Brief Introduction to Technology Education in Taiwan

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序

在世界各國愈來愈重視透過中小學科技教育培養全民科技素養的洪流中，我國也需要積極透過中小學「生活科技」課程落實全民科技素養教育。

本簡介的目的在介紹中小學科技素養教育的「全國概況」和呈現學校教師撰寫的「學校例示」，希望有助於國內外人士更加了解這個領域的理想與現況。

本簡介得台灣師大推動學術之經費補助以及作者和編輯們之熱心參與，始能完成。一併致謝。

李　隆　盛　謹誌

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２００４年７月

Preface

Technology Education at both elementary and secondary schools levels has become an important means to develop citizens' technological literacy for all worldwide. In Taiwan, Living Technology is also necessary to be energetically offered at both elementary and secondary school levels in order to improve technological literacy of the public.

This brief introduction is to present the national status of technological literacy education at both elementary and secondary school levels, and provides examples of schools, written by school teachers, in the hope that domestic and international people will gain a better understanding of the ideal and reality of this field.

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Content

全國概況
The National Status

The Overview of Technology Education in Taiwan

Technology, people's livelihood, economy and culture are interrelated and interdependent. The public sometimes refer to "technology" as "science & technology"; however, most of the time they mean by "technology" related to people's life.The relationship of life and technology is getting closer than before. In order to become wise consumers and producers of technological products, service, system and society, people have to be quipped with technological literacy besides the basic skills of reading, writing and calculating.

The major learning areas of technology education of elementary school and secondary school implemented in many countries are as followed: technology education, design and technology, information technology, technical skill, and technology / engineering. It is a integral course in general education, because it is regarded as emphasizing multiple knowledge and skills, practical, experience, and also facilitating individual holistic education.

This education is beneficial for the following multiple aspects: breeding technological talents, advancing economic development, solving technological problems, and facilitating social adaptation.

Entering in to the era of knowledge and innovation, we have to rely on the professional technology education which can foster skillful talents and have to enhance all people's the education of technological literacy in order to become the Asia-Pacific technology island and modernized country. The goal of technology education in kindergarten, elementary, and junior high school in Taiwan is to assist students to develop the ability to be aware of, explore, understand, use and manage technology in order to adapt to current and future technological society.In fact, the technology education of all people can be implemented through many formal and informal curricula and instructions; all in all it mainly relies on Living Technology subject.

The Living Technology subject was evolved from"Manual Arts"and" Industrial Arts". This subject has changed

Utilization of Technology Daily Life-
N.T.U Smart House(low-energy building)

Beauty of Technology –
Star Ocean Square, Kaohsiung

as time went by. It not onlyhas changed in name, but also the content. Currently, this subject was instructed in projects in our kindergarten. The focus is on assisting children to be aware of the existence of technological world. Before the implementation of national Grade 1-9 Curriculum Guide in 2001, we did not have a stand-alone Living Technology course in elementary schools(grades 1 - 6). It was integrated into the "Arts and Crafts" course, and it emphasized "to combine life, and technological knowledge and skill, and to enhance the quality of life". We have Living Technology course in junior and senior high schools, and the structure of this course is based on four main technological systems (Technology and Life, Information and Communication, Construction and Manufacture, and Energy and Transportation.) After the implementation of Grade 1-9 Curriculum Guide, the technology education and science education of elementary and junior high school (grades 1 - 9) were integrated into the learning area of "Science and Technology". In addition, the course was implemented according to competence indicators. Technology courses focus on the integrative ability of the following aspects: food, material, mechanical application, electricity and its application, information and information communication, residence, transportation, the exploitation and utilization of energy, originality and fabrication. In senior high school(grades 10-12), we have a stand-alone "Living Technology" subject, and its national curriculum guide is under revision.

The Technology Education in Our Kindergartens, Elementary Schools, and Junior High Schools

The early childhood education primarily focuses on health education, life education and ethics education, and it tightly links to family education in order to maintain the soundness of children' s body and mind, develop children' s good habits, enrich their life experiences, enhance their ethical concepts, and develop their sociable habitual behavior.

We have implemented Grade1-9 Curriculum Guide since 2001.The Guide to integrates students' life experiences into education situations, and we provided seven learning areas: Languages, Health and Physics Education, Social Studies, Arts and Humanities, Mathematics, Science and Technology, and Integrative Activities originated from three aspects: individual development, social culture and natural environment. Technology education is embedded in the "science and technology" learning area. This sub- area emphasizes the linkage of nature, science and technology, and its major contents include: Material and Energy, Biology, Earth, Ecological Conservation,Information Technology, and valuing the knowledge and skill of science and scientific study, developing the sentiments of respecting life, loving environment, utilizing technology and information, and implementing in daily life.

Experiency Technology via Hands-on Activity Contest of Stone Thrower

Next we are going to introduce the curriculum evolution, goal, content, characteristics, and implementation of technology education in our kindergarten , elementary and junior high school:

1. Curriculum Evolution

We did not plan a stand-alone technology instruction in our kindergarten curriculum guide; however, some courses of two learning areas "Working" and "Common Sense" include developing good working habit and attitude, recognizing common material and tool of daily life, designing production, understanding simple dynamics, mechanics and daily application. In this way, technological literacy education is embedded.

Before the implementation of Grade 1-9 Curriculum, also we did not have a stand-alone subject teaching Technology Education; however, part of the content of "Manual Arts" or "Arts and Crafts" include Technology Education. After implementing Grade 1-9 Curriculum in 2001, Technology Education was integrated into "Life" learning area in grades 1-2, and integrated into "Science and Technology" learning area in grades 3-6.In this way."Science and Technology"

Learning area is more consistent and integrative.

Technology Education of junior high school formerly was crafts-oriented or manufacture-oriented; however, it is now problem solving-oriented. In addition, the content has shifted from "Manual Arts", "Industrial Arts" to "Living Technology" in 1993 and implemented in 1997. During this period, this curriculum was presented by four learning areas: Technology and Life, Construction and Manufacturing, Information and Communication, and Energy and Transportation. Nevertheless, in order to enhance nationals' quality and national competitiveness, our government announced the "Tentative Grade 1-9 Curriculum Guide". These guide regulated a principle: "On the basis of learning area and integrated instruction".By this principle, Technology Education was integrated into "Science and Technology" learning area. Additionally, school administrators and teachers have to figure out school and students features, develop curriculum, design learning materials according to competence indicators. There is no curriculum content regulated in curriculum guide.

2.Curriculum Goal

It stated the following goals in the "Working" curriculum goal of kindergarten: to satisfy children's natural need for work, to develop good working habit and attitude, to facilitate them to recognize working material and tools usage, to expand their life experiences, to develop the interest of working, to develop the interest of working, to facilitate their ability to appreciate beauty, publish, and create. The goal of "Common Sense" is: to appeal children's attention to and interest of nature phenomena and social life, to guide them to observe and analyze natural and social environment, to develop their nature-loving and sociable habit and attitude, and to inspire their learning interest of number, quantity, and shape, and let them do uncomplicated application of these abilities, to develop their correct concepts, attitude, and methods of natural science. We can see from the above that we can develop children's technological literacy through these courses.

The major goal of "Science and Technology" learning area of Grade 1-9 Curriculum is to enhance all people's scientific and technological literacy. Students are expected to achieve the following six goals through the integrated learning of technology and science: (1) To develop students' interest and passion of exploring science, and to develop their active-learning habits; (2) To learn the exploring method and basic knowledge and skill of science and technology, and they can apply their learning to current and future life; (3) To develop their attitudes of loving environment, cherishing resources and respecting life; (4)To develop their abilities to communicate with others, cooperate with others in teams, and to be easy-going; (5) To develop the ability of independent thinking and problem solving, and to explore their potential; (6) To let them be aware of and explore the interaction of human and technology.

3.Curriculum Content

One of the common trends of development in Technology Education toward the end of 20th century is the transformation from practical arts orientation to the education enhancing technological literacy and developing the skills of problem-solving and creative thinking.

"Working" curriculum of kindergarten includes the following four areas: (1) Painting (2) Paper Working (3) Sculpture (4) Crafts. "Common Sense" curriculum includes the following three areas: (1) Society (2) Science (3) the concepts of number, quantity, and shape. From these courses, children can develop their abilities and interests and apply their thinking and solve problems via observation, exploration and learning how to use tools and materials. There are no complicated knowledge and skill in the curriculum; however, it is the significant outset of inspiring and developing children's technological literacy.

The Grade 1-9 Curriculum implemented in elementary school and junior high school was based on "competence indicators", and according to which school administrators and teachers do curriculum planning and teaching material development. The eight competence indicators are the following: (1) Processing skills, (2) Scientific and technological perception, (3) Nature of science, (4) The development of technology, (5)Scientific attitude (6) Thinking intelligence, (7) Scientific application, and (8)Design and making. There are sub-competence- indicators under each grade. This website details all the indicators: http://teach.eje.edu.tw/9CC/index.php

Corroboration Scientific Through The Technology Activity Glider

Corroboration Scientific Through the Technology Activity Carousel lantern

4.Curriculum Characteristics

We conduct technology-related courses mainly through "Working" and "Common Sense" in kindergarten. Teachers will discuss with children besides beforehand planning and preparation when they plan to do activities. We let children to feel, experience and develop technological literacy via many experiential hands-on courses and activities.

Because of the implementation of Grade 1-9 Curriculum, we expand Technology Education to elementary schools in order to let students to develop technological literacy from early ages; in

addition, we expect that technology education can be consistent with and integrated to the one in junior high school. Teachers should design instructional content and activities according to "competence indicators" of each learning stage. We put an emphasis on making students integrate the learning experiences of other subjects, understanding the development of technological society, using problem-solving steps, operating tools, materials, and bringing creativity into full play in our technology education.

5.Current State

Technology Education in early childhood education is heuristic, leading children to explore the technological world. There is no specific subject or course in kindergarten; however, led by teachers, children still can experience various technological styles in the real world and they can be aware of technology freely under natural condition.

After the implementation of Grade 1-9 Curriculum in elementary schools and junior high schools, teachers of technology education face many challenges. In elementary schools, we still have not adjusted teacher training according to Grade 1-9 Curriculum; therefore, we have not many technology education teachers in school. This led to focus on science in "Science and Technology" learning area. In junior high school, formerly technology education was instructed in"Industrial Arts", and then instructed in "Living Technology". Shortly after five or six years, Living Technology was integrated into "Science and Technology" learning area. Technology teachers need to adjust themselves to these rapid changes and challenges in these years. In addition, the impression of Technology Education on the public was still "beating and hitting". This is such a great misunderstanding. Moreover, because of the pressure of entering a higher school level, public focus on the tested subjects. School's focus of arranging courses and teachers was on these subjects and ignored the importance of technological literacy. The advancement of Technology Education still has a long way to go.

There are many challenges in real world; however, most of the Living Technology teachers still wholeheartedly promote Technology Education.Students are expected to experience, apply and then recognize technology via lively and rich technology learning activities (TLA`s).

Technology Education at the Senior High Schools Level

Following the international technology education trend in the 1990s, Industrial Arts in Taiwan was transformed into Technology Education in both junior and senior high schools. Technology Education in senior high schools is aimed for deeper explorations and studies, as well as preparations for career development. However, we face countless difficulties in teaching Technology Education which has not been include in entrance examinations for further education, when teaching old "Industrial Arts" or new "Living Technology" because of the prevailing attitudes toward credentialism. Infact, Living Technology emphasizes hands-on and problem-solving abilities. It creates a situation which can stimulate students to exploit both their mental and physical power. Therefore, students can not only learn skills, but also realize in their experiences how to practically use acquired knowledge in their daily lives.

1. Evolution of Living Technology

The current Curriculum Guide of Living Technology for senior high schools was announced in 1995 from modifying the Curriculum Guide of Industrial Arts. It has been gradually implemented on an annual basis since 1999. In the meantime, a new Curriculum Guide is under development and expected to be implemented in the academic year 2006.

2. Goals of Living Technology

The objectives of required Living Technology in grades 10 and 11 are to educate students to understand technology and its influence on the aspects of individual, society, environment, and civilization; to apply technology to problems and then advance it; to adopt a right attitude and view toward technology so as to arouse interests in studying technology and pursuing related careers, and build a solid foundation for further study, knowledge and skills.

3. Content of Living Technology

Living Technology in senior high schools is extended from the curriculum framework of junior high schools. "Technology and Life" and "Information and Communication" are taught in the first school year. "Construction and Manufacturing" and "Energy and Transportation" are taught in the second school year. Here are specific topics of the courses: Technological Society, Resource and Environment, Information

Bridge Weight Loading Test

Technology, Graphic Arts Communication, Electronic Communication, Construction System, Life Environment, ManufacturingTechnology, Energy and Power, Transportation System. Teachers' teaching methods are activity-oriented. Therefore, in teaching activities, they help students to combine previous experiences, other knowledge, conceptual and creative thinking, and problem-solving development together. Teachers also help students to understand overall ideas in training of cognition. In addition, we focus on integrating technological systems.

4. Features of Living Technology

The course follows the ideology of Technology Education in elementary and junior high schools. Thus, senior high school students can learn from hands-on work, and they are mainly expected to learn how to solve technological problems. In four main learning areas, teacher can provide students insights into various technological systems and their influence and relation to our society. Moreover, students can also start to discover their aptitude for future careers.

Material Processing

The reason we arrange Living Technology in the first and second years(i.e.,grades 10 and 11) at senior high schools is to dodge the third year. Schools can provide students with well-adjusted elective courses based on students' interests and schools' faculties, characteristics, and facilities.

5. Status-quo of Living Technology

Technology Education is taught better in senior high schools than in junior high schools and elementary schools. Class hours of Technology Education are not be reduced because of entrance examinations so it is more possible to improve the courses in senior high schools. Teachers can plan for each technological topic according to resources and technological systems. They can also encourage students to have creative thinking and exploit both their mental and physical power. When the courses get more challenging, Living Technology comes closer to our daily lives. Students are not only expected to learn technological products or master skills. In parallel, they should be able to analyze the roles of humans, affairs and things in technological society, and investigate technology's influence on society, culture and individuals from different angles.

Technology Teacher Education

Teacher Education of teachers at kindergartens, elementary and secondary schools is governed by the regulations of Teacher Education Law. Therefore, those who complete required education credits shall obtain teaching intern status and then after undergoing an internship of one year, shall obtain status as certified teachers. On the other hand, in the latest version of Teacher Education Law, those who undergo an internship of half a year and then the pass teacher certification shall be given certificates of certified teachers by the administration in the central government. Pre-service teacher education is provided in a teachers college or normal university, which educate teachers for kindergartens, elementary schools and/or secondary schools according to each school's specialties. The following are simple introductions to teacher education at different educational levels.

1.Teacher Education for Kindergartens

Apart from normal universities and teacher training colleges, many teacher education centers in other universities and colleges also educate teachers for kindergartens with help of the Department of Child Care--where child's integral development and holistic education are stressed. Although Technology Education is not specified in the courses, there are still some contents trying to lead children to learn about technology and creative thinking.

3.Teacher Education for Elementary Schools

Seven major teacher training colleges aim at educating teachers for elementary schools:the National Tai-Chung Teachers College, the National Taipei Teachers College, the National Tainan Teachers College(to be renamed to the National University of Tainan in August 2004), the National Hulian Teachers College, the Taipei Municipal Teachers College, the National Ping-Tung Teachers College, and the National Hsin-Chu Teachers College. In the past, more courses about Technology Education could be found in the Department of Arts Education. After starting Grade 1-9 Curriculum, some colleges move such courses to the Department of Science Education. Taking the National Hsin-Chu Teachers College (NHCTC) for example, its pre-service teacher education curriculum in educating teachers for elementary schools is shown in the Table 1.

Table1. NHCTC's pre-service teacher education curriculum in educating teachers for elementary schools

General Knowledge Courses	Common Courses		Education Specialization Courses	Department Specialization Courses	Total Credits
14 ("Military Training" and "Physical Education" are included.)	Social Studies	8	20 (required for students who take a teacher education program)	74 (6 credits can be earned from specialization courses in any department or group.)	148 (for students who take a teacher education program)
	Mathematics	8			
	Science and Technology	6			
	Arts and Humanities	6			
	Health and Physical Education	8			
	Language Arts	4			
	Total	40			

3.Teacher Education for Secondary Schools

Two schools educate Living Technology teachers for high schools: the Department of Industrial Technology Education in the National Taiwan Normal University (NTNU) and the Department of Industrial Technology Education in the National Kaohsiung Normal University (NKNU). In both departments, students can study for a Bachelor's degree, a Master's degree, or a Ph.D. degree. That is, both Living Technology teachers and Technology Education professionals are educated. The International Technology Education Association (ITEA) places its International Center of Taiwan in the Department of Industrial Technology Education at NTNU.

The NTNU's specialization courses in educating Living Technology teachers for secondary schools are listed in the Table 2.

Department of Industrial Technology Education, College of Technology, NTNU, Taiwan

Woodworking Practice

Table 2. The NTNU's specialization courses in educating Living Technology teachers for secondary schools

Course	Credit	Note
Introduction to Natural Science	3	Core Course
Manufacturing Technology/ Introduction to Manufacturing(including practicum)	2	Required
Basic Design	2	Required
Introduction to Computer Science	3	Required
Construction Technology/Construction/ Introduction to Construction	2	Required
Communication Technology/Introduction to Communication	2	Required
Transportation Technology /Introduction to Tansportation	2	Required
Energy and Power	2	Required
Manufacturing Process	2	Required
Wood Working	2	Required
Graphics	2	Required
Electronic Communication	2	
Electricity	2	
Graphic Arts Communication	2	
Information Technology	2	
Planning and Management of Technology Labs	2	
Introduction to Industrial Technology Education	2	
Plastic Working	3	
Industrial Safety and Hygiene	2	
Total	41	

Note: At least 33 credits, including core and required courses, are mandated.

Professional Associations and Events of Technology Education

Professional associations, periodicals, and events associated with Technology Education of elementary and secondary schools are listed below:

1. Industrial Technology Education Association, Taiwan, R. O. C.

It is located in the Department of Industrial Technology Education in the NTNU. Its goals are to conduct research studies, keep close liaison with all members, and help to advance industrial technology education. It holds an annual convention, coordinates activities to encourage research of Technology Education and cooperation with international academic groups, and give awards to people who have outstanding performance in this field. It is also one of the seven founding members of the International Conference on Technology Education in the Asia-Pacific Region (ICTE).

2. Living Technology Education Journal and Journal of Technology Education

Both Journals are published by the Department of Industrial Technology Education in the NTNU. Their goals are to communicate ideas, practices, and messages of living technology education so as to improve quality of Technology Education. Teachers and researchers of Technology Education can use them to contribute their articles and exchange information. Currently, Living Technology Education Journal is electronically published.

3. Promoting Activities of Technology Education

(1)Living Technology Performance Contest

Living Technology Performance Contest is held annually in Taipei City. Students from public and private junior high schools form their own teams and teachers coach them. Its goals are to arouse students' interests in exploring questions about Living Technology, to encourage them to brainstorm and work in a team, and to learn how to solve daily problems with knowledge learned in Technology Education.Teachers can also have a chance to observe, demonstrate, and compete with each other, and exchange their experiences in this inter-school event.

There are Living Technology Performance Contests in other counties: Nature and Technology Contest for junior high school students in Taoyuan County,

Living Technology Performance Contest in Taipei

Living Technology Contest in Kaoshung City, and Nature and Technology Contest for elementary school students in Taidong County.

(2)Science Fair of Elementary and Secondary Schools

National Taiwan Science Education Center is in charge of the National Science Fair of Elementary and Secondary Schools. The fair goes from local to central level. Students' works first are exhibited in local areas and then excellent ones will be chosen and sent to the national fair. In addition, they are divided into several categories: Physics and Chemistry, Biology, Mathematics, Earth Science, as well as Living and Applied Science. Notably, there are always many works in the category of Living and Applied Science.

(3) Power Tech--National Youth Creative Contest

This contest is held by the Chinese Creativity Development Association. The purpose of this contest is to broaden students' scope of knowledge in technology and foster their ability of independent thinking. By so doing, the organization hopes to enhance the implementation ability among future talents. Furthermore, its Seed Instructor of Creative Teaching Training Program can also help to spread the idea into schools.

(4) Yuan T. Lee Science Education for All

Hsin-Yi Foundation funds Yuan T. Lee Science Education For All. The president of Academia Sinica Yuan T. Lee invites entrepreneurs and scholars who are constantly concerned about development of education in Taiwan to serve in the committee. Its goal is to promote Science Education. It holds workshops of Science Education, and many of them are related to Technology Education. It helps the public to explore technology and science by technological activities and products.

4. Institutions of Social Education

(1) National Science and Technology Museum

The museum is located in Kaoshung City. It shows the theory and application

Living Technology Performance Contest in Taipei

National Youth Creative Contest

of technology that fit the local industry needs. Its exhibitions includes Children's Science Center, Chinese Achievements, The Electronic World, Power and Machines, Food Industry, Dwelling and Environment, Biological Technology, Clothing and textiles, Transportation and Civilization, Computer and Communication, Utilization of Water Resources, Plastics and Rubber, Air Navigation and Aerospace, and Temporary Exhibitions. Visitors are allowed to join hands-on activities in most sections so they can have vivid feelings toward Science and Technology. They are hoped to realize the beauties and fun of Science and Technology through sensory stimuli, and proactive observation and interaction.

(2) National Museum of Natural Science

The museum is located in Taichung City. It is the first national science museum in Taiwan. It goals are to provide the newest resources and information of Natural Science, to educate the public through activities, and to host teachers' workshops. There are four exhibition halls--The Science Center, The Life Science Hall, The Global Environment Hall, and The Chinese Science Hall--and four theaters--Space Theater, 3-D Theater, Bird's Eye View Theater, Environment Theater. The Chinese Science Hall includes 6 main units-- Chinese Science and Technology, Chinese Medicine, Agriculture, Astronomical Observation and Calendar Development, Shipbuilding and Navigating, and Chinese Spiritual Life. Theaters, equipped with computerized controllers and multimedia equipment, present various latest information.

(3) National Taiwan Science Education Center

The Centre is located in Taipei City. Its goals are to enact public science education, increase the public's understanding of Science, and support schools and organizations of social education in the field of Science Education. It takes science out of the lab and into everyday life, allowing people to discover the many wonders of science in their own daily lives. This will encourage the exploration of science and learning.

Content

學校例示
Examples of Schools

- 台灣師大附屬幼稚園
  The Affiliated Kindergarten of National Taiwan Normal University
- 台北市建安國小
  Taipei Municipal Jianan Elementary School
- 台中市黎明國小
  Taichung Municipal Li Ming Elementary School
- 台北市仁愛國中
  Taipei Municipal Renai Junior High School
- 台北市金華國中
  Taipei Municipal Jinhua Junior High School
- 台灣師大附中
  The Affiliated Senior High School of National Taiwan Normal University
- 台北縣福和國中
  Taipei County Fuho Junior High School
- 台北市麗山國中
  Taipei Municipal Lishan Junior High School
- 台中二中
  National Taichung Second Senior High School
- 台北市永春高中
  Taipei Municipal Yongchun Senior High School
- 台北市景美女中
  Taipei Jingmei Girls High School

The Affiliated Kindergarten of National Taiwan Normal University

Fong, Sha Zon

There are currently six classes, 18 staff members, including the kindergartener and 12 teachers. All our teachers are qualified teachers certified by the City Bureau of Education.

In 1985, we started to work on the plan by Ministry of Education to promote experiment and research on technological education in kindergartens, and conducted researches and publications. Currently we are also conducting projects under the National Science Council on children's scientific discovery.

Our mission is to improve children's mental and physical health, and to serve as the model for teaching, research, and experiment by teaching-related departments of the National Taiwan Normal University and other universities. Our educational objectives are:

1. To cultivate children's confident and active personality.
2. To develop children's ability to use knowledge, think creatively, and to solve problems.
3. To cultivate children's ability to develop good interpersonal relationships.
4. To improve teaching methods, as well as the quality of teaching in the kindergarten.

DIY

Decorating a Park

Our teaching has the following characteristics:

1. We insist on the spirit of open education, and respect children's ability to act and think out of their own will.
2. Open teaching style with a consistent subject through the curriculum. Exercises mainly take place in the corners, and teamwork and group activities are secondary teaching exercises.
3. Balance of active and sedate teaching activities.
4. Emphasizing research and experiment on teaching methods, and providing students of kindergarten education the chance to take internship, in order to help them put theory into practice.
5. Focusing on researches of the relation between family, curriculum, children's development and learning.
6. Emphasizing communications of emotion and information between kindergarten and student's family. We hold tours and activities for parents to participate in, and we allow parents to observe how their children are doing in the kindergarten. We take the parents as a valuable resource and expect them to contribute to the learning of their children.

Concerning teaching methods, we are

now trying to adopt the project method developed by Reggio Emilia. The so-called project-oriented teaching is to focus on children's participation in the study project they are interested in. The projects can be engaged by an individual, a group, or by the whole class. The content or topic of the project often comes from the world children are familiar with, and is decided by the discussion among children and the teacher. For example, kids living in the city may like to study the types of buildings, transportation facilities, shops, parks or natural phenomena such as raining or rainbows. Because the final decision to study the topic or not depends on the children, once they have selected a topic, they will work with the teacher to collect information and discuss the topic outline, drawing the graphics, and try to locate questions while they enjoy playing on the topic. Then, they will talk about modifications and re-exploration.

The following topics of color, park, and secret base are examples of the children's exploration activities:

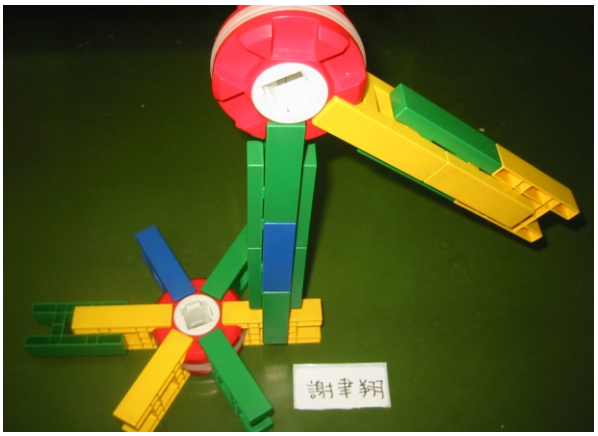
Topic 1: Playing with the Colors

This exercise derived from a child who brought a silk cotton blossom to school, which started the discussion between the children and the teacher on the fact that at an earlier time there was not any color paint at all. So they tried to pull the flower pedals, twisting and scrub them on the paper, which actually made some color, but is the color of purple; and that was really puzzling to the children, since the color of the blossom is orange. The children then tried to find eight kinds of plants in the garden and pressed them one by one on the paper. Different colors did show, and they pasted each plant beside the color it produced and took notes of the name of the plant and the color.

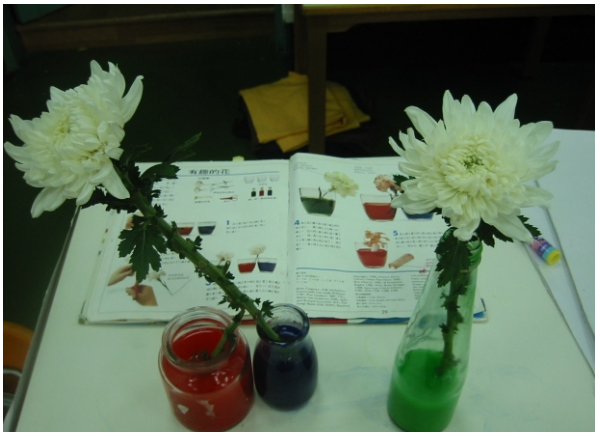
Some children also came up with the idea to □dip in the water,□ and there came one bottle after another of paints made of flowers and grass. Other observant children also noticed the color in the bottles of flowers showed faster than the bottles of grass; and the flower pedals and leaves that the colors came from turned transparent. The children took notes of the results of their experiments and share it with other children.

The wonder of the silk cotton blossoms producing colors enabled the children to discuss with their teachers about questions such as: What is color?Why there is a color?Where are the colors? Through the discussions, children found out that colors come from the Nature, and we can try to juice the flowers for the color ink.

Before the experiment, teachers would ask the children to bring up hypothesis, and take a guess if the juice coming out of



Student's Work


Magic Color

bananas is yellow? They bring all kinds of vegetables, meat, and rice for the experiment, and found the color ended up amazingly different from what they expected. After all, the nature of science is to hypothesize boldly, and to verify it carefully!

Topic 2: Park

Parks are children's favorite places to spend their holidays. So it is naturally a topic children would be very much interested in. The children are not allowed to go to the park everyday, so they say: Let's move the park to the classroom! That is a huge project. We begin to think about things like: what's in a park? A swing, sandpit, and sliding board are absolutely indispensable. But to mount a swing on the ground is not a small piece of cake. We had to observe the shape of a swing in the outdoor playground and think again why it does not collapse while there are children sitting on it?

After returning to the classroom, we tried to move the closets and use them as the trestle, and find a balance beam as the bulk to tie the rope that connects to the sitting board. The children attempted to build the swing by themselves; once failed, they tried another way to do it. And after the elephant sliding board was finished, they tried to found different paper and clothe for the surface material and see which one can make the slides faster!

Topic 3: The Secret Base-Candy House

Children like the feeling of hiding in a secret base, where they can play secretly and do things they like to do. More intellectual kids thoughts of a secret base with the shape of a candy house. At first they tried to use small camps to put up the secret candy house, but then they found the material of the camp could not stick to the candy; so they tried a big paper box for the walls of the candy house, and a super-sized candy house was finished! Children played transactions inside the house, and there were also a witch flying here to render her delivery service!

Student's Work—Candy House

Due to the spirit of open education and exploration of projects, children in our kindergarten are very interested in observing, asking questions, and especially in doing things by themselves to solve problems. Such qualities are not easy to be shown in the ordinary evaluation charts recording children's learning conditions. Therefore, at the end of every semester we use a descriptive evaluation report for each child to capture his/her growth with truthful depictions.

In all, the teaching and the plan of the Living Technology course are infused into the project methods. Some projects have more technological content; others less, but basically every project emphasizes the coordination of children's hands and their brain.

Student's Work—Secret Candy House

Taipei Municipal Jianan Elementary School

Chen, Te Jen

The school is located in the Daan District in Taipei City. There are 102 classes, 3,424 students, and 174 faculty members (including full-time and part-time teachers of Science and Technology Courses). We have six labs for the Living Technology course, and three facilities rooms, and three computer classrooms.

According to Grade 1-9 Curriculum Guide, Living Technology and Natural Science courses are classified as an integrated field. Currently, our Science and Technology courses for each grade are as follows:

Grade	Course	Session(s) per week
1	Life	7
2	Life	7
3	Science and Technology	3
4	Science and Technology	3
5	Science and Technology	4
6	Nature	4

Note：

1.Life includes Science and Technology, Social Studies, Arts and Humanities.

2.Now,the sixth grade still adopts the 1993 Elementary School Curriculum Guide, and combines Living Technology in the Science course.

3.There are 40 minutes in each session.

Except Science and Living Technology, the third and sixth graders have a computer class on information technology education every week.

Besides, every March we have science fair competition before the National and Taipei Science Fairs are held. Those are good opportunities for students to use

Joining Science Fair of Elementary and Secondary Schools

technology and scientific knowledge to solve problems and present the results.

Our principle of technology education and teaching plans are based on the nature of elementary school technology education and the physical and mental development of the students (7-12 years old). The introduction to our technology education is as follows:

1.Concepts of Teaching

Technology is the human activity to take advantage of various resources to solve problems and to adapt to the environment; "action", "practicality", and "innovation" are its main characteristics, which are concordant with the quality of cognitive development of children in elementary schools. Therefore, technology education in elementary schools should begin with teaching the technology in everyday life, based on children's activities, and focus on the cognitive ability of technology, in order to expose students to technology and let them understand the convenience and impact of technology on human life by hands-on experience. Thus, students are inspired to get curious and take interest in learning about technology, which not only helps lay the foundation for the

Discussion of Making a Rainbarrel
(Rain Water Storage)

technology education at a later time, but also gives students a chance to learn to make use of technology to adapt to future life and develop technological literacy that is incumbent on every child.

Besides, technology and science are two complementary subjects. The knowledge of Science provided by the science serves as a solid theoretical basis for the development of technology. Through the innovation by technology, humans are able to verify scientific theories and grasp the chance to arrive at the truth, and adapt to living in the natural environment. Therefore, to conduct technology education through Science and Technology courses should be very helpful to cultivate students' technological and scientific literacy.

2. Curriculum Planning

The Grade 1-9 Curriculum has a limited schedule for technology education in the elementary schools, so it is difficult for us to introduce a complete technological knowledge system and related concepts to the students. Considering the interdisciplinary quality of the Technology Education, this course not only cultivates students' technological literacy, but also effectively integrates the center of the whole curriculum. Therefore, in planning the curriculum, we combine the subjects of Science and Living Technology as well as computer lessons to apply to technology education, and coordinate the teaching contents of other fields (such as number, shape, and quantity in math, association, design and creativity in arts and humanities, historical development of civilization and environmental consciousness in the social field, and the practical learning experience in the synthetic activities) to form appropriate topics for the technology course. For each field and the course of each grade, we try to instill technological components for the school-based curriculum, for the purpose of enhancing the output of technology education.

3.Teaching Methods

The teaching delivery resorts to various strategies and flexible methods depending on different situations, in order to meet the needs by distinct individuality of every elementary school students. Yet in terms of the content and quality of technology education, the problem-

Making a Rainbarrel
(Rain Water Storage)

solving teaching method is the most common strategy for this course.

In class, the teacher creates a problematic condition to motivate students to learn actively, and provides a supportive environment to encourage students to use speech and signs to express their own thoughts and concepts. We starts with observing concrete matters, then proceed to learn to comprehend abstract analysis and probing of the issue, and then engage in the procedure to solve problems.

Besides, we make use of elementary school students' psychological feature to care much about peer relationship, and to induce them to develop solutions for technological problems through group discussion, brainstorming, and objective thinking and analysis.

4.Instructional Evaluation

The criterion for evaluation of learning outcomes is the course objective. The selection of evaluation methods, including paperwork, oral presentation, project, and portfolio, depends on different teaching content. Besides evaluating cognitive ability, emotion, and skill, formative and overall evaluation would also take the teaching process into consideration. Besides teachers' evaluation, we also adopt group learning to implement self-evaluation and peer evaluation. The evaluation results will help students understand their learning process and also facilitate teachers to improve their teaching.

5.Teaching Outcome

Although technological literacy has been a component of elementary school curriculum, it has never been a complete knowledge system until the effectuation of the Grade 1-9 Curriculum, technology education in elementary schools was made an official curricular component. Due to the fact that technology education is still new to elementary school teachers and students, the substantial teaching outcomes are still unknown. Yet through the teaching process we find elementary school students are generally enthused with technological courses. The zealous participation of the students in technological courses, from our point of view, is the best demonstration of the teaching outcome of technology education.

Student's Wind Power Car

Wind Power Car Testing

Taichung Municipal Liming Elementary School

Shen, Yuoh Ching

The school is located in the Nantun district of Taichung City, with a large expanse of campus and abundant natural life resources. We have 49 normal classes, 1 special class, and two kindergarten classes. There are 110 faculty and staff members and 1,788 students in the school. I am the present principal. My specialty is natural science; and my target is to develop the school in its natural environment as well as the technology education. I select teachers with specialized knowledge and a passion for education and who actively improving themselves in their profession to teach in our school.

The teachers are responsible for teaching and planning Science and Technology courses, to substantiate the educational principle of technology education in the curriculum. We establish teaching resources center and little sun bio-garden to provide all kinds of teaching facilities and assist teachers in fulfilling the concepts of ecological environment teaching and technology education.

The main contents of the course are: (1)To learn the knowledge of technology and popular hi-tech products. (2)To know household technological products. (3)To understand the impact from the development of science and technology

Graduate's Paper Presentation

Students Are Enjoying in the Activities

on human life, and learn to use and manage science and technology to adapt to modern society.

Through technology education, the problem-solving learning activity which is the main part of the course plan, teachers use questions to induce students to think and inquiry to learn to observe, experiment, and generalize, and to develop the ability to criticize and to create. In this way, the class is vivified with an inquisitive atmosphere that involves every student in the discussion and expressing their own opinions, to experiment and bring out results of their own judgment, and to work on a project and present their own achievement.

The principle of teaching is to cultivate students' ability to inquiry and to learn as a team, to acquire technological intelligence and skills, so as to satisfy the course objectives, and also, to train students to inquire and verify an issue with scientific approach, to develop a habit to think with scientific logic, as well as to use scientific knowledge and skills to solve problems. We emphasize cultivation of a scientific attitude that leads students to enjoy the pleasure of discovery and to foster a truthful and practical spirit.

Evaluation of learning outcomes is conducted along side teaching, with course objectives as the basis to inspect if students have learned the basic skills they are expected to learn. The aspects of evaluation are cognition, psycho-moto

skill, and attitude, including formative evaluation and summative evaluation.

In order to realize technology education concepts, we not only have Science and Technology course, but also actively plan on various kinds of teaching activities related to the subjects. Those activities are put in the School-based curriculum and the school calendar as among the priority list. For example:

1.Implementing Scientific Creativity Contests

(1)Purpose: to encourage students to think creatively under a situation with constraints and to actually take actions, and be inspired by both thinking and action in science.

(2)Topics of contest: (1)chopsticks gun bombards the castle.(2)creative contest of making a solar-powered steaming boiler.

(3)Form of contest: open to the fifth grade teams, six to seven in a team with a leader and a self-designated team title. The items to compete are creative shape and operational skills.

2.Hosting Observation Competition of Making Scientific Toys

(1)Purpose: to encourage students to recycle materials and use their creativity to make interesting scientific toys, in order to effectuate the implementation of basic courses in our school.

(2)Form of activity: encouraging student participation from every grade, to use recycled things such as plastic bottles, paper, clothes, wooden boards, and batteries to make a curious scientific tool.

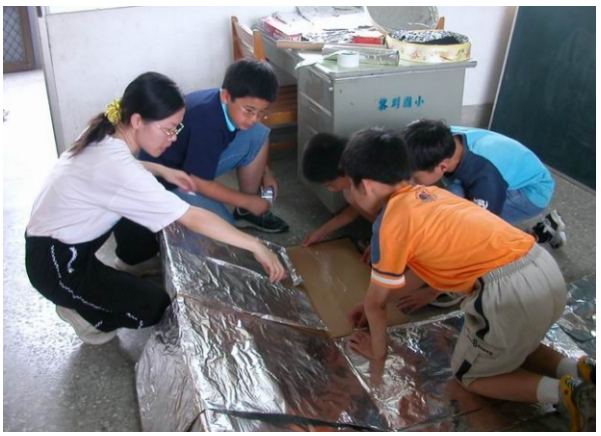
(3)Things to encourage and to caution: In the beginning of the semester every class has to submit three works of creativity to the academic office, for a public display on campus later; and the reward is a certificate of honor from the school principal. The works are supposed to be created by students with proper advice by their parents. Former works from previous years can be a reference for types of works and topics to be chosen. A team of no more than four people is the restriction.

3.Presentation of Capstone Project as Graduation Paper

(1)Purpose: to encourage students' interest in researching and promote a research atmosphere; to cultivate the ability to think independently and solve problems, as well as to use technology to develop the ability to collect information and present the results.

(2)Form of activity: open to sixth-graders, with six to eight people in a group for a team research project. Teachers serve as advisor, and parents are also encouraged to participate. Research results

Solar Crockpot



Making Solar Crockpot

should be edited in the form of a paper and a PowerPoint file to be presented in conference where the parents are invited to come, and the principal will openly award the outstanding papers, which will be printed as an anthology as a souvenir for the graduates.

(3)Research methods: to integrate present subjects of similar concepts and nature, and to deepen and expand the topics of educational value and are worth researching, through information collection, analysis and generalization, survey and interview, observation and experiment, thinking and challenging, etc., to conduct a rather serious research.

4.Teaching Outcomes and School Features.

(1)Teaching outcomes:

I.Our school was awarded the first prize with Technology Education of Ecological Environment and Project Research as Graduation paper in the evaluation of school's special features for the elementary school section in Taichung City, 2003.

II.Our school is the key school to implement scientific creativity activities, with satisfying results.

III.Our fifth-grade students joined in teams the No-nuclear Homeland Solar-power Creative Application Competition hosted by the Housewives' League, and won the first prize with the invention of solar-powered steaming boiler.

(2)School features

I.Emphasis on actualizing the ecological environmental education: we established ecological teaching material garden and the campus walk of learning to supplement the teaching. We also join in the green school partners and apply e-technology to share reflections of

Students Are Making Chopsticks Gun

technology to share reflections of teaching regularly.

II.Promotion and implementing teaching activities of the subjects of information and technology applications, to improve students' technological competency. Every class have their won website, where real-time teaching can be conducted on-line, and that makes a good example of e-learning strategy. We also host scientific creativity competitions and producing scientific toys.

III.Healthy, Vigorous, Creative, Outstanding are the features of our school's basic courses. We aim to cultivate students with limitless creativity and the ability to conduct research project, as well as the fundamental intelligence of using modern technology.

Graduate's Paper Presentation

Taipei Municipal Renai Junior High School

Wang, Ching Hsiang

Renai Junior High School is located in the east sidethe downtown area of Taipei city, so most of the students come from families with high financial and social status, and their parents are actively engaged in the affairs of the school and are rather demanding on their academic performance. Even so, technology education is in no way neglected in the school. Living Technology plays a part in the school curriculum. Devoted teachers, happy students, and full support from the administration are the components of the ideal technology education in our vision.

In each grade, all the classes have a session of Living Technology Course every week. There are five to seven teachers lecturing this course for all the 86 classes in the school, and some of them are also responsible for the information technology course.

In order to improve the quality of teaching and the content of the teaching activities, and to facilitate the teaching process, our Technology labs are fully equipped to meet all the demands.

The Mini-Machine in Living Technology Lab

Living Technology Class

There are currently four Living Technology labs, and each one has a wall screen and a suspended projector to enable the teachers to sufficiently implement e-learning strategies and help Science students' Technological Literacy. Technology labs are mainly furnished with desktop machines, such as jig saws, drill presses, and abrasive machines which enhances students' capacity to think creatively, to plan and design, and to carry out their ideas into practice, so as to strengthen their confidence and ability to solve problems independently.

Our teachers encourage students to participate in technology competitions and science shows, and instruct them through the whole process, with an aim to motivating students in their learning of Living Technology, as well as allowing them the opportunity to demonstrate their learning outcomes. Outstanding works will be displayed in the school anniversary. We also established a Living Technology DIY Society in the 2004 school year for students interested and skilled in this subject to be more adequately exposed to living technology.

Our educational objective of the Living

Technology courses are: to increase every student's technological literacy, and to cultivate the ability and knowledge a consumer should have to properly identify the quality of technological products of everyday use. We have a situational Q&A exercise designed for specific topics to provide students the chances to learn the skill of problem solving, to think and take actions, so as to enable them to think individually and creatively to solve problems in daily life from such hands-on experience, and to have every student happily adjust to the technologically highly developed social life of today and the future.

Most of the teaching materials of our Living Technology courses are designed by the teachers. Every learning activity session is composed of the following elements: input of questions, management of resources, handling process, output, and the feedback. The content of teaching integrates four main technological systems: construction, communications, transportation, and manufacturing. The teaching activities emphasize all of the three aspects of learning: cognition, emotion, and skill, and correlate with nature, mathematics, and humanities,

Instructor is Helping Students for Working Out Problem—Solving Project

Instructor is Helping Students for Working Out Problem—Solving Project

with the hopes of cultivating students' technological competency in a well-rounded and integral way.

The focus of teaching activities is problem-solving teaching strategy, different from those adopted in the traditional Industrial Arts courses, like lecture, demonstration, practice, and evaluation, where teacher takes the lead and students learn what they are taught. This strategy allows students to solve problems by the following steps: defining the problem, setting the goal, developing possible solutions, selecting the best option, taking the planned actions, and assessing the outcome. They are usually implemented in the following model:

1. free grouping
2. teacher brings up the question, deadline, and the criteria of evaluation.
3. clarify the problem
4. collect information
5. analyze the information
6. figure out the possible solutions
7. choose the best option
8. assign the work and carry out the best option
9. evaluate the outcome
10. design the method of improvement

The way to evaluate learning outcomes of the Living Technology course is diversifying and flexible. Appropriate tests are given in the beginning, middle, and the end of the learning process to keep track of students' development before and after the learning, as well as the learning outcomes. The results of the tests provide the reference to students' learning and teachers' improvement of the teaching methods. The three aspects of evaluating students' learning outcomes: cognitive learning (knowledge), emotional learning (attitude, attendance, and class participation), and skillful learning (DIY), are all our target of assessment. We also take individual difference into consideration to implement the proper evaluation criteria. Peer comments are also important to the assessment of learning outcomes, in order to instill through the process the principle of value judgment in the students.

All the teachers of the Living Technology course are very devoted to contributing our specialty to teaching, as well as continuously improving ourselves in the special field and conducting teaching research, actively design new teaching materials and activities, and improving the teaching of this course. We share common teaching resources and upgrade the facilities of the labs to establish a quality environment for teaching the most useful course that is closely related to everyday life. Hence, our students often win big prizes in a variety of contests. There are also a fair number of students who do not perform well in ordinary subjects gain their sense of achievement in the hands-on exercises in a Living Technology course or

Students Are Working out the Problem Solving Project

competitions, and discover their specialties and a zeal to probe further into this field. This change also affects their grades in the other under-performed subjects, improve them to an adequate level, and in the end the students pass the entrance exam to the school of their ideal, where they get to develop their potentials and are able to create a good future for themselves.

Over the years, Living Technology has never been a required subject of the entrance exams to senior high schools, but our school abide by the principle of conducting a well-rounded education of morality, intelligence, gymnastics, community, and aesthetics, keeping sowing the seeds of technology education.

Student's Carpentrys of Woodworking Design

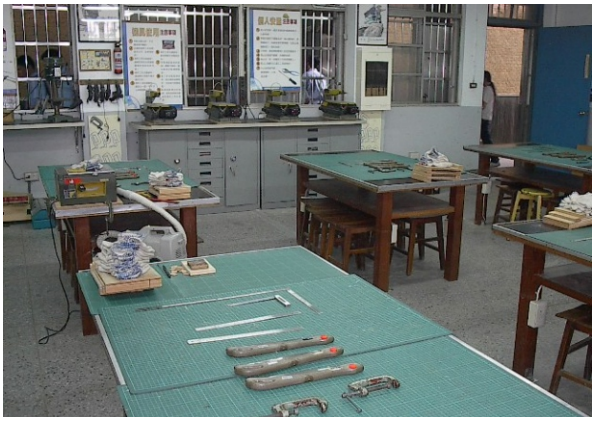
Taipei Municipal Jinhua Junior High School

Lin, Ran long

Our school is located in the center of Taipei city, next to the lush Daan Forest Park. The school was founded during the Japanese occupation, and has a 67 years' tradition of history and humanities. There are about 4000 teachers and students in the school. Most students come from financially and socially better-off families in the district, and are versatile and deft to learn. Since the new policy of Grade 1-9 Curriculum was enforced in 2002, the previous curricular subjects have been gradually integrated into seven fields, among which Living Technology and Natural Science (including Biology, Physics and Chemistry, and Earth Science) are combined in the same field, called Science and Living Technology.

Currently, Living Technology and other Natural Science courses are offered for students in every grade (grades7-9) to take a weekly Living Technology class as required by the curriculum. Since there are 100 classes in the school, there are five full-time teachers responsible for all

Living Technology Teachers Share and Discuss Teaching Experiences



Living Technology Labs

the Living Technology courses. All of those teachers are graduated from the National Taiwan Normal University, and are capable of contribute their specialty to fulfilling the needs of students' according to their different abilities. Most of the teachers design technological education activities independently, and every one has his/her own lab and well-equipped teaching environment, which provides tools and handy machines required by different topics for students' hands-on exercises, and thus facilities a high quality learning experience.

In each school anniversary, many of students' works in the Living Technology course are on display, exhibiting their unique creativity, and attracting all viewers' attention. Visitors recognize the outcomes of technological education in this way. Besides, the students' projects have stood remarkable in several of the yearly Taipei Living Technology Education Contest. Moreover, teachers of this subject meet from time to time to discuss the design of lecture and activities, and coordinate with the community and the National Normal University to conduct trainings of in-school teachers to cultivate young teachers of technology

Display of Student's Works

education in high school."Scientific reason is the faculty to probe and comprehend the nature of things (to knowledge); technological sensibility is the capability to realize human ideas and creativity (to manupulate). The concord of reason and sensibility, and the combination of knowledge and action, is a learning experience to accommodate all levels of students' knowledge, skills, and value judgment (emotion)".

The technology education curriculum is a continuance of the former Industrial Arts course for junior high school, which demands the training of skills. Afterwards, based on the impact of technological and social development, the government enacted the criteria for Living Technology curriculum, and thus the course is gradually transformed into technological teaching activities that stress the thinking and ability to design. The nine-year educational system results in the integration of math, science and technology, developing a MST technological education strategy. The overall content of the technological courses we designed for students includes the following five aspects:

1. To design, develop, and utilize technological systems in human life.
2. Open and trouble-shooting oriented design and project.
3. Learning strategy that covers cognition, skill (hands-on activity), and emotion.
4. Utilizing modern resources to apply technological knowledge and process in the real life.
5. Independent effort and team work to learn and solve problems.

We provide the following three learning activities to students:

1. Design: problems to be solved are presented in the form of key issues of design, to encourage and challenge students to think and resolve the technological problems.
2. Inguiry: design learning activities to instill basic knowledge and skills in students to effectively practice problem-solving and project exercises. Students have to learn the skills to use certain tools and to handle materials in order to solve problems. For example, before students are able to design and produce technological products, they are required to learn to draw simple

Presentation of Students in Class

Robotic Arm

graphics and make models.

3. Creation: design activities give students the chance to experience the nature of technological activities practice. The most exciting thing for students about learning technology is to use tools and handle materials to produce their own works; they always do it for curiosity and fun.

In teaching Living Technology, we have made problem-solving tactic and thinking of design the symbiotic elements in the practice. Providing students with learning activities directly related to everyday experience is the most important point in our labs, especially the problem-solving teaching strategy, which is the focus of the technology education we have tried to promote. Problem-solving activities in the course are authentic questions, that is, students can try to resort to their cognitive and real-life experiences to take logical and effective actions and arrive at the targeted answer. Also, the answer, once confirmed, can be measured and evaluated for its applications in students' everyday life.

The technologiy education courses we implement have a unique system of knowledge and learning materials. The application of science and information technology, and the parallel design of science and technology have contributed to the same goal. Science and Living Technology are form into an integrating curriculum; that is, those courses carry out their separate goals of teaching and inducing students to probe the mission of creativity under a common structure of subject learning. The subjects of learning include: power and structural design application, module of simple mechanical and power gear design, electricity and practical electric circuit design, audio visual and communication technology apparatus design and application, etc. The lesson plan of every teaching unit is discussed and practiced by the teachers before it is taught in the class. Students' learning outcomes are evaluated by their portfolios.

In future, we hope the development of technology education curriculum can gain support from community resources to hold creative technological design competitions, in order to encourage more students to join in the learning of technology.

Students Were Discussing and Searching Information

The Affiliated Senior High School of National Taiwan Normal University

Ling, Yung Shun

Our school is one of the top senior high schools in Taipei, and our primary function is to ensure students to succeed on the college entrance examination. Even so, a well-rounded curriculum that cultivates multiple potentials of the students' is our priority, and therefore the Living Technology course is planned and conducted regularly in the sufficiently equipped teaching environment.

Our school is a complete secondary school. We have three teachers lecturing on Living Technology, including me; two of us teach in the senior high school, and I teach in both the senior and the junior high schools. In the senior high section, we have two consecutive sessions every week, and the course rotates with the Housekeeping course every other semester, and is for the 10th and 11th grades. In order to meet the demands of the Grade 1-9 Curriculum, the junior high school keep the course in the 8th-grade curriculum, a weekly session through both semesters.

Constructing a Bridge

Nearly Finished Bridge Made From Straw

The three Living Technology labs are situated in the Talent and Skill Building; each lab is administrated by one teacher of a special field. The labs and the facilities are arranged firstly according to the requirement of the course, and secondly to each teacher's specialty. To meet the new criteria of the curriculum that emphasizes students' creative thinking and design project, the course design focuses on integration of the living environment, and thus large-sized machines are replaced by popular and convenient facilities. Also, to meet the requirements of e-learning strategy, each lab is equipped with electronic teaching facilities, information facilities and Internet access.

In the senior high school, there is a student club on the subject of Living Technology, called Industrial Technology study club, where students have more opportunities to probe into creative design and practice and acquire more knowledge and fun. In 2003, we held a first round of selection competition for the Taipei Junior High School Living Technology Contest.

There was a small pool of contesters, but every one was among the top ones in each class. The group that won the contest has also in a way brought about a competitive atmosphere among the students on the outcome of Living Technology projects, and boosts their interest in learning.

The content of Living Technology courses is meant to be close to daily life and centered on problem-solving skills, and it is also expected to inspire students' interest and curiosity in technological matters in order to incite them to develop the ability to research. Therefore, lecture is absolutely indispensable. But due to the fact students may not be able to concentrate and take interest in the whole session, we use 20-minites footages edited by ourselves from programs such as Discovery Channel to amplify the lecture, which not only fulfills the purpose of teaching, but also impresses the students.

Production is another key point of the curriculum planning. But it doesn't mean a large number of common productions from the whole class, but projects by each person that demonstrate individual ideas and weusually tell students some basic principles of doing the project that allow them the space to fully exercise their creativity to reach the target, and thus also inspire their potential greatly. We ask students to keep a learning schedule, taking note of the whole process, and to write a paper for each assignment, in order to ensure them adequate knowledge to conduct the project of design, and the method also serves to lead the students through every step and ensures active participation from each student. In every semester, we will give three assignments to the students based on the course content, and each assignment would take four weeks; two of them are team project, the others are individual. Teamwork inspires better creativity, and personal project would better display technical and operational abilities.

Before we let the students start their own projects, we would demonstrate how to use every tool and machines, and remind them of safety issues; more importantly, we would constantly remind them of the regulations and inspect them during the exercises, to make sure they do

Testing Weight-loading of Finished Bridge

Soldering Practices

everything in the right way, since we consider safety at work and correct attitude the basic requirements of learning.

As for the assignments, besides teaching knowledge and skills related to the subjects of the course, we also try to instill knowledge of other fields in the students for the purpose of integrating education. Take last semester's Energy and Power for example, the exercise of designing a windmill, an adaptation from an activity in the YuanT.Lee Fun Science Contest, is a practice for students' to design the form and structure as well as the mechanism of a windmill, including the working of axle and abrasion, etc. Students have to exercise their creativity to finish their project with limited materials and supplies.

The assignments are designed based on course requirements. Teachers do not prepare materials for students (except the special materials).

To collect necessary components isconsidered as integral ability for adjusting to a life of technology.By locating into and buying the necessary materials, students learn more of the living environment, and through the activity of buying, they have the chance to know a lot of different materials.

Practicing the Usage of Multimeter


Student's Work—Electronics Tester

I especially like to discuss with students during their practice. From those discussions, I get students' feedback of the assignment so as to give them useful advice. When students stumble upon some problems, I can correct them and impress them at a best timing. During the teaching activities, frequent discussion and communication with students not only benefit them, but also myself. Students are endowed with limitless creativities, and their ideas often make up for what teachers miss to notice. Thus, through those activities, teachers are given a chance to keep improving their teaching, and make the course a platform for them and students to learn from each other.

Taipei County Fuho Junior High School

Lu, Nancy

Since Fuho Junior High School was founded in the fall, 1979, the curriculum has been designed according to the educational objectives of junior high school, especially the equal development of the five educational targets. We have won the first prize of the Industrial Arts Exhibition for six years in a roll, and have outstanding performance in the national science demonstration.

The incumbent principal, based on the ideal of an unconditional education that cultivates each student's potential, joins the force of all faculty members on the mission to educate the youngsters of the 21th century, on the solid basis of a fine school tradition.

There are now six teachers of the Living Technology courses. They often share their teaching experience among one another. One of them is in charge of all the Living Technology courses, and some others are members of the curriculum development committee, and they are actively involved in the observation team supported by the Taipei County Government. Their work has enhanced the standard of the teaching of Living Technology in the school and caused

Marketing Course

New Opening of Our Practice Company

positive influences on the public; they also acquired considerable new teaching methods and ideas through participating in the training of new teachers of Living Technology course. To ensure the new school curriculum wouldn't take up the session hours of Living Technology course, our curriculum development committee decided to add one more session to the original one-session classes of the 8th grade on a flexible basis since the school year of 2004; and the teachers should prepare their own modular learning workbooks.

The lecture of Living Technology for each grade is theme-oriented. Following are the themes for every grade:

7th grade: environmental protection creativity--graphics and construction.

8th grade: Fuho Internship Corporation--manufacturing and communications.

9th grade: household recreational activity design--electronics and transportation.

Our Living Technology labs include three manufacturing workshops (for carpentry, multi-purpose lab, and pottery) and two communication studios (information communication and electronic communication). The teachers are assigned the management of the labs according to their specialties, and

Being Directors

Printing T-shirt

coordinate in the teaching based on the needs of the students. The courses of manufacturing design and communications take the form of modular teaching, which allows a shift of classes every semester or 10 weeks to allow teachers to fully invest their special knowledge in the students who are interested in certain subjects. It is an effective way to cultivate the basic abilities the youth of the 21th century should command.

The greatest challenge all teachers are faced with after Grade 1-9 Curriculum Guide is officially launched, is to teach the knowledge of technology to the students, cultivate their creativity, thinking, and problem-solving ability in a limited time period. Hence, contests held on a regular basis, such as stone-casting truck, bridge construction and weighting test, or science fair, not only meant more workload but also gave us more time to teach and to learn. Our school has been one of the Green schools for two years we employ the policy of energy restriction and making use of local or existing materials to design creative products. For example, the mini environment-friendly night lamp made in a seventh-grade subject lesson, demonstrates students' ability to draft graphics and design simple electrical circuits.

Designing an ideal classroom is a topic lesson that focuses on in-depth learning of the basic knowledge of construction technology, measurement competition, interior design, planar graph, signal identification, and building models.

In the lessons of technological news report, students in each group played the roles of a news anchor, production director, copywriter, setting designer, or cameraman; they collect information about technology development to make TV news stories.

Fuho is an information concentration school. We make use of our plenty of resources to teach students how to make online serial image files, and train students on the ability to effectively express themselves. We established our own online TV station, which enables both students and teachers to show their animated performance on this digital platform anytime, and it is also the outcome of our efforts on applying information technology in teaching. Since this summer, the school has adopted wire-free Internet service, which greatly facilitates online teaching and learning activities.

We developed a cooperational teaching strategy for the eighth grade, which is an imitation of real-life companies. Students learn how the business is run in a company, and what is the e-commerce through the super salesperson platform. They tried to

get orders by printings, photography, and online marketing; after that, they practiced to loan from a virtual bank, and carried out plans of designing models and made certain amount of products by order. Active evaluation motivates students to learn by themselves. The course design for the ninth grade focuses on greenery architecture; the key concept is utilization of new energy resources. Students design electronic components and circuits to manufacture works according to their plan, which is a challenge to students' intellectual capacity. Activities on the course agenda to be implemented include debates on nuclear power plants, and a local tour by MRT system.

The course design emphasizes both technology and humanities, promoting the importance for students to be responsible in their duties. We also arrange want ads for students to take different services that suits their specific strengthens, and give them □caring service cards□ whenever possible, to let them accumulate credits for business image for their groups.

At the end of term, we hold online project exhibitions to display pictures, works, music, and performances online, so as to encourage students to share their versatility more actively.

Now we have students volunteer for services to assist teachers to design teaching materials and thus inspire the trend of knowledge management. We also won the first prize in the Creative Course Competition held by the Institute of Chinese Creative Teaching.

We have issued Living Technology digital certificate for years. During the three years, students have to learn graphics inspection, drawing, purchasing printing materials, making printing mode, and designing and producing two pieces of an environmental friendly product. By

Porous—Screen Printing

Interior Design Model

the time of graduation, students have to finish an electronic product, an interior design, and they have to take a picture of their work with their parents, and help plan a trip with their parents.

Our school has long been recognized by our performance in the field of Industrial Arts and Living Technology. The new course design composed of the up-to-date elements demonstrates our vitality and creativity, as well as the fruits of all the teachers' efforts. We expect a creative teaching style that is open to change can also achieve brilliant learning outcomes and improve steadily.

Our Living Technology websites:

1.E-learning Lab of Living Technology
http://163.20.173.111

2.Living Technology Teaching Platform
http://163.20.173.110:1234

Taipei Municipal Lishan Junior High School

Chang, Ming Chieh

Our school is located in the Neihu district in Taipei city, inside the alleys adjacent to a residential area, and is endowed with tranquil surroundings. But since the recent ten to twenty years, the population in this neighborhood has increased quantitatively, so the school that was planned to accommodate forty-five classes, now the number of classrooms generally required have jumped to sixty-five, and the available space has been greatly reduced. Consequently, subjects that need independent classroom for a better teaching ambience are left with limited space, and Living Technology labs are also under the same constraints. The classrooms available are a computer classroom in the fourth floor and two other classrooms in the basement. Due to geographical factors, Neihu is very humid and over the years the buildings have been shocked by many severe earthquakes, the cracks of the walls and leakage are all inevitable conditions,

Collecting Information from Internet and Discussing Problem-Solving Projector

Students Compromise the Class Regulation in Classroom

which though have been somewhat improved with many renovations, but years' humidity has rapidly damaged the machines and turned them into waste. To solve the problem, the newly purchased twenty jig saw tools and desk-top machines required by the new curriculum, are placed in the facility section in the third floor, and are moved to the labs in the basement when the course need them. For long-term development, we will apply for water-proof renovation and humidity control and air-conditioning. When those are finished, we will arrange and buy more equipment like closets, machines, tools, etc.

We have three full-time teachers responsible for the Living Technology courses. In the new curricular plan that is subjected to the school's policy, there is still a weekly session of Living Technology for three full school years in our school. The core concept of this course is to design technological products, and relevant topics include communications, manufacturing, construction, transportation, energy and power, etc. The subject of group activities also has advanced selective courses

DIY Design, Graph, and
Make the Pattern Plate

outside of computer lessons (there are separate computer courses.

Natural Science aims to discover and explain the process and effect of natural phenomena; technology the process and effect of human efforts to adapt to the environment and improve life with machines, materials, knowledge and creativity. The learning of technology should begin with the design, production, and utilization of artificial environment, then proceed to exploring the ways to have man-made environment co-exist with Nature. The development of technology is closely related to the evolution of humanistic society. Technicians apply both the existing knowledge, skills and materials and new findings of science in innovating products and techniques to improve the working of humanistic society and create better living environment for human beings. Owing to the complex mechanism of humanistic society, the design of technological products has evolved from manual operational merchandize to that with sophisticated functions but easy to operate, in order to accommodate the changeable human needs and sever tests of the environment. However, the basic course is not supposed to be too complicated, so we put accumulation of creative experience in designing technological products as the target of students' learning. We teach students to use existing humanistic and scientific knowledge as the foundation, Nature as the materials, and learning or attempting at inventing effective tools and operational skills as the process, to create a wonderful lifestyle for the humankind, which is our objective of learning.

It is important to learn the existing techniques, but most of the skills the students learn will be replaced once they come into the society; therefore, learning to adapt to and develop new skills and to solve unknown problems are the tasks too important to be ignored. Moreover, given the limited sessions of the Living Technology course, the priority of learning the techniques lies in creating more value out of the skills acquired instead of learning more skills.

Because the target of learning is to express the creative experience accumulated in designing technological

Presentation with Projector in Class

products, we adopt the design situation that spans over school years to develop students' problem-solving ability, which is the dominant learning mode. At present, a more matured course is the simulation course of the model design company.

Products developed by the model design company include models (blocks, bridges, or plane miniatures), technological brochures (maintenance guide or user's manual) and product wrapping. Students have to learn the prime missions of the designer, producer, seller, and the user, and strive to achieve the utmost benefits for the environment and quality of living.

The following step is to cultivate students' ability to observe. The tasks on the to-do list include:

1. What is the problem to be solved? (who, what, when, where, how, and the inter-connections between those elements.)

2. What is the purpose to achieve? (what are the jobs to be done, and what outcome needs to be created to resolve the problem?)

3. What is the method to use? (the principles, rules, tools, and techniques and the procedure and skills of working.)

4. What is left to be desired? (The things to be improved to create the competitiveness of the product.)

The next step is to learn the procedure to solve problems through cooperation and to utilize resources to make the products. The resources include human force, information, material, equipment (tools and machines), energy, budget, and schedule. We adopt the problem-solving procedure developed by Prof. Fang, Chung Hsiung to classify the ability to solve problems into four kinds: locating the problem, identifying cause and effect, developing the measures, and thoroughly seeing through the process.

In the process of working and the demonstration of the outcomes, comments of both the leader and the group, and the peer groups are taken into consideration to improve their ability to appreciate each other's works. Students are also asked to collect obstacles encountered or inappropriate actions to be compiled in a spreadsheet for future reference in upgrading their competency in this subject.

Manufacture by Using Pattern Plate

Fabricating

National Taichung Second Senior High School

Huang, Chiung

Located in downtown Taichung City, National Taichung Second Senior High School is an urban school with a tradition of 80 years. There are 69 classes in the school, and the total number of students is around 2850. Living Technology is a required course for both the 10th and 11th grades; it takes turns with the Housekeeping course of the Life subject every other semester. In every school year, we have Living Technology in the first semester, and Home Wconomics in the second semester; there are 2 sessions for each class every week.

There are four fulltime teachers teaching Living Technology courses. All of them were either graduated from both Departments and Graduate Institutes of Industrial Education, or had earned the full credits required by a graduate institute. Two of them also play administrative roles in the school. There are 3 Living Technology labs (including communications, energy transportation, and operation manufacturing) that provide the location for teachers to prepare for teaching materials as well as for students to engage in the exercises. Each lab has tables for groups of 5 students each, and every table has a computer with built-in Internet access to allow students to search and collect information related to the contents of the course. Besides, in order to let students have enough space for hands-on experience, there is an exclusive working area that allows students to practice operating machines, equipments, and other related tools. Also, there are many actual-sized models of engine, solar power supply system, etc, to help students familiarize with theories taught in class, and boost their motivation to learn.

Making a Bridge

Operating Machines

Our school has a fine tradition since the time when the Course of Industrial Arts was part of the curriculum. We have held Taiwan's teaching observation, competition, and exhibitions, etc. In recent years, we have held meetings such as Teaching Living Technology and Application of Computer to Living Technology for teachers. The teaching

Activities of Living Technology consist mainly of project design, often conducted in the form of contest or of accomplishing a certain target. Those activities emphasize students' problem-solving ability and creativity; they must try to deal with the problems they encounter in the process. In this way, students are not only inculcated with the spirit of teamwork, they are also trained on the ability to solve problems and to think creatively.

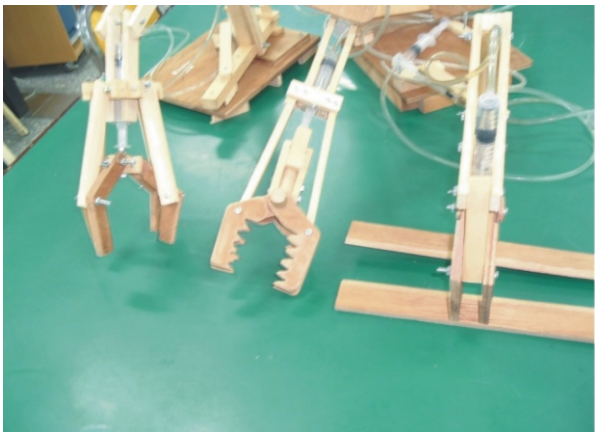
Curriculum wise, the main course contents for the 10th grade are Introduction to Technology and Information and Communications Technology; the main subjects for the 11th grade include: Construction Technology, Manufacturing Technology, Energy and Power, and Transportation Technology. But due to limited time of the sessions, the teachers often choose only one or two of the subjects for the lessons.

In Construction Technology, taking Design and Construction of a bridge for example, the teacher introduces knowledge of construction techniques related to course content and illustrate concepts of bridge structure with class exercises. Problem-solving strategy is the key teaching objective. Students are given 25 small pieces of wood, nails, and glue to make a simulation structure of a bridge of a required size out of the spare ingredients, and have the bridge tested on its capacity of loading, in order to allow the students a chance to improve on their works. Besides exploring the structural

Simulation and Design

issues of mechanics, we also expect students to work as a team to design the form of a bridge. The outcome of this activity is satisfying: the students not only learn the structural issues, but they also show their limitless creativity in designing different styles of bridges.

In the subject Manufacturing Technology, we have an exercise called "hydraulic press robot arm", with the objective that the students learn to design a hydraulic press robot arm that can hold a certain object and move it from one spot to another in two minutes, and we count which one make the most rounds. The teaching activity enables the students to learn the basics of manufacturing



Different Chucks Design for Hydraulic Press Robot Aim

Completion of Bridge

technology, and let them understand the role robots play in the industry, and how oil pressure and atmospheric pressure work and their application in mechanical functions. In these exercises, students would have to employ the knowledge acquired in previous lessons and apply it to the activity. In our plan of this activity, the injector is used to create water pressure, and the students are required to design how to turn the water pressure into a move of clipping, of going up and down, and of turning around. Through this activity, students not only learn the process of designing a robot through hands-on experience, but they also design, as a team, works of a variety of perspectives and forms, which exhibit an intense interest and creativity of the students.

In "Communication Technology", students learn to use digital video recorder and digital camera to film and make a VCD or DVD, in the form of a special feature, a class activity, or a TV commercial. In this process, students learn to demonstrate with still images, animated optical messages, sounds, music, and characters a colorful picture of the multimedia technology. Students learn to use digital video recorder, digital camera, the PC file format of DVD, VCD, and MP3, and the skills of image editing program in those sessions.

On the topic of "Energy and Power", the exercise of "Racing Solar-powered Model Cars" is for students to use the same type of solar-powered batteries and engine to build a model car, and to have it race in runways, in climbing slopes, and in a tug of war. Students design different shape, structure, and gears for each type of race. In the end the activity provokes a lot of tremendous ideas and the students produced different "solar-powered model cars" that can climb slopes of an 80 degree acclivity.

The above activities are evaluated by principles such as the effectiveness of fulfilling an objective, creativity, and skills of production; and teamwork and the form of brainstorming are also important teaching methods that are taken into consideration.

Solar Car Contest

Taipei Municipal Yongchun Senior High School

He, Chi Chun

Yongchun Senior High School was converted from Yongchun Junior High School and established in 1994. Located in Elephant Mountain, generally known as Yongchun Hill, the school is privileged with geographical accessibility and serene surroundings, as well as sufficient teaching facilities, consequently an ideal environment for learning. There are totally 49 classes (including a special class) and over 2,000 students in the school.

Living Technology Class is scheduled for two consecutive sessions weekly, and for 10th and 11th grades this course is arranged to rotate with Home Economics Class for a full school year. The course emphasizes both creative thinking and practice. Facility-wise, there are two multi-functional labs with desktop machines that gradually replace traditional large-sized equipments. In order to apply information technology into teaching, this author submitted an application for purchasing information technology facilities in 2002, which included 19 PCs and Internet access for each group table to produce its own team project. A teaching website was established to showcase student projects and share teaching materials, with an aim to building an e-learning environment. There is also a room for displaying students' works and accommodating equipments. Since there is limited space in each lab, only facilities required for the course are put in the lab, and the others are put in the display room. There is adequate space on the displaying shelves for student works, which allows the students to place and display their works both in process and finished.

Warehouse

Processing Machines

The school holds a variety of talent and skill contests during every school year. Living Technology is certainly on the list. Recently we had competitions such as "Campus Architectural Model","Solar-Powered Vehicle Race","3-D Model of Buildings in Paris's Scenic Spots", etc. The winners' projects were exhibited along with outstanding works designed by students in Living Technology Class.

Student club that is associated with Living Technology is: Technology Players, a society that enables students interested in technology to research and explore the subject as a team.

At present, curricular activities are mostly designed by Living Technology teachers, or are adaptations from course designs by other teachers to suit the teaching facilities and our students' needs. Curricular activities are structured to teaching fundamental knowledge and providing the experience of practice, with the hopes that students can cultivate their abilities of team-working, inter-personal communication, and problem-solving through hands-on activities.

Categorized by two to three guiding concepts of different subjects, the main teaching activities consist of team projects, such as "Musical Stories", and "Commercial Show"— to write story or commercial scripts and film them with digital camera, processing them with image software and media player to show the work consisting of image, music and animated comics; and "Model House Design"— to instill the concepts of interior through the making of model houses. Also, "Designing High Speed Railway Station" is an exercise of designing the train station of Taiwan's High Speed Railway that will come into use in the near future, to explore the technical issues of architectural structure and its combination with local culture, and how to make the buildings blend in the environment. The aim of "Designing a Bus Stop" is to re-design the existing bus stops with knowledge of ergonomics and to learn environmental design and public arts. "Automation" is an assignment for the students to design a device to activate, stop, and re-activate a ball, in order to train students' problem-solving ability. "Application of Solar Power" is an exercise to use solar power as a resource to save energy consumed in everyday life. "Water Transportation trains" on designing to transport/move a glass of water to an empty glass. "Automatic Ship Model" is an exercise of fashion design for ships with the same power equipment; it is a competition meant to be entertaining and educational.

Each semester, there are two to three

Manufacturing

Instructor is Helping Students to Design

exercise activities related to the course content. The teaching of basic knowledge and skills comes before supplementary techniques or information that will be inculcated in the real practice; in this way it enhances the effectiveness of student's learning. Each group consists of four to five students, who learn to communicate and coordinate with one another and time management through the steps of comprehending the subject, discussion and design, work arrangement, buying materials, and actually producing the project as a team; they keep the process in a record of tables and produce a paper report. After their projects are finishes, they allow other groups to appreciate their works and give comments, thus developing their ability to appreciate designs。 In most of the activities, the students buy the materials by themselves, and only some of the required materials are procured by group order. The reason for doing this is to give students the opportunity to learn better about the materials. I also join the students' discussions, design, and work when there is a chance, and try to understand their ideas and questions in order to give them some advice. Sometimes they demonstrate unique creativity and ideas that in some ways inspire me. I think that is what is said: "Teaching is a way of learning".

The methods of evaluating students' learning outcomes include not only measuring their cognitive competency and skills by reviewing term papers, tests, performance in operating machines, exercise outcomes, etc., but also their general learning attitude and the ability to interact and cooperate with other students. Students in Yongchun are excellently creative, and they often bring out unusual and outstanding works that exhibit a sense of diversity and variation in their learning. The students take class activities seriously and their performance is the direct feedback to the teachers, thus encouraging the teachers to be devoted to course planning. As a result, the teaching of Living Technology Class keeps improving as time goes on.

Student Peer Evaluation

Taiwan High Speed Railway Station Model

Taipei Jingmei Girls High School

Wu, Hsiao Liang

The board of Taipei Jingmei Girls High School chose Gang-Qien, Muzha Hsiang, Taipei County as the school location in Feburary, 1963. The school was founded in May in the same year. In July, the school's official dependence was changed from Taiwan to Taipei City. Now there are 66 classes, 148 teachers, and 2,828 students in the school.

As the new policy on senior high school's curriculum was enforced in 1999, demanding girls' schools to give Living Technology Courses, I was invited to be the first full-time teacher for teaching this subject. I was graduated from the Institute of Industrial Education, National Taiwan Normal University, and currently I am a member of the team of Living Technology, Taipei Municipal Educational Bureau.

In October 1999, the school changed an old cooking classroom in the Talent and Skills Building into Living Technology Lab; since then, more facilities are purchased each year according to the plan. In the school year of 2003, the Dun-Pin Building was re-opened after being restored on its damage in the 921 Earthquake. The new building has two labs for Living Technology Course, both of them are equipped with a projector and audio-video facilities. Now there are different types of apparatus and devices on the table, and eight computers (with scanner and CD burner) for group exercises. However, the number of computers is still inadequate for Living Technology Courses. Since the school year of 2003, our school established distance learning classrooms with more computers, so Living Technology Courses have been able to access the former computer classrooms to facilitate the teaching of the topic of career counseling— to teach the exercise of "Planning My Future"and produce "Individual Photo Album CD." Moreover, those facilities also enhance the teaching of "Information and Communications," and enable the students to learn the skills of image processing, film editing and CD burning, thus providing them a chance to

Living Technology Learning Website

Demo of Student's Work

explore the choices of further education, and help them with the decision making.

Regarding teaching activities and design of the first Living Technology Class in a girls' school, I designed exercises such as "Memory Album of Youthful Days,"Making a Photo Album CD,"The Show of Creative Commercial VCD," and "Contest of technology common sense," and display students' learning outcomes in the exhibition of the school's annual anniversary. I also taped the performances of the school band and the flag team and other activities to make the anniversary VCD copies and distribute them to students and colleagues to give them and the parents a better understanding of the Living Technology Class and gain their recognition.

In order to follow through the concepts of teaching Living Technology Course, I would take time during school's winter and summer vacation to plan on the teaching contents for the next semester and draft a syllabus as well as a course plan, in which I classify teaching objectives into cognitive, skillful, and emotional ones, and list the agenda for each activity, methods of evaluation, teaching resources, and related websites. Also, I designed an inspection form for work skills to facilitate students' self-evaluation and teachers' review to keep track of student's learning outcomes. Besides, I produce teaching materials with the contents in the two Living Technology textbooks and student exercises, and make them into slides; I also record the process and results of

Student's Presentation in Contest of Technology Common Sense

every teaching activity and edit the film into VCD and give it to the publisher to share with all teachers of this course in the country. I also established a personal teaching website to let students preview the teaching contents and appreciate the results, to better motivate them in learning Living Technology.

In the back of the Lab, the school designs a bulletin to display student's project and teaching materials, with the hopes that students will appreciate the works of their senior schoolmates. We also demonstrate how lighting and stairway lighting is set, and thus intensify students' interest in learning by allowing them to operate it in person. Besides, in order to instill the basic safety principles

Demo of Student's Work—CD Clock

in the students, we hang teaching illustrations on the lab walls and display working suits and helmets on open shelves. Apparatus on the table is obviously attached with operative guidelines and safety rules to sufficiently remind students of the rules of utilizing each kind of machines.

Students' photo album CDs are vigorous showcases of the integration of subjects on modern communications and information. We have found girls are more interested in courses like information and media than boys and are much more devoted. Their zeal is especially vibrating in their performances during school anniversary, such as "Fashion Show," "Welcome Party for Fall Term,""poetry recital competition," "English Drama contest,""school band and flag team performance," and every club demonstration like pop music and sign language. Students make their own films and edit them for their hand-made CD. Those activities exhibit students' strong will and passion for learning, as well as showing girls' can produce delicate and original works in the courses of information and communications.

Interior Design Model

Work of Interior Design

Since the former Course of Industrial Arts was changed into Living Technology Course, our school has purchased more equipment convenient for use on the table and can be easily stored to adjust to the change of space in the lab. In teaching different technical fields, we can move and adapt different machines as suitable for our needs, and use double-fold plank and C clip when using different machines, to fix lightweight apparatus on the table. In this way, we can use the machines flexibly by the needs of each class, and it greatly improves the effectiveness of the machines.

Jingmei Girls High School is a traditional girls' school. In terms of gender equity education, girls perform pretty well in the Living Technology course. As long as the teachers can devote to course planning and exercise design, they can not only boost up the students' interest in learning, but also achieve original and outstanding teaching outcomes, as demonstrating the unique quality of a girls' school.

◎ TECHNOLOGY EDUCATION IN TAIWAN ◎

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