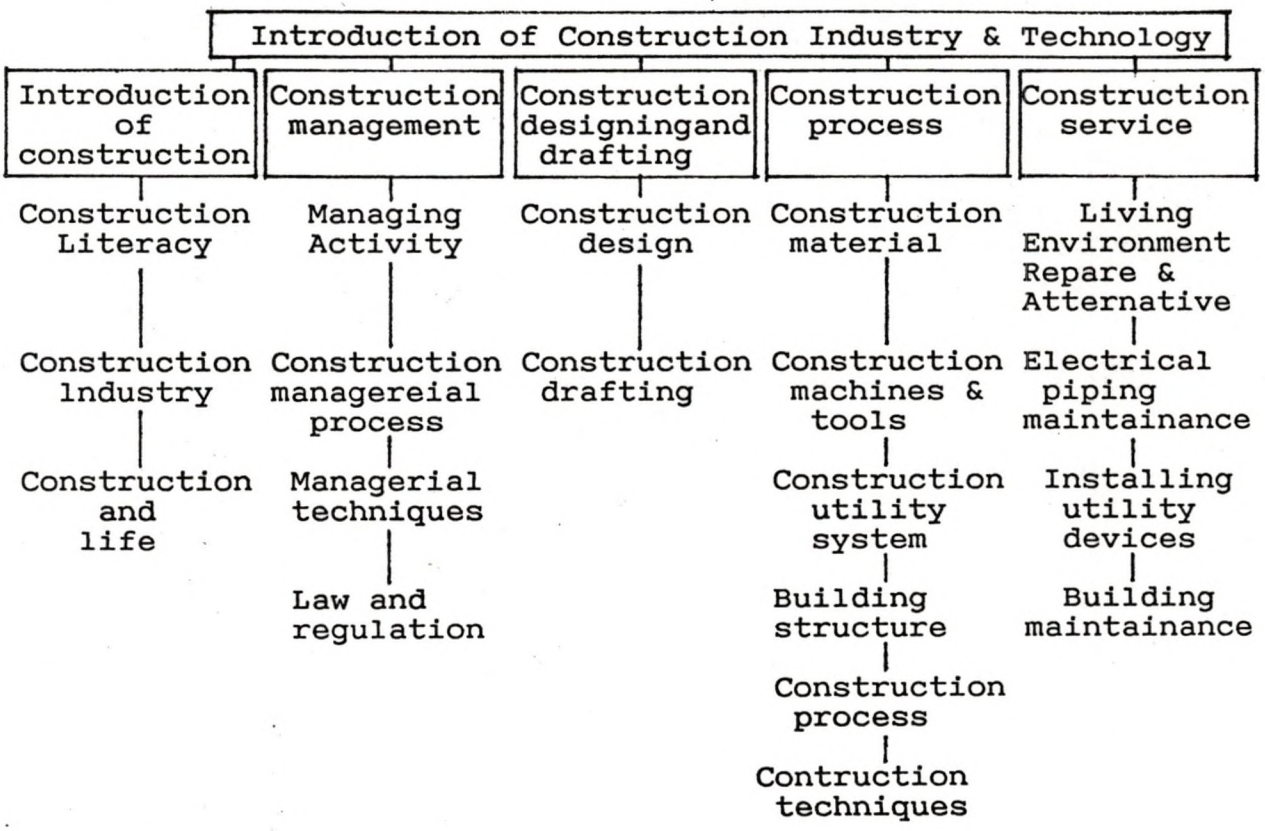


Figure 2.14. An examplary construction course structure of DIE, NKTC

In order to match with the present teaching perids and materials of junior high "Construction & Life" course, I have made a questionaire concerring the above curriculum contents, and use it as a basis for arranging the contents of construction curriculum.

Review of the course contents of "Construction & life" Of Taiwan junior high industrial arts

Review of the new part "Construction & life" in newly published junior high industrial arts:

Information Part

a. The contribution of construction to living.

b. Introduction to construction engineering.

c. Introduction to the procedure of building house: design, building, saling and service, etc..

d. Introduction to construction materials.

e. Landscaping residential environments.

Lab (Learning Activities)

a. The application and maintenance of plumbing system: to replace faucet and clean u-shape pipe, etc..

b. Finishing and painting

c. Mixture of concrete and low to work.

d. Repair doors and windows.

e. The maintenance of furniture.

Analyzing the contents, We find the following shortcomings;

1. inconclusive in contents;
2. lack of the cluster concepts in organizing the curriculums;
3. no group project in the part of activity;
4. difficult of practicing the activities; and
5. no information of the traits of local constructional industrial culture.

In order to do well with the teaching of "Construction & life", We have to improve the flaws, and present certain

measures or cooperative methods to fulfill the spirit of revised curriculum standards. The following are some problems that will probably happen in the actual class situations:

1. insufficient ability of the teacherr to teach the course;
2. need of improving teaching methods and teching materials;
3. need of installing required equipments;
4. need of improving teaching environment;
5. need of the academic support; and
6. need of reinforcing the training of Industrial Arts teachers.

These problems will not only happen in the actual teaching of "Construction & Life", but also happen in the teaching of hall new curriculums.

Problems occured in The Teaching of New Industrial Arts curriculums Vs construction & life course in junior high schools.

In order to match with the new curriculum, Yang Cha'o Hsiang urged junior high industrial arts teachers to do the following:

1. participation in in-service education;
2. collection of related sources;
3. self-affirmation;
4. improvement of teaching methods:
   a. emphsasis of teaching process, but not over-emphasis of teaching results;

b. flexible teaching materials;

c. co-emphasis of activities and effects;

d. coordination of techniques and arts;

e. coordination of teachers' background and students' needs;

f. coordination with the teaching of other subjects; and

g. coordination with the Counseling Section.

As to the senior high teachers, Yang said:

1. identification with the spirit of new curriculums;
2. collection of teaching materials;
3. flexible use of various teaching methods;
4. emphasis of the function of career exploration;
5. coordination with the teaching of other subjects; and
6. encouraging students' sensibility toward good and bad industrial effects

Insufficient Ability of the Teachers to Teach the Course

Most of the Industrial Arts teachers are not graduated from the Industrial Arts departments or relative departments. The actual case will be shown in the analysis of questionaire (chapter IV).

Predictably, these teachers lack of specialized knowledge and skills would get trouble in teaching "Construction & Life". At the same time, their teaching methods would be

insufficient for teaching it.

Need of Improving Teaching Methods and Teaching Materials

Yang Cha'o Hsiang said that in order to match with the teaching of new Industrial Arts curriculum standards, the curriculum project-drawing unit made the following suggestions to "the improving of teaching methods and teaching material":

1. writing of textbooks
2. development of unit teaching
3. structure of textbooks:
   a. Security and sanitariness of the working place of Industrial Arts in Junior High School;
   b. security and sanitaniness manuals for the working places in Secondary School;
   c. teaching materials of rural arts;
   d. maunals for using and making media;
   e. security watchwords; and
   f. Industrial Arts teaching media.

And Wang Tso Jang said in "Present Situations of Junior High Industrial Arts Teaching and a Research of its Problems":

Industrial Arts teaching is the means for achieving the objectives of Industrial Arts education because teaching is developed and designed out of the objectives. Industrial Arts teachers commonly use "lecture" or "illustration" as teaching methods, telling students how to use tools, machines, and the excercise of Industrial Arts. Many

teachers overemphasize the training of skills and neglect the overall objectives of Industrial Arts education. Therefore the teaching materials of Industrial Arts and teaching methods should be improved from the following things:

1. establishing the research & development center of Industrial Arts teaching sources;
2. expanding teaching materials of Industrial Arts;
3. flexibly using teaching methods of Industrial Arts; and
4. changing the type of Industrial Arts teaching.

Need of Installing Required Equipments

Because of the great differences between old and new curriculums in teaching and items, the present Industrial Arts equipment need to be installed and furnished with new equipments, except for the part capable of being still used. To match with the new curriculum standands, Yang cha'o Hsiang said: there are some new items in the new curriculums such as information, pottery and procelain, graphic communication, plastsics, and construction. Therefore installing new equipments is unavoidable. And in the 6-year middle school education plan, the central government and the local government have budgeted a large sum to support the schools in improving the quality of middle school education. As to the teaching items of middle school industrial arts education, the government has begun to make

programs support schools in buying new equipment.

And Wang Tso Jung suggested in "Present Situations of Junior High Industrial Arts Teaching and a Research of its Problems" that junior high schools should install required equipment. He suggested:

1. to submit "Central-Supported Installing of Industrial Arts Equipment of Junior High Program," enabling schools to furnish working places with tools, machines, etc gradually and annually.
2. to form "Maintenance of Industrial Arts Teaching Equipment Association" by the teachers from various vocational & mechanic schools or by teachers from DIE of Taiwan Normal University, Changhua Teachers' College, and Kaohsiung Teachers' College to do the maintenance locally, and increase the rate of using Industnal Arts equipment and the teaching effects.

Need of Improving Teaching Environment

Wang Tso Jung said in "Present Situations of Junior High Industrial Arts Teaching and a Research of its Problems" that present junior high teaching environment needs improving. He suggested:

1. the teaching periods of junior high industrial arts teachers should be cut down to 16 hours a week as Lab (learning activities) teachers in

vocational high schools;

2. the system of assisstants of technian-teacher should be established;
3. group teaching or cooperation teaching method should be adopted to fully use the Industrial Arts Lab, decrease the number of student in the Lab, and so get better teaching effects;
4. security measures and security education should be reinfocred;
5. to raise the practicing materials fee, regulate rigidly the school budget for the use of Industrial Arts, and set a definite sum of money exclusively for the use of industrial arts teaching;
6. To hold industrial arts education seminars, and invite junior high school masters and relative executives to the seminars, enabling them to know the objectives and functions of modern industrial arts education;
7. to use various public media to make the executives, school masters, and the public know the meaning and function of industrial arts and then solicit support and sponsor from them in promoting industrial arts education.

Need of Academic Support

Industrial Arts is a subject, which consumes a lot of materials, needs a lot of equipment, and an independent classroom. It not only requires devotion of teachers, but also needs the support of executives. Because of the predominance of the influnce of Joint Entrance Examinations. and the neglect of executives, their support is felt to be insufficient. Therefore, Department of Education of Taiwan Provincial Government divided the province into 19 districts, in each of which a model school was set up to help the teaching of neighboring schools.

Besides, Bureau of Education in counties founded " Industrial Arts Education Counsiling Groups", responsible for the direction and promotion of industrial arts teaching of junior high.

Need of Reinforcing the Training of Industrial Arts Teachers

1. pre-service education: In order to provide excellent industrial arts teachers for schools, DIA of National Taiwan Normal University (NTNU) was established in 1972, and worked with NKTC to cultivate industrial arts teachers. The senior & junior high industrial arts curriculums were rrevised, so industrial arts of Teachers colleges and the course contents should be revised, enabling Industrial Arts pre-service teachers to

possess the compentecy to do teaching in future.

2. In-Service education: In order to enable the in-service teachers to possess the competency to teach Industrial Arts, Ministry of Education, and Bureau of Education of Taiwan Povincial Government entrusted NTNU and NKTC to hold training. It is hoped that the short-termed training would enable the industrial arts teachers to possess a deeper understanding of the curriculums.

And the held training includes:

1. long-termed training: The training is for those teachers who have registered as industrial arts teachers, and were graduated from relative departments, but did not receive special training of industriall arts. DIA of NTNU was responsible for it. Every term lasts for 3 weeks. The purpose is to increase the competency of the teachers and the understanding of the courses. Up to now, there has been held for 3 terms, 6 classes, and 150 or so teachers took it. The result is good.
2. short-termed training: The training is for the new teachers to increase competency and understanding of certain items in the curriculums. Every term lasts for 2 weeks. Some

were held during the semester; some in summer session. Changhua Teachers College, NKTC, and NTNU were responsible for it. The classes include: information, pottery and procelain, production, energy & power, plastics, graphic communication, etc.

After review the problems which would occured in the teaching of new industrial arts curriculums Vs construction & life course in junior high schools.

I designed a questionaire and the respondents were junior high industrial arts teachers. The purpose was to find the possible problems existed in the teaching of new "construction & life" course. The details of the questionaire would be shown in Chapter IV.

CHAPTER III

METHOD AND PROCEDURES

The purpose of this study is to match with the new currculum standards of Industrial arts. In order to well prepare for the implementation of the "construction and life" course in junior high school. The construction course teaching in pre-sevice and in-service teacher's education of Industrial Arts must be well done. In order to make sure the "construction"course be well done, an ideal model of the construction course is necessary.

The key elements of developing the "construction" course model are: coordinating with the objectives and the length of the course. Choosing adquate contant and learning activities to make sure that the course model can fit with the in-service program, the education needs of the industrial arts teachers in junior high school and the current status of the teaching of "construction and life" must be well understood.

In order to decide the course contents and its rank order objectively, a survey questionnaire was desighed to collet data from the chiefs of the construction departments of the vocational high schools. And another questionnaire was designed to collect the data of the current industrial arts teachers' education needs and the current status in

teaching the "construction and life" course.

Procedure

When developing a construction course model for the Industrial Arts Education departments, I personally think that it should conform to the theories of the Industrial Arts education and the principles of the course development. The elements which will be included in the course development are: (1) Title (2) Description (3) Objectives; (4) Content; (5) Representative learning Activities.

Therefore the procedure of this study is: first to review the literature about the theories of Industrial Arts education and the principles of curriculum development of Industrial Technology, then develop a content taxonomic on the basis of the related program model of the construction course and certain knowledge base of construction. In order to decide the rank order of the contents, a questionnaire based on the above content texonomic. The respondents of the questionnaire were the Chiefs of the construction departments in vocational high school. Besides, in order to identify the education needs and the problems which may exist in the process of implementation of the "construction and life" course. And the other questionnaire was designed to the current junior high industrial arts teachers. The steps of accomplishing the survey instruments are:

1. identification of the population to be surveyed
2. development of the questionnaire
3. collection of data
4. analysis of data

The Charts of the procedure of this study were showed as follows (Fig 3.1)

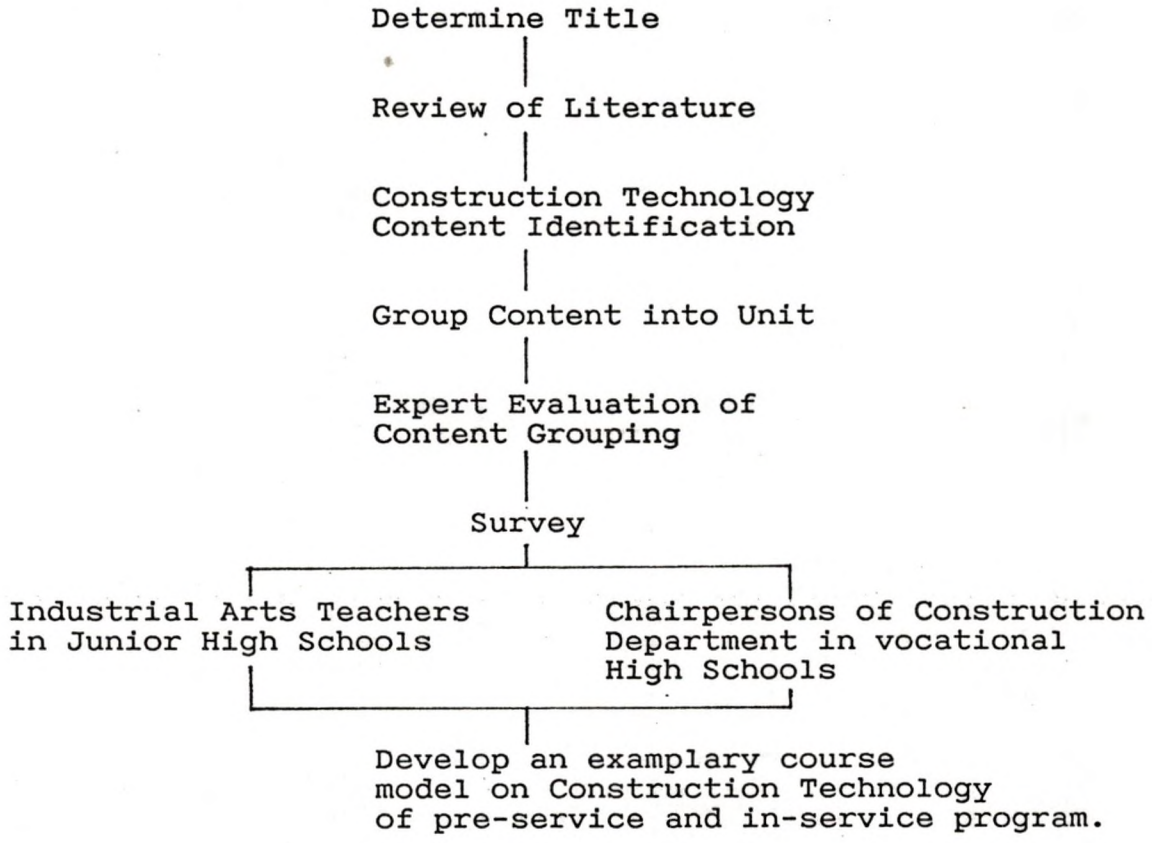


Figure 3.1 The Research process

POPULATION

In order to decide what contents should be taught in the "construction" course in Industrial Arts Education Department, Kaohsiung teachers college, Taiwan R.O.C., we designed the first questionnaire. The populations of this questionnaire were selected from the "Industrial and Vocational Education Publication". The number of the population is 43. They all are the chiefs of the construction departments in vocational high schools. The reson we choose them as a population was:

1. They are professioner
2. They understand the principles of curriculum plan.
3. They are concerned with the implementation of "construction and life" course in junior high schools

In order to identify the education needs and the problems which may exist in the process of implementation of the "construction and life" course, we designed the second questionnaire, and select 245 junior high industrial arts teachers in Taiwan as the populations taken from the Industrial And Vocational Education Publication".

Questionnaire

There are two questionnaires designed to elicit the information for this study.

The first questionnaire was designed to get information from Industrial Arts teachers in junior high schools. The data that we expect to collect are:

1. The education background of current Industrial Arts teachers in junior high schools.
2. The teaching methods that the junior high school teachers preferred to use.
3. The possibility of receiving adequate academic support for teaching "Construction and Life" course.
4. The current physical facilities for teaching "Construction and Life" course.
5. The teachers personnel limits in teaching "Construction and Life" course.
6. The grading criteria that the teachers preferred to use in teaching "Construction and Life" course.
7. The attitude in participating in-service training for preparation to teach "Construction and life" course.
8. The kinds of in-service teacher education activities the teachers preferred.

The second questionnaire was designed to get information from the chairpersons of Construction department in vocational high schools. The data we expect to collect

are what contents should be taught in the industrial arts department, Kaohsiung Teachers' College. The content was grouped into Units and included in the following categories:

1. Introduction of Donstruction Technology.
2. Construction Management and Plan.
3. Construction Design and Drawing.
4. Construction process.
5. Construction Service.

The data that we expect to collect in this questionnaire are:

1. The rank order of the above five content areas.
2. The rank order of the units of the "Introduction of Construction Technology" content area.
3. The rank order of the units of the "construction management" content area.
4. The rank order of the units of the "construction Design" content area.
5. The rank order of the units of the "construction process" content area.
6. The rank order of the units of the "construction services" content area.

The content of this two questionnaires were concluded with and evaluated by Dr. Myron Bender, chairperson of Industrial Technology Department, UND, and by Dr. Cheng-Chun Lin, Chairperson of Industrial Education Department, Kaohsiung Teachers' college, Taiwan, R.O.C.

Collection of Data

The next step in this study was to collect the data. The two questionnaires were mailed to the respondents on November 21. 1985 at the same time.

A letter of explanation accompanied each questionnaire emphasize the nature of the study and the importance of obtaining a high percentage of response. A self-addressed , stamped envelope was enclosed in the mailing to the population.

The final date for acceptance of data was December 20, 1985.

Fifty-five survey instrument were posted to the chairpersons of the construction related departments of vocational high schools, among those 43 or 79% mailed back. And 313 survey instrument were posted to the industrial Arts teachers of junior high schools, among those 245 or 78% mailed back.

Analysis of data

After receiving and reviewing the data, the data were prepared for statistical analysis. The percentage of the population which returned their questionnaires should be counted. An explanation on the returned questionnaires should be mentioned too.

The data were recorded on coding forms by the researchers at the computer center of NKTC and the computer program "SPSS" (Statistical Package for the Social Sciences) was used to analyze the data.

The frequency and mean are the main descriptive statistics; they are used to indicate the average score and the variability of scores for the sample.

CHAPTER IV

FINDING

The Data Presentation of the First Survey Instrument

The data which we want to collect from the first questionaire were the education background, the teaching environment, the teaching methods, the teaching ability, the qrading criteria and the attitude to aocept the in-service education which the current junior high industrial arts teachers held.

The education background of current Junior High School Industrial Arts Teachers in Taiwan

Item one in the survey instrument is used to request information about the educational level of junior high School industrial arts teachers. In reference to the highest degree earned, information on table 1 reflects that only ninety-nine or 40.4 percent of the respondents were degreed teachers. The number of non-degree industrial arts teachers was ralatively high, with 59.6 percen teaching with less than the bachelor's degree, And none of the participants in this study who had answered earned a degree higher than the bachelor's.

Table 1

Degrees held by junior high school industrial arts teachers in Taiwan

Degree	number	Percent
master's	0	0
Bachelor's	99	40.4
Less than Bachelor's	146	59.6

*245 study respondents.

The second item of the survey instrument is used to collect the data of the distribution of the graduated department of the respondents. According to the analysis data, Among 245 respondents there are 70 or 28.6 percent of the respondents who graduated from the industrial arts or industrial education department; 41 or 16.7 percont of the respondents who graduated from the construction department and among those, there are 6 who got the bachelor degree. 35 who graduated from junior collage. And the number of respondents who graduated from other unrelated departments compromise 134 or 54.7 percent is relatively high.

Table 2

The majors held by the junior high school industrial arts teachers.

Value Label	Value	Frequency	Percent
IND ED	1	70	28.6
CONS COL	2	6	2.4
CON JUN	3	35	14.3
OTHERS	4	134	54.7
	TOTAL	245	100.0

The teaching methods that the iunior high school industrial arts teachers prefered to use

The teaching methods used in industrial arts education included lecture, Presentation, learning activities, and field trip etc. Among these methods which one do the teachers prefer was showed in the following 4 tables.

Table 3 shows that there are 175 or 76.4 percent of the respondents who are going to use the "lecture" approach as teaching methed, And there are 66 or 26.9 peront of respondents who are not going to use it. The other 4 or 1.6 percent of the respondents did not answer this question.

Table 3

The choosing tendency of the teaching method-lecture

Value Label	Value	Frequency	Percent
	0	4	1.6
YES	1	175	71.4
NO	2	66	26.9
	TOTAL	245	100.0

Table 4 shows that there are 166 or 67.8 percent of the respondents who are going to use the"presentation" approach as teaching method. And there are 76 or 31 percent of respondents who are not going to use it. The other 3 or 1.2 percent of respondents did not answer this question.

Table 4

The choosing tendency of the teaching method-presentation

Value Label	Value	Frequency	Percent
	0	3	1.2
YES	1	166	67.8
NO	2	76	31.0
	TOTAL	245	100.0

Table 5 Shows that there are 173 or 70.6 percent of the respondents who are going to use the "iearning activities" aprroach as teaching method. And there are 70 or 28.6 percent of respondents who are not going to use it. The other 2 or 0.8 percent of repondents did not answner this question.

Table 5

The choosing tendency of the teaching method-learning activities.

Value Label	Value	Frequency	Percent
	0	2	.8
YES	1	173	70.6
NO	2	70	28.6
	TOTAL	245	100.0

Table 6 Shows that there are 181 or 73.9 percent of the respondents who are going to use the "field trip" approach as teaching method. And there are 60 or 24.5 percent of respondents who are not going to use it. The other 4 or 1.6 percent of respondents did not answer this question.

Table 6

The choosing tendency of chosing the teaching method-field trip.

Value Lable	Value	Freequency	percent
	0	4	1.6
YES	1	181	73.9
NO	2	60	24.5
	TOTAL	245	100.0

From Table 3 to Table 6, the data indicated that the "field trip" approach was the most popular way to which the respondents prefer. All the four approaches are relatively popular. The percent of the respondents was from 67.8 to

73.9.

The possibility of receiving adequate academic support for teaching the "construction and life" course.

At the beginning of the implementation of the new "construction and life" course, the teachers should receive adequate academic support in order to expand the Lab; equipments, and tools. The "construction and life" is a new course. So a new construction lab should be elected.

TAble 7 shows that there are 151 or 61.6 percent of the respondents were confident that they will receive the academic support. And there are 84 or 34.3 percent of respondents who did not have confidence. The other 10 persons did not answer this question.

Table 7

The possibility of receiving adequate acadmic support.

Value Label	Value	Frequency	Percent
	0	10	4.1
YES	1	151	61.6
NO	2	84	34.3
	TOTAL	245	100.0

The current phisical facilities for teaching the "construction and life" course

Table 8 shows that there are 216 or 88.2 percent of the respondent confirm that the current phisical facilities of their schools are not sufficient for teaching the new

"construction and life" course. Only 27 or 11 porcent of the respondents fell adquate of their current plisical facilities. The other 2 persons did not answer this question.

Table 8

Analysis of the status of the current phisical facilities of industrial arts lab in junior high schools

Value Label	Value	Frequency	Percent
	0	2	.8
YES	1	27	11.0
NO	2	216	88.2
	TOTAL	245	100.0

The teachers personnel limits in teaching the "construction and life" course

Table 9 shows that there are 193 or 78.8 percent of the respondents confirm that lack of "construction knowledge" was one of their limits in teaching the "construction and life" course. And there are 49 or 20 percent of the respondents confirm that they did not feel shortage about the "construction knowledge". Most of them 41 of 49, are construction major. The other 3 persons did not answer this question.

Table 9

The "construction knowledge" which is held by the current industrial arts teachers.

Value Lable	Value	Frequesncy	Percent
	0	3	1.2
YES	1	193	78.8
NO	2	49	20.0
	TOTAL	245	100.0

Table 10 shows that there are 199 or 81.2 percent of the respondents confirm that lack of "construction technique" was one of their limits in teaching the "construction and life" course. And there are 43 or 17.6 percent of the respondents confirm that they did not feel shortage about the "construction technique". The other 3 persons did not answer this question.

Table 10

The "construction techniqne" which is held by the current industrial arts teachers.

Value Label	Value	Frequency	Percent
	0	3	1.2
YES	1	199	81.2
NO	2	43	17.6
	TOTAL	245	100.0

Table 11 shows that there are 163 or 66.5 percent of the respondents confirm that lack of "teaching experience"

was one of their limits in teaching the "construction and life" course. And there are 81 or 33.1 percent of the respondents confirm that they did not feel shortage about the teaching experience. There are 1 person who did not answer this question.

Table 11

The "teaching experience" which is held by the current industrial larts teacheres.

Value Label	Value	Frequency	Percent
	0	1	.4
YES	1	163	66.5
NO	2	81	33.1
	TOTAL	245	100.0

Accoding to the data analysis of table 9, table 10, and table 11, We could understand the limits in teaching "construction and life" course of junior high industrial arts teachers are very serious.

The data in table 2 indicate that 41 respondents were major in Construction, except those who graduate from the construction department, almost all of the other respondents feel that they were shortage in construction knowledge, teehnique, and teaching experience.

The grading criteria that the teachers preferred to use in teaching the "construction and life" course

Table 12 shows that there are 109 or 44.5 percent of the respondents confirm that "the quality of schoolshop work" was one of their grading criteria in teaching the "construction and life" course and there are 134 or 54.9 percent of the respondents did not use it as grading criteria. The other 2 persons did not answer this questions.

Table 12

The choosed & criteria of grading- The quality of school-shop work.

Value Label	Value	Frequency	Percent
	0	2	.8
YES	1	109	44.5
NO	2	134	54.7
	TOTAL	245	100.0

Table 13 shows that there are 205 or 83.7 percent of the respondents confirm that "the development of good working behavior" was one of their grading criteria in teaching the "construction and life" course. And there are 37 or 15.1 percent of the respondents did not use it as grading criterica. The other 3 persons did not answer this question.

Table 13

The choosed criteria of grading working behavior.

Value Label	Value	Frequency	Percent
	0	3	1.2
YES	1	205	83.7
NO	2	37	15.1
	TOTAL	245	100.0

Table 14 shows that there are 221 or 90.2 percent of the respondents confirm that the "attitude toward work or performance" was one of their grading criteria in teaching the "construction and life" course. And there are 23 or 9.4 percent of the respondents did not use it as grading criteria. 1 person did not answer this question.

Table 14

The choosed criteria of grading-attitude

Value Label	Value	Frequency	Percent
	0	1	.4
YES	1	221	90.2
NO	2	23	9.4
	TOTAL	245	100.0

Table 15 shows that there are 206 or 84.1 percent of the respondents confirm that the "students initiative" was one of their grading criteria in teaching "construction and life" course. And there are 34 or 13.9 percent of the

respondents did not use it as grading criteria. The other 5 persons did not answer this guestion.

Table 15

The choosed criteria of grading-students initiative.

Value Label	Value	Frequency	Percent
	0	5	2.0
YES	1	206	84.1
NO	2	34	13.9
	TOTAL	245	100.0

Accoding to the data analysis of Table 12, 13, 14, & 15, We could confirm that there are a lot of teachers (134 or 54.7%) who don't prefer "the quality of schoolshop work" as criteria of grading. But there are comparatively more teachers (83.7%-90.2%) who prefer "working behavior", "working attitude" and "students initiative" as grading criteria.

The attitude in participating in-service training for teaching the "construction and life" course.

Table 16 shows that there are 89 or 36.3 percent of the respondents have a very high willing to participate in the in-service training of the "construction" course. 43 or 17.6 percent of the respondents' willing is very high, 82 or 33.5 percent are medium, 26 or 10.6 percent are low, 2 or 0.8 percent are very low, And the other 3 persons did not answer this question.

Table 16

The attitude to participate in service training.

Value Label	Value	Frequency	Percent
	0	3	1.2
VERY HIGH	1	89	36.3
HIGH	2	43	17.6
MEDIUM	3	82	33.5
LOW	4	26	10.6
VERY LOW	5	2	.8
	TOTAL	245	100.0

The kinds of in-service training the teachers preferred

The question 18 in the survey instrument was designed to ask the respondents which way they prefer to in-service training of the "construction" course. Table 17 shows that there are 17 or 6.9 percent of the respondents preferred to accept the weekend in-service training. 59 or 24.1 percent of the respondents preferred summer session. 101 or 41.2 percent of the respondents preferred in regular school year. 50 or 20.4 percent of the respondents preferred independent study or practicums under direction. 12 or 4.9 percent of the participents preferred the others.

Table 17

The kinds of in-service training the teachers preferred.

Value Label	Value	Frequency	Perecnt
	0	6	2.4
WEEKEND	1	17	6.9
SUMMER	2	59	24.1
NORMAL	3	101	41.2
PRACTICUM	4	50	20.4
OTHERS	5	12	4.9
	TOTAL	245	100.0

The Data Presentation of the Second Survey Instrument.

The purpose of the second survey instrument means to decide what contents should be taught in the "construction technolgy "course of the industrial education deprtment of NKTC, Taiwan, R.O.C. We grouped the contents into five contents area and asked the respondents to rate each units and cotents area according to their perceived value. This was done on the scale of 1=extremly important to 5=not necessory. The five contents area which we grouped were: 1. introduction of construction technology; 2. construction management; 3. construction design; 4. construction process; and 5. construction service.

The rank order of the five content areas

Table 18 shows that the most important contents area should be taught in the "Construction Technology" course was: 1. the "construction process" (meam=1.88). The rank order of the other contents areas were 2. the "construction design" (mean=2.14); 3. the "construction service (meam=2.26); 4. the "introduction of construction technology" (mean=2.36) and 5. the "construction management" (mean=2.62).

Table 18

Rank order of the five contents areas

Rank	Contents	Area	Mean score
1	Construction	Process	1.88
2	Construction	Design	2.14
3	Construction	Service	2.26
4	Introduction of Construction Technology		2.36
5	Construction Manegement		2.62

The rank order of the "Introduction of Construction Technology" contents area.

In the survey instrument, the question 6,7,8 were designed to collect the data of the ramk order of the units in the "Introduction of construction Technology" contents area.

Table 19 shows the rank order were 1. "construction and life" (mean=2.31); 2. "construction literacy" (mean=2.52); 3. "construction industry" (mean=2.64).

Table 19

Rank order of the "Introduction of Construction Technology" Content area.

Rank	Contents	Mean Score
1	Construction and life	2.31
2	Construction literacy	2.52
3	Construction industry	2.64

The rank order of the "construction management" content area

In the survey instrument, the question 9.10.11.12 were designed to collect the data of the rank order of the units in the "construction management" content area.

Table 20 shows the rank orders are: 1. construction laws (meam=2.02); 2. managerial techniques (mean=2.62); 3. construction managerial process (mean=2.81); 4. managing activity (mean=3.14).

Table 20

Rank order of the "construction management" contents area

Rank	Contents	Mean score
1	Construction laws	2.02
2	Managerial techniques	2.62
3	Managerial process	2.81
4	Managing Activity	3.14

The rank order of the "Construction Design" contents area

In the survey instsrument, the question 13,14 are designed to collect the data of the rank order of the units in the "construction management" content area.

Table 21 shows the rank orders are 1. Constsruction Design (mean=1.83); 2. Construction Drafting (mean=2.02)

Table 21

Rank order of the "Construction Design" content area:

Rank	Contents	Mean score
1	Construction Design	1.83
2	Construction Drafting	2.02

The rank order of the "construction process" contents area

In the survey instrument, the question 15,16,17,18,19, 20. were designde ot collect the data of the rank order of the units in "construction process" content area.

Table 22 shows the rank orders are 1. Construction Techniques (mean=2.14); 2. Buildillg Structure (mean=2.48) 3. construction material (mean=2.55); 4. construction utility system (mean=2.60); 5. construction process (mean=2.62); 6. construction machines & tools (mean=2.83)

Table 22

Rank order of the "construction process" content area.

Rank	Contents	Mean Score
1	Construction Techniques	2.14
2	Building Structure	2.48
3	Construction Material	2.55
4	Construction Utility System	2.60
5	Construction process	2.62
6	Construction Machines & tools	2.83

The rank order of the "construction service" contents area

In the survey instrument, the questions 21,22,23,24 were designed to collect the data of the rank order of the units in "construction service" content area.

Table 23 shows the rank orders are 1. Building (mean=2.45); 2. Living Environment Repare & Atternative (mean=2.60); 3. Electrical / Piping maintenance (mean=2.60) 4. Installing Utility Devices (mean=2.83).

Table 23
Rank order of the "construction Service" content area.

Rank	Contents	Mean Score
1	Building maintance	2.45
2	Living Environment Repare & Atternative	2.60
3	Electrical / Piping Maintance	2.60
4	Installing Utility Devices	2.83

Finding of the Study

The findings formulated from this study are based on the review of the literature and the analysis of data from the two Survey instruments. The following fingdings arrive at.

1. After the review of the literature of the development of industrial Arts education, we find that the new industrial arts curriculum standands of secondary school that in Taiwan reflect the current factors influencing the Industrial Arts education. The factors are: 1. the technology education trend; 2. the career education trend; 3. the current ecnomic or education policy.

2. After the review of the literature of the development of Industrial Technology curriculum, we find that the current curriculum development of Industrial Arts tends to use the cluster concepts, the systematic way and the new curriculums of the secondary school indurtrial arts in Taiwan are industrial / Technology-oriented.

3. After the review of the literature of the development of construction system in Industrial Arts curriculum, we find that the contents of the "Construction Technology" show be comprehensive. The main content areas were: 1. Introduction of construction Technology; 2. construction management; 3. Construction Design; 4. Construction process; and 5. construction service.

4. The educational background of current industrial arts teachers in junior high schools is relatively low: only 99 or 40.4 percent of the respondents are degreed teachers. 70 or 28.6 percent of the respondents were major in industrial arts and 41 or 16.7 percent of the respondents.

5. The teaching methods that the junior high school industrial arts teachers prefer to use in the "Construction Technology" course are the "field trip".

6. Most of the respondents (61.6%) confirm that it is possible to receive adequate academic support in their schools for teaching "construction and life" course.

7. There are 216 or 88.2 percent of the respondents who confirm that the current phisical facilities of their schools are not sufficient for teaching the new "construction and life" course.

8. There are 193 or 28.8 percent of the respondents who confirm that lack of "construction knowledge" is one of their limits in teaching the "construction and life" course. And 199 or 81.2 percent of the repondents confirm that lack of "construction techinique" was one of their limits in teaching the "construction and life" course.

9. There are 221 or 90.2 percent of the respondents who prefered to 26 use the "attitude toward work or performence" as means of their grading critiria, Then the "students initiative" (206 persons or 84.1%), then the "development of better working behavior "(205 persons or 83.7%). But the

numbers or the percent of the respondents select "the quality of schoolshop work" as grading. critiria are relative low (109 persons or 44.5%)

10. The willing of the respondents in participating in-service training for the "construction and life" course was relatively high. There are 89 or 36.3 percent of the repondents who the in-service training felt extremely necessary. 43 or 17.6% felt very necessary. 82 or 33.5% felt necessary totally 214 or 92.4%.

11. There are more respondents who prefer the "short two week courses during regular shool year "way of in-sevice training. (101 persons or 41.2%). And less respondents prefer the "evening or saturday workshops during regular school year" way.

12. According to the data presentation of the questionnaire, we find the rank orders of the five content area of the "Construction Technology" couse were:
(1) Constructions Process; (2) construction design;
(3) construction service; (4). introduction of construction techndogy; (5) construction management.

13. According to the data presentation of the survey instrument, we find the rank order of the "Introduction of the Construction Technology" content area was:
(1). construction and life; (2). construction literacy;
(3). construction industry.

14. According to the data presentation of the survey

instrument, we find the rank orders of the "construction management" content area are: 1. construction laws; 2. managerial techniques 3. managing process 4.managing activities

15. According to the data presentation of the survey instrument we find the rank orders of the "Construction Design" content area are: 1. Construction Design 2. Construction Drafting

16. According to the data presentation of the survey instrument. We find the rank orders of the "construction process content area are: 1. Construction Techniques; 2. Building structure; 3. construction material; 4. constuction utility system; 5. construction process; 6. construction machines & tools.

17. Accoreing to the data presentation of the survey "instrument, we find the rank orders of the"construction service content area are: 1. Building maintance; 2. Living Enviroment Repare & Atternative; 3. Electrical / Piping maintance; 4. Installing Utility Devices.

Based on the review of the literature and the analysis of data from the two survey insturments, I will present an examplary course on "construction Technology" as follow:

An Examplary Course on Construction Technology

I. Course Title: Construction Technology

II.Course Description:

Construction Technology develops the student's understanding of general principle of Technology and their application to the construction industry and the social-cultual impacts of both industry and technoloby. It is a Comprehensive Course. In Technology, we learn its evolution and appropriate use and significance; in lndustry, its organization, systems, personnel, techniques, resourses, products. The key elements include the managing, planning, designing, constructing, and servicing of construction relataed activities and products in a given enviroment.

III.Objectives:

1. Develop the essentval competence for teaching "construction and life" course in Junior high school

2. Relate construction technology to the broader context of industry and technology

3. Develop awareness of careers in construction technology

4. Provide selected construction Technology activities for the development of attitudes, appreciation, and understanding in an introduction to construction technology, construction management, construction Design, constructing and sevicing.

5. Develop understanding of construction activities and the tools and materials utilized in their construction

6. Related the activities of construction technology to the local, and national development

7. Develop awareness of the significance of construction industry and technology in the past, present, and future

8. Cultivate students' competence of research and development on construction technology

IV.Contents (unit outlines): Time Ratio

1.00 Introduction to Construction Technology. 8 hrs

1.10 construction literacy

1.11 construction & culture

1.12 construction & social

1.13 construction & technology

1.20 construction industry

1.21 construction area

1.22 construction history

1.23 construction career

1.24 construction industrial organization

1.30 construction and life

1.31 living environment

1.32 contribution to life

2.00 Construction Management 4 hrs

2.10 construction law and Regulation

2.11 construction law

2.12 construction regulation

2.13 construction appointment

2.20 managerial techniques

2.21 CPM

2.22 PERT

2.23 Computer application

2.30 Construction Managerial process

2.31 Planning

2.32 Organizing

2.33 directing

2.34 controlling

2.40 managing activities

2.41 construction & economics

2.42 marketing

2.43 financing

2.44 personal

2.45 reserch & development

3.00 Construction Design 12 hrs

3.11 concepts

3.12 methods

3.13 process

3.14 engineer

3.15 arts

3.16 cost estimate

3.20 Construction Drafting

3.21 language & symbols

3.22 types of drawing

3.23 drafting tools

3.24 read architectural drawing

3.25 construction specification

4.00 Construction Process 36 hrs

4.10 Construction Techniques

4.11 surving

4.12 forming

4.13 rainforce

4.14 concrete

4.15 masonary

4.16 woodwork

4.17 painting

4.18 plumbing & piping

4.20 Building Structure

4.21 The Components of Building

4.22 structure system

4.30 Construction material

4.31 classification

4.32 production

4.33 properties

4.34 test

4.40 Construction utility system

4.41 electrical

4.42 plumbing

4.43 communication

4.44 air condition

4.45 transportation

4.46 environment

4.50 construction process

4.51 preparing the site

4.52 building the structure

4.53 installiIng utility system

4.54 enclosing the structure

4.55 finishing the structure

4.56 completing the site

4.60 Construction machines & tools

4.61 classification

4.62 usage

4.63 curing & mantainance

5.00 Construction Service 12 hrs

5.10 Building Maintance

practice and use masonry, concrete painting & woodworking techniques

5.20 Living Enviroment Repare & Atternative

coordinate managing designing and constructing process in the construction activities.

5.30 Electrical / Piping maintance

5.31 diagnosing

5.32 troubleshooting

5.40 Installing Utility Devices

5.41 electrical system

5.42 piping system

5.43 air conditioner

The main objective of the "construction service" was to make the student coordinate managing, designing. drafting

and constructing knowledge & techniques.

V. Learning Activities

body of knowledge	relative learning activities
Introduction of Construction Technology	a. Vidio- Ten Big Construction Project in Taiwan.
Construction management	a. field trip - a construction & management company. b. use the techniques of CPM, PERT to draw a network of a certain construction project.
Construction Design	a. give a house floor plan and ask the students design the interior b. draw plan, elevation, section and perspective of a house c. reading an Architecture drawing
Construction Process	a. display and let the students recognize the construction material b. display and let the stsudentes recognize the construction machines and tools c. field trip - review the construction utility system of their own school d. build a structure model of a

	house e. develop a plan of certain construction project f. measure and survey of a certain project g. brick, forming, reinforce, concrete, and finishing a centain project h. woodwork - door window or roof structure i. painting j. installing electrical or piping system
construction service	a. coordinate managing designing and constructing knowledge & techniques to a certain building maintenance or living environment reparement project

CHAPTER V

SUMMARY, CONCLUTIONS, AND RECOMMENDATIONS

Restatement of the Problems

The purpose of this study was to develop an examplary course model on Construction Technology that will be used to train in- service and pre- service secondary school industrial arts teachers at National Kaohsiung Teachers' College, R.O.C. The elements of the course model will be included are: 1. Title; 2. Description; 3. Objectives; 4. Contents; 5. Representative Learning Activities.

Summary

The need of this study has been identified in the introduction. The investigation of this study would contribute to the implementation of the new Industrial Arts curriculum, and set the fondation of the Costruction Education in Taiwan, R.O.C.

The review of literature identified the current mission of industrial arts education. That is, teaching Industrial Technology should be based on the system of industry/ technology, and the concept of clusters. The contents of the construction course are directed by the objectives of industrial arts education and the structure of curriculums. Thus it is a comprehensive course, it would taught the

students: industry/ technology, social- cultural impacts. At the same time, to identify current possible problems in teaching " Construction and Life " course.

Two different survey instruments need to gather data were designed in the methodology.

Then,the data collected were presented and analyzed. The data analysis of the first questionaire identified the problems existed in teaching the "construction and life" course. The data analysis of the second questionaire shows the Rank order of the contents and units. An examplary course on Construction Technology was then developed in the finding.

Conclutions

The conclusion formulated from this study was based on the review of the literature and the analysis of data from the two questionaires. The following conclusions were arrived at:

1. Based on the finding of the literature review of the development of industrial arts education. We concluded that the functions of the current industrial arts education should include (1) the functions of general education; (2) the functions of deliving technology-culture; (3) the functions of career development.
2. Based on the finding of the literature review of the development of curriculum for industrial technology. We conclude that the development of the industiral arts

curriculum in Taiwa, tend to accept the four industrial /technology systems : manufacturing, construction, communication & transportation as the curriculum structure, but the current curriculum did not follow the cluster theories totally.

3. Based on the finding of the literature review of the development of construction system in industiral arts curriculum, we conclude that under the constrain of the course length we cann't teach the students too much detail of each units. The course should taught the students understanding of general principles of technology and application of both industry and technology. The content area were: (1) introduction of construction technology; (2) construction management; (3) construction design; (4) construction process; and (5) construction service. Besides, the contents of " construction and life " course in junior high school, Taiwan, were narrow.
4. According to the data analysis of the questionnaires, the current junior high industrial arts teachers are lack of construction knowledge of techniques.
5. According to the data analysis of the questionaires, lack of facilities or lab will be problems in teaching "construction and life" course in junior high.
6. Based on the finding of the second survey instrument we know that the willing of the respondent in participating

in-service training for the "construction and life" course was relatively high, and there are rather more respondents prefer the "short two-week courses during regular school year" way of in-service training.

7. according to the finding from the survey instrument the "Construction Technology" course will teach the students with the more time ratio, knowledge and techniques of the "Construction Process" content areas, than "Construction Design"; "construction service"; introduction of construction technology; and "construction management". Among those "Construction management" was less important.
8. According to the finding from the survey instruments we will stress the relationship between the instruction, Technolgoy and life in teaching the "controduction of construction technology" content area.
9. according to the finding from the survey instruments. teaching the "construction laws "and" managerial techniques is more importnat than the "managerial process" and "manging activities" in the content area of the "construction management".
10. according to the finding from the survey instruments, the "construcion design" content unit is more important than the "construction drafting".
11. according to the finding from the survey instruments,

the "construction techniques" was the most important content unit which we shold teach in the "construction technology" course and the other units of the "construction process" content area will be taught more or less according to the rank order,that is "Building structure"; "construction material'; "construction utility system"; "construction steps "construction machines & tools".

12. According to the finding from the survey instruments, the "Buildig maintenance" was the most importnt content units of the "construction service" content area. We need to spend more time in teaching on this unit.

Recommendations

Based on the results of this study it was recommended that:

1. The structure of secondary school industrial arts curriculum should be revised to apply the theories of technological clusters totally.
2. The course contents of "Construction & Life" of junior high should be comprehensive, not narrow as they are now.
3. The industrial arts Lab equipment and environment should be improved, teaching materials should be improved, and teaching methods should be multiple

and flexible.

4. The "Short two-week courses during regular school year" way of in-service training, should be put into practice as soon as possible. The main content areas for the teaching of "Construction Technology" are: (1) introduction of construction technology; (2) construction management; (3) construction design; (4) construction process; and (5) construction service
5. The structure of curriculums of DIE of NKTC should adopt the cluster structure which orients the curriculums towards the goals of industrial industrial education.
6. The present unit construction course should be enlarged. The ideal construction cluster will composed by the courses billow: (1) Introduction of the Construction Technology; (2) Industry Management (include construction management); (3) Construction Design and Drafting; (4) Construction Methods and Process; and (5) Construction Service.
7. The Industrial trades type of equipping factories should be given up to adopt the cluster type, and Lab of construction should have an outdoor place for cement and concret work.
8. The Lab of construction and other activities should be installed as lab, and should not imitate factories.

9. The textbooks of the construction course of DIE, teaching media, and teaching units should be developed.
10. Flexible use of the teaching methods: lectures, performance, experiments, field trips, and speech by experts, etc.

APPENDIX A

Letter Accompanying Questionaire Sent to the Industrial Arts teachers in Junior High School Taiwan, R.O.C.

Letter Accompanying The Questionnaire

Dear Industrial Arts Teachers:

The new curriculum guide of Industrial Arts in Junior High School was announced in 1983. In the new curriculum guide, there is a "Construction and Life" course involved. It is a 9 week, 2 hours per week course that you will teach. We hope we can know the possible problems which are suggested by you and the educational needs you desire.

The purpose of this survey is to know the comomon educational needs of "Construction" for the Industrial Arts teachers, and use the information of this survey to plan a model "Construction" course at Department of Industrial Education Kaohsiung Teachers College, Taiwan, R.O.C.

Your help and cooperation is very important to yourself and the Industrial Arts teachers program. This research will be accomplished when we get your answers.

It is a scholastic survey so you don't need to worry about anything when answering the questions. Please choose the appropriate answers and mail it back in the self-addressed enclosed envelope within one week. Thank you!

Yours Sincerely

Chi-Yu Liu

Department of Industrial Atrs Education

Survey Questionnaire

The purpose of this study is to determine the educational needs in teaching the "Construction and Life" course in Junior High School Industrial Arts propram in Taiwan, R.O.C.

Directions:

Please place an x in blanks if the answer is most appropriate for you.

1.Please indicate the highest degree you have earned.

---(a) masters degree

---(b) bachelor's degree

---(c) Junior college

---(d) other

2.You were

---(a) Industrial Arts Teachers Education Program in college

---(b) Construction Technology department in college

---(c) Construction Technology department in Junior college

---(d) other

3.Do you have any work experience in the construction industry?

---(a) yes

---(b) no

4.Do you plan to use "explanation/lecture" method in teaching "Construction and Life" course?

---(a) yes

---(b) no

5.Do you plan to use "performance/laboratory" method in teaching "Construction and Life" course?

---(a) yes

---(b) no

6.Do you plan to use "students activity/experiments" method in teaching "Construction and Life" course?

---(a) yes

---(b) no

7.Do you plan to use "field trip" method in teaching "Construction and Life" course?

---(a) yes

---(b) no

8.Do you receive adequate acadmic support for teaching "Construction and Life" course?

---(a) yes

---(b) no

9.Are the facilities adequate for teahcing "Construction and Life" course?

---(a) yes

---(b) no

10.Do you feel that you had adequate preparation/training for teaching "Construction and Life" course?

---(a) yes

---(b) no

11.Do you believe that lack of "knowledge" limits you in doing an effective Job in teaching "Construction and

Life" course?

---(a) yes

---(b) no

12. Do you believe that lack of "techniques" limits you in doing an effective Job in teaching "Construction and Life" course?

---(a) yes

---(b)no

13. Do you believe that lack of "experience" limits you in doing an effective Job in teaching "Construction and Life" course?

---(a) yes

---(b) no

14. Is "the quality of schoolshop work" one of your grading criteria in teaching "Construction and Life" course?

---(a) yes

---(b) no

15. Is "development of good working behavior" one of your grading criteria in teaching "Construction and Life" course?

---(a) yes

---(b) no

16. Is "attitude toward work or performance" one of your grading criteria in teaching "Construction and Life" courses?

---(a) yes

---(b) no

17. Is "students initiative" one of your grading criteria in teaching "Construction and Life" course?

---(a) yes

---(b) no

18. Please check your attitude in participating in-occupation training for preparation to teach "Construction and Life" course?

---(a) Extremely needed

---(b) very needed

---(c) needed

---(d) not too needed

---(e) not necessary

19. What's kind of in-occupation training of Construction do you desire?

---(a) evening or Saturday workshops during regular school year

---(b) special courses offered during summer school

---(c) two-week courses during regular school year

---(d) independent study or practicums under direction

---(e) others (please list)

20. Please list any other concepts or needs that you fell are important for you in teaching "Construction and Life" course?

APPENDIX B

letter Accompanying Questionalire, Questionnaire Sent to the chairperson of Construction department in vcational high School. Taiwan, R.O.C.

Letter Accompany The Questionnaire

Dear Chairperson:

The new curriculum guide of Industrial Arts in teachers' education and in the high school was announced at 1983. The new Industrial Arts Teachers' Education program contains a "Construction" course and the new Industrial Arts curriculum guide of the Junior High School contains a "Constructio and Life" course. We developed this survey for collecting information from you and used it to plan a model "Construction" course in Department of Industrial Arts Education Kaohsiung Teachers' College, Taiwan, R.O.C.

You have been choosed as respondent for the following three reasons:(1) you are a professioner. (2) you understand the principles of curriculum plan. (3) you are concerned with the implementation of "construction and Life" course in the Junior High Schooly. We hope to find the important suggestions to "Construction" course contents from your answers.

Your help and cooperation are very important in seting the foundation of construction education in Taiwan, R.O.C. It is a scholastic survey so you don't need to worry about anything when you answer the questions. Before you answer, please read and pay attention to the objectives of Industrial Arts Education which are:

A. The educational objectives of Industrial Arts

Education Department, Kaohsiung Teachers College.

1. To train the Industrial Arts teachers of secondary school.

B. The objectives of Industrial Arts course in Junior High School.

1. To instruct the students to understand the inherent and modern Industrial Civilization of our country, and to recognize the local circumstances. of Industry and the trends of development in the future.
2. To create an opportunity for the students in career development, and in finding the interests and talents of Industrial Technology.
3. To provide the necessary knowledge, technique and talent of everyday living in Industrial society.
4. To cultivate the character of cooperation, communication intolerance, adn service.
5. To breed the ability and knowledge processing by the customers.
6. To train the mental-manual coorelation behavior, and to breed the concepts of working-honor and occupation equal.

Please choose the appropriate answer and mail it back in the self-addressed enclosed envelope within one week. Thank you!

Yours Sincerely,

Chi-Yu Liu

Industrial Arts Education Department

Survey Questionnare

The purpose of this study is to determine what content should be taught in the "Construction" course of the Industrial Arts teachrs program. (Please check on a scale of 1 to 5 as to the importance of the concepts to be taught in a Construction course in Industrial Arts)

Grouping Content	extremly important (1)	very important (2)	somewhat important (3)	not too important (4)	not necessary (5)
Basic territory of Construction					
1.Introduction of Construction:					
---construction literacy					
---construction industry					
---construction & life					
2.Construction Management:					
---managing activities					
---managing systems					
---managing techniques					
---laws & requlations					
3.Construction Designing & Drafting:					
---construction designing					
---construction drafting					

	extremly important	very important	somewhat important	not too important	not necessary
	(1)	(2)	(3)	(4)	(5)
4.Construction Process:					
---construction materials					
---construction equipments					
---construction techniques					
---construction procedure					
---building structure					
5.Construction Service:					
---alternatives					
---installing					
---repairment					
---maintaining					
Introduction of Construction					
6.Construction Literacy:					
---construction & culture					
---construction & society					
---construction & technology					
7. Construction Industry:					
---area					
---history					
---career					
---organization					

	extremly important	very important	somewhat important	not too important	not necessary
	(1)	(2)	(3)	(4)	(5)
8.Construction and Life"					
---living environment					
--contribution to life					
Construction management					
9.Managing Activity:					
---construction & economics					
---marketing					
---financing					
---personal					
---research & development					
10.Construction Managerial Process:					
---planning					
---organizing					
---directing					
---controlling					
11.Managerial techniques:					
---CPM					
---PERT					
---computer application					

extremly important
very important
somewhat important
not too important
not necessary

(1)(2)(3)(4)(5)

12.Law and Regulation:

---construction law

---regulation

---appointment

Construction Designing and Drafting

13.Construction Design:

---concepts

---methods

---process

---engineer

---arts

---cost estimate

14.Construction Drafting:

---language & symbols

---types of drawings

---drafting tools

---reading architectural drawing

---construction specifications

Construction process

	extremly important	very important	somewhat important	not too important	not necessary
15.Construction Material:	(1)	(2)	(3)	(4)	(5)
---classification					
---production					
---properties					
---use					
---test					
16.Construction Machines & Tools:					
---classification					
---use					
---curing & mantainance					
17.Construction Utility System:					
---electrical					
---plumbing					
---communication					
---air condition					
---transportation					
---environment					
18.Building Structure:					
---components					
---structure system					

	extremly important	very important	somewhat important	not too important	not necessary
	(1)	(2)	(3)	(4)	(5)

19.Construction Process:

---preparing the site

---building the structure

---installing utility system

---enclosing the structure

---finishing the structure

---completing the site

20.Construction Techniques:

---serving

---forming

---rainforcement

---concrete

---masonary

---woodwork

---painting

---plumbing & piping

Construction Service

21.Living Environment Repare & Atternative:

---coordinate managing, designing, and constructing process in the constructing activities.

	extremly important	very important	somewhat important	not too important	not necessary
22. Electrical/Piping Maintainance:	(1)	(2)	(3)	(4)	(5)
---diagnosing					
---troubleshooting					
23.Installing Utility Devices:					
---electrical system					
---piping system					
---air-condition					
24.Building Maintainance:					
---practice and use masonry, concrete,painting, & woodworking techniques.					

25.Please list any other concepts or contents that you fell are important in teaching Construction course.

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