An evaluation of a design and technology project in Cyprus

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ABSTRACT

In September 1990 after a long preparation a project aiming at introducing the subject of Design and Technology into the General Education System of Cyprus started being implemented

This thesis involves a description of the Cyprus context, an analysis of Design and Technology and a sample of observations, questionnaires and interviews of those directly involved in education.

After an introductory review of the Cyprus context , the meaning of Design and Technology is discussed in an attempt to offer the reader enough information to define the subject.

The main part of the thesis is concerned with concepts, attitudes and views related to the implementation of the course in schools of Cyprus and gives results which are of considerable interest and provide important insights and issues for further research and analysis.

The data have been gained by evaluating individual responses to interviews and questionnaires and from observations done either personally by the writer or by other persons.

Because of the nature and extent of the research there is limited background data in respect of individuals' attitudes either to education in general or to other specific subjects of the curriculum.

In spite of this, the outcome gives some very definite and encouraging pointers and at the same time raises questions for further research and analysis.

The new course started raising the status of the subject within the educational establishment, though many of the new teachers were surprised at the superior attitude some other teachers showed to both themselves and their subject.

AN EVALUATION OF A DESIGN AND TECHNOLOGY PROJECT IN CYPRUS

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Declaration:

This study is entirely the work of the author. No part of this thesis has been previously submitted for a degree to the University of Durham or any other University.

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Introduction

There can be little doubt that we live in a technological world. A world which because of Technology is changing and becoming smaller in terms of the opportunities now offered by improved communications. As such it has implications for all countries which must learn to exploit the new opportunities that are offered for the benefit of their people.

It is important to emphasise that education has a role in all strategies or technological initiatives adopted by countries. As stated in the Institute of Development Studies (1988) report:

> *"We believe that technology must be considered in a much broader framework which incorporates not just machinery but bodies of knowledge which allow for the efficient attainment of productive objectives. Consequently, it includes, managerial procedures, skills in the labour force software and so on [...]" (Institute of Development Studies 1988 p. 1)*

In Cyprus, students are reluctant to take up technical education, not because of the quality of the technical education offerings but because curriculum planners have not taken a sufficiently broad view of what counts as technology and what education as opposed to training should involved. Instead technical education has primarily been geared towards training people for the immediate needs of the industry by providing courses relevant for this purpose. In doing so technical education gained the reputation of offering inferior education and of diminishing the life chances of the students.

The purpose of education is certainly much wider than simply preparing a work force.

During the last ten years it became obvious that such a policy could have been acceptable for purely utilitarian reasons but not for general education purposes. In 1989 it was decided by the government of Cyprus to introduce into the education system a new subject named Design and Technology and to replace the existing subjects, Craft for boys and Home Economics for girls.

The project required the design of a new curriculum, textbooks and the training of teachers. The Ministry of Education invested considerable sums in the appointment of new teachers, the construction of new technology rooms and the purchase of equipment for the new subject. The project exceeded its targets in terms of the number of teachers trained, course material and the speed of implementation of the new course into Gymnasia Schools.

In the first and second years students have 1.5 periods or 67.5 minutes of study per week, whilst in the third year this is reduced to 1 period or 45 minutes per week.

At the commencement of the project in 1990, considerable attention had been given to the aims and objectives of teaching Design and Technology in the Gymnasia. The introduction of a new course into an educational system has given rise to a number of performance indicators mostly relating to whether some action has been undertaken or in respect of teachers trained and students taught. This can be perceived as a measure of the efficiency of the project. Such measures tend to be concerned with quantitative data.

Being an individual interested in education in Cyprus and at the same time being involved in the attempt of the government of Cyprus to introduce Design and Technology into the educational system of the country I asked myself several times in the past.

> *"Does this subject, Design and Technology, offers any value for the money and the toil invested in it?"*

People in my environment expressed either positive or negative opinions. Those with negative opinions were more persistent in their opinions maybe intentionally as they knew very well that I was involved in the project. I thought several times that I was carried forward because of my professional commitment and I became a supporter of this project.

Professional bodies like , the Planning Bureau, the Inspectorate of the Ministry of Education, primary and secondary Teachers' Unions as well as other professional bodies expressed positive opinions towards Technology but not about the specific project of the Ministry of Education.

The existence of such contradictory opinions and my desire to be better informed about the subject prompted me to research the subject.

Having a new course in place is one thing, but whether it is actually achieving its objectives is another. One way of measuring the effectiveness of the project is to measure students' outcome through assignments or tests and the added value of the project measure in terms of the change in performance. In this project however, the purpose was not to improve a subject within the curriculum; the project is concerned with new working methods, skills, concepts, attitudes and

knowledge concerning a new subject (Ministry of Education, 1989). These were therefore several issues to be addressed regarding the measurement of the effectiveness of the project. The attempt in this thesis is to examine the issue of concepts, attitudes and peoples' perception and the influence of design and technology project towards the creation of a "technology culture" the absence of which results from the nature of the educational system and a range of other influences, which biases students in favour of the academic and white-collar skills. The aim of this thesis is to examine the implementation of Design and Technology, to determine the effectiveness of the first phase of the project and to discover strengths and weaknesses of this phase, which might then be helpful in the future for sustaining and developing Design and Technology in the Gymnasia. It does not attempt to portray Design and Technology in any particular school, rather it is constructed around issues and topics within Design and Technology across its implementation.

This study, a product of the reflections previously mentioned, consists of four sections.

Section One aims to introduce the reader to the Cyprus context, including such elements as the Cyprus economy, the labour force, the attitudes of young people towards technical education and technical occupations, the role of education in the economic development and the existing perceptions about technology in secondary education.

Section Two deals with technology in secondary general (not technical) education in Cyprus and the strategy adopted for the introduction of Design and Technology into the educational system.

Section Three is the essential core of the thesis. It evaluates the new subject from the point of view of students, teachers, headteachers, inspectors and parents.

Section Four predicts that Design and Technology will continue to be an essential subject for the education of students and that it will continue to be an indispensable part of the school curriculum.

SECTION ONE

THE CYPRUS CONTEXT

INTRODUCTION

The aim of this section is to introduce and familiarise the reader with basic elements related to the Cyprus economy

In the first chapter of this section, I shall deal with the Cyprus context. I shall try first to highlight problems that exist in the economic development of the island and then discuss the imbalances created in the labour force and show the extent of the responsibility of the educational system for the existing situation as well as its responsibility to improve the quality and distribution of the various occupations and the manpower demands.

In the second chapter I shall try to establish a definition of the meaning of development and examine the role of education in the national development of developing countries. In spite of the fact that the development problems that Cyprus faces are not of the same intensity as in some other developing countries, the underlying issues have similar relevance.

In the third chapter I shall try to examine the role of schooling in modern societies and refer to the development of a technology curriculum in Cyprus. Then I shall try to examine innovations in relation to the existing educational situation in Cyprus and define Design and Technology as a subject in Secondary Education

CHAPTER ONE

CYPRUS ECONOMY AND THE LABOUR FORCE

The most significant resource available in Cyprus is its population. While it used to be thought that in the absence of abundant natural resources such as oil and other minerals, countries such as Cyprus would face insurmountable obstacles to development, we now know that this is in fact not the case. The experience of Japan, Switzerland and other countries have shown that a highly educated and skilled labour force is probably the single most important factor in long-term growth - it may in fact be not just a necessary factor, but even a sufficient one - for this growth to occur.

Unfortunately, Cyprus has not escaped the fate of many other developing countries in the general pattern of mismatch between educational provision and the needs for labour and the subsequent ill effects on the economy of the country. Though the government's declared objective is to gear education towards the economic needs of the country, the system does not produce the people with the knowledge and skills the country needs (C.I.T.A. 1993). To justify the above assertion it is essential to consider the Cyprus economy, its occupational structure and the structure of the educational system.

a. Cyprus Economy

Perhaps the best time from which to start examining Cyprus economy is 1960, the year of establishment of the Republic of Cyprus. But because most of the economy had been destroyed during the events of 1974 and because

in 1974 there began the process of re-establishing the Cyprus economy, 1974 becomes the initial year of reference.

After the tragic events of the Turkish invasion during the months of July/August 1974 the Gross Domestic Product (GDP) fell by 17 percent in 1974 and in 1975 by a further 16 percent. At the same period unemployment rose from 1 percent in the pre - war period to 40 percent (Department of Statistics and Research, 1991 p. 65)

In a short period of time after the Turkish invasion, the economy was fully reactivated. The GDP reached pre-invasion levels in 1977 and as a result the massive unemployment was eliminated and full employment prevailed by 1978 (Department of Statistics and Research, 1991).

During the period of 1980-1988, the economy continued to expand at an accelerated rate. As a result there has been a dramatic transformation of the structure of the economy. The construction and manufacturing sectors were the leading production sectors. The first was helped by the extensive government housing programme and the latter by the great interest of Middle East countries for textiles, clothing and footwear. Subsequently, in the 1980's tourism took over the two previously mentioned sectors, and became the leading sector, followed by other tertiary sectors (House, 1988).

The dramatic transformation of the economy is marked by the decline in the share of agriculture, from 18 percent of GDP in 1972 to 7.5 percent 1988, and by the rise in the shares of manufacturing from 14 percent to 16.3 percent and construction from 7 percent to 9.9 percent.

As a consequence, agriculture's share of employment declined during the period 1972-1988 from 37 percent to 15.1 percent, while that of manufacturing rose from 15 percent to 19.9 percent. (Table 1)

TABLE 1

PERCENTAGE DISTRIBUTION OF GDP AND EMPLOYMENT

Sector	1972		1988	
	GDP	EMPLOYMENT	GDP	EMPLOYMENT
Agriculture, forestry, fishing	18	37	7.5	15.1
Manufacturing	14	15	16.3	19.9
Construction	7	22	9.9	26.7
Source: House, 1988				

The success of economic renewal after 1974 is attributed to the high quality of the labour force as well as to its flexibility and adaptability to changing conditions. Other specific factors that contributed to this success, were the hard work, the sense of self-denial and devotion of people, the acceptance by Trade Unions of a voluntary reduction of salaries and wages of 25 percent and the decisiveness and dynamism of the class of entrepreneurs who fully exploited the opportunities that came their way (Ministry of Finance, 1988). But this success was not possible without the adopted economic policy aiming at economic expansion through solution of the refugee problems and the reactivating of the economy. A number of exogenous factors were of decisive importance in the success of the export effort. Such were the increase of the purchasing power of the Arab Countries and the crisis in Lebanon.

After the rapid reactivating during the years 1975-1980 the economy started to show signs of instability and decelerating growth. The basic reasons for this development were the intense competition in the Arab markets and the reduction of the purchasing power in the petrol producing countries of the Gulf as a result of the decrease in the prices of petroleum products (Ministry of Finance, 1974-1991).

Despite the substantial decrease in the rate of growth of exports, they continued to play a central role to growth, as during the early post invasion years. However, this time it was the export of services which was growing faster at 18% p.a. and more specifically, tourism which averaged a growth of 23% p.a. rather than exports of industrial products, which grew by 8% p.a. (Ministry of Finance, 1974-1991).

Viewing developments from the sectoral point of view, it was the secondary sectors of industry and construction, such as shoe making, clothes industry and house building, which contributed mostly towards reactivating during the first years after the invasion, while during the 1980's this role was taken over by services in general and particularly by tourism. It is estimated that on average during the years 1980-1990 tourism increased by 14.5% p.a. This had positive results on the demand for locally produced industrial and agricultural products and other services as well. The industrial sector grew by an average rate of 5% while services grew by 8% increasing their contribution to the GDP from 55% in 1980 to 65% in 1990. The secondary sectors reduced their share from 34% in 1980 to 25% in 1990 (Ministry of Finance, 1974-1991). Another characteristic of this period is the deceleration in the growth of

construction sector, which is related to a large extent to the housing needs for refugees.

Characteristic of the sectoral developments of this period was that almost 90% of the 50.000 new employment opportunities were created in the services sectors and of these 12.000 were absorbed by the sector of hotels and restaurants. This last remark shows the need to examine the labour market and the supply and demand of labour force as well as any educational implications.

b. **Labour Force**

An analysis of the labour force for the year 1992 for the 8 main occupational groups is highlighted in Table 2 which shows clearly the number of persons engaged in every occupational group and the Supply and Demand as well as the Shortage and Surplus. Except for the first two occupational groups where the supply is much higher than the demand, in all other occupational groups the demand is higher. In the case of executives and senior officers the supply is twice as much as the demand; in the case of degree holders and other specialists the ratio of supply to demand is nearly three to one (3:1). In the case of executives, though, there is a surplus of 420 individuals, at the same time there is a shortage of 210 individuals. The same situation exists for the degree holders. This is because special qualifications are needed for such jobs and people with such qualifications are not found among the individuals included in the surplus column. This means that the counselling and guidance services need to examine their role and do more exact forecasting of the needs of the economy in specialised labour. For the occupational

groups 7, 8 and 9 (namely technicians and workers, users of machinery and tools, occupations which need little specialisation) the situation is terrifying. For the technicians and workers the shortage is 1465 persons and the surplus is only 290. The situation is worse for users of machinery and tools, where the shortage is 1550 persons and the surplus is only 40, and for occupations of low specialisation where 1815 are needed but only 32 are available. (Table 2)

TABLE 2

LABOUR FORCE EQUILIBRIUM FOR THE YEAR 1992

CODE	OCCUPATIONS	EMPLOYMENT	OFFER	DEMAND	SHORTAGE	SURPLUS
1	Executives and high officials	7,749	575	365	210	420
2	Degree holders and other specialists	21,452	1,700	1,425	270	725
3	Technical assistants and special clerks	29,314	1,255	1,775	950	450
4	Clerks, typists, cashiers	27,371	1,555	1,670	575	460
5	Sales and service clerks	44,383	1,515	4,190	2,780	105
6	Technicians and specialised workers	42,669	1,120	2,475	1,465	290
7	users of machinery and tools	29,257	280	1,800	1,550	32
8	Occupations with less specialisation	35,084	670	2,450	1,815	40
10	Foreigners	15,500				

Source: Cyprus Industrial Training Authority, Equilibrium of labour force, 1993

This mismatching in the labour equilibrium created problems in the growth of economy.

LABOUR EQUILIBRIUM FOR THE YEAR 1992

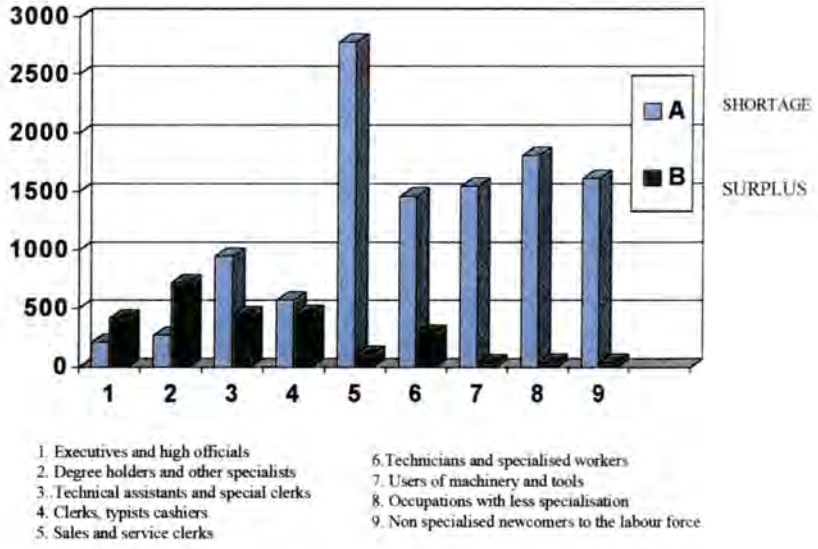


Figure 1

Table 2 provides a picture of the relationship between supply and demand for scientific and technical occupations for the year 1992.

The supply and demand of the labour force in the various sectors of the economy and comparisons between them highlight a possible view of the labour market for a few years in the near future. For this reason, analysis of the existing situation in the basic sectors of the labour market, namely, economically active population, employment and unemployment, is quite essential.

It is obvious from figure 2 that executives and high officials as well as degree holders and other specialists are the only groups in the labour market having a surplus. In all other cases there is a shortage with an exceptionally high shortage in sales and service Clerks and less severe in users of machinery and tools, occupations with less specialisation and non specialised newcomers to the labour force.

c. Economically Active Population

In 1991 the economically active population (Department of Statistics and Research, 1991) was 297,700; this figure is higher than that of 1990 by 1.1%. The economically active population constitutes 48.4% of the total population of the island. The percentage of women was 38% and during the previous five years it had a very small increase in spite of the encouragement made to activate economically inactive women.

TABLE 3

ECONOMICALLY ACTIVE POPULATION

Year	Economically Active Population	Percentage of Change	Percentage in relation to Total Population	Percentage of women in relation to the Economically Active population
1987	257,300	+2.3	46.5	36.0
1988	265,800	+3.3	47.5	37.1
1989	273,500	+2.9	48.4	37.3
1990	276,600	+1.1	48.4	37.7
1991	297,700	+1.1	48.4	38.0
Source: Department of Statistics and Research , 1991				

d. Employment

The economic growth of the period after the events of 1974 led to a rapid increase of employment. The conditions of extensive unemployment which existed soon after the events were changed to full employment in less than three years. Although the rate of growth was not high after 1980, the economy continued to generate opportunities for employment at the rate of 2.7% per annum between 1981 and 1988. This outcome is the result of the structure and direction of development and the position which tertiary sectors of the economy acquired in the last few years.

Table 4 shows that during the period 1990-1991 employment decrease in the sectors of agriculture (-2.8%) transformation industry (-0.8%) and even in the sectors of commerce, restaurants and hotels (-0.2%). For the last sector this is attributed to the unfavourable conditions which were caused because of the Gulf war.

TABLE 4

EMPLOYMENT BY BRANCH OF ECONOMIC ACTIVITY

Branch of Economic Activity	Number of persons 1990	1991	Change (%)
1. Agriculture, forestry, fishing	35,400	34,400	-2.8
2. Mining and quarrying	700	700	-
3. Manufacturing	48,900	48,500	-0.8
4. Electricity, Gas and Water	1,300	1,400	7.7
5. Construction	22,800	23,200	1.8
6. Trade, restaurants and hotels	61,100	61,000	-0.2
7. Transport, storage and Communication	15,300	15,400	0.7
8. Financing, Insurance and Business services	16,200	17,000	4.9
9. Community, Social and Personal services	52,300	54,100	3.4
Employed Population	254,000	255,700	3.4
Source: Department of Statistics and Research , 1992			

The highest rates of increase existed in services of the tertiary sector. It is indicative that out of the 45,000 new employment opportunities during 1981-1988, 40,000 were in the services of tertiary sectors. The more recent acceleration of growth and the high demand for labour have created serious shortages of labour and a reduction in unemployment.

e. Unemployment

The declining trend in unemployment experienced in the last few years was reversed in 1991. The unemployment rate rose from 1.8% to 3.0% of the economically active population, and during the Gulf Crisis (January - February 1991) it reached 5.3%, though by September it declined to 2.3%.

TABLE 5

UNEMPLOYMENT 1983-1992

YEAR	NUMBER	Percentage of E.A.P.
1983	7,772	3.3%
1984	7,952	3.3%
1985	8,302	3.3%
1986	9,196	3.7%
1987	8,700	3.4%
1988	7,412	2.8%
1989	6,243	2.3%
1990	5,068	1.8%
1991	8,319	3.0%
1992	5,124	1.8%

Source: CITA 1992

The existing low unemployment, under 3%, and the great demand for labour created staff shortages, particularly in the sectors of manufacturing, construction and tourism, where the pre-existing shortage of trained workers in technical and tourist occupations had been increased. At the same time, unemployment and underemployment of tertiary education graduates continued to be a serious problem.

This shows the need to examine the role of education and especially technical education in relation to occupation. Musgrave (1974, p. 103) says:

> *"In any culture one important dimension of the system of alternative role opportunities is the occupational structure and in modern economy the path that an individual can take through this structure are influenced greatly by the path that he takes through the educational system. The curriculum of a school can shape the goals of the children in it; these goals play a great part in motivating educational choice. Allocation to a particular type of either secondary school or course within a secondary school, or gain a choice of one particular option can restrict the future occupational role open to the child."*

The figures referred to in this chapter and especially those on table 2 related to the considerable labour imbalances in the labour market for which the educational system should be held, at least partly, responsible. Also, the trend for change shown on table 4 prompted the government to think about a kind of innovation of the curriculum, in order to change it to what students and parents in today's society regard as valid knowledge, to reflect the attitudes of young people to technical education, and to channel it in the right direction.

CHAPTER TWO

ATTITUDES OF YOUNG PEOPLE TO TECHNICAL OCCUPATIONS

The aim of this chapter is to define the dimensions of the problem of lack of interest of young people in technical occupations and to recognise those the accreditation of the elements in the educational system which relate to the problem.

In this chapter the use of the term "technical occupations" is used for those occupations relating to the working of various materials, construction and assembling of products or parts of products and the use of mechanical equipment. It is the group of professions under the code numbers 7, 8, 9 of ISCO (International Standard Classification of Occupations). All skilled and semi-skilled technicians engaged in transformation and construction industry are included in these groups.

a. Industrial and Social Development of Cyprus

The problem of lack of interest of young people in technical occupations is related directly to the industrial and social development of Cyprus. As a head master of a technical school in Nicosia said:

> *"In the 1960s the best students were directed to technical schools. Nowadays, only very weak students attend technical schools. Most parents visit teachers of the third year of the first cycle of secondary education asking them to give their children a passing grade because in the second cycle they will go to technical schools!"*

This is the characteristic way most parents think about technical education. In their minds, technical education is for less able pupils.

According to Michaelides, (1982) the political climate and the ensuing dominant philosophy adversely affected Technical Education.

Up to 1974 the Cyprus economy was based to a great extent on agriculture. After 1975 (Five Year Reactivating Plan) as most of the productive land was not under the control of the Republic of Cyprus there was no other choice, but to jump to another sector, the industrial development, and more specifically to the transformation and later to the development of the sector of services. This relatively abrupt change created the need for relevant changes, both qualitative and quantitative, in the demand for labour force.

Until recently industry used technicians of low educational level who in great majority were semi-specialised. Today the industry needs well educated and specially trained technicians because of the great competition existing in the united market of the E.U.

Socially, the Cyprus community has not been adapted to the needs of industrial development. The economic welfare which followed the economic development created the presuppositions for young people for studies at High Colleges and Universities, looking for occupations high up in the social hierarchy.

As a result of this and other essential factors, there is not enough interest in technical occupations.

b. **Lack of Interest in Technical Education**

The problem under examination was primarily found to be the lack of interest of young students to attend technical and vocational education and training.

Table 6 shows the distribution of students in different fields of education for the years 1980-1989. The low percentage of students attending technical and vocational classes (5% and 12% respectively) compared to those attending other classes can very easily be seen from the data of this table.

TABLE 6

DISTRIBUTION OF PUPILS FOR THE YEARS 1980-1989

IN RELATION TO TYPE OF STUDY

Sector	School Year								
	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89
1. Technical Education	934 4%	953 4%	1,017 5%	1,034 5%	1,180 5%	1,115 5%	1,070 5%	989 5%	937 5%
2. Vocational Education	2,679 12%	2,658 12%	2,637 12%	2,641 12%	2,736 12%	2,886 13%	2,687 12%	2,577 12%	2,384 12%
3. Commercial and Secretarial	4,112 19%	6,566 30%	6,692 30%	7,306 33%	7,236 31%	6,856 30%	6,564 29%	5,855 27%	4,436 23%
4. Other	13,886 64%	11,556 53%	11,725 53%	11,244 53%	11,997 52%	11,789 52%	12,345 54%	11,916 54%	11,912 60%
Total	21,611	21,733	22,071	22,225	23,149	22,646	22,646	21,337	19,669

Source: Department of Statistics and Research, Educational Statistics, 1992

The percentage in technical classes is steadily 5% for six consecutive years while in vocational education, except for 1985-86, it is fixed at 12%. Both

percentages are very low compared to the needs for technicians in industry in spite of the campaigning of the government to attract pupils to technical schools. Table 7 shows that young people 16-18 years old - the age group for the second cycle of secondary education - are in the great majority students or apprentices, and that the percentage from 1980 to 1989 increased steadily every year. The actual number and percentage of individuals out of the educational system represents those who for several reasons did not attend any kind of education and might work in technical occupations as unskilled workers or in agriculture, or they might not work at all.

TABLE 7

Distribution of Young People 16-18 Years old in Secondary Education, Apprenticeship Scheme or out of the Educational System for the Years 1980-89

Section of Study	School Year								
	1980- 81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
1. Education	26,611	21,733	22,071	22,225	23,149	22,646	22,666	21,337	19,669
2. Apprenticeship Scheme	1,367	1,276	1,158	1,047	982	980	967	959	830
3. Total of pupils	22,918	23,009	23,229	23,272	24,131	23,626	23,633	22,296	20,499
Percentage	82%	83%	84%	85%	86%	87%	87%	88%	90%
4. Total of people out of the Ed. System	5,022	4,791	4,371	4,128	4,069	3,474	3,517	2,954	2,371
Percentage	18%	17%	16%	15%	14%	13%	13%	12%	10%
Total of people 16-18 years old	28,000	27,800	27,600	27,400	28,200	27,100	27,150	25,250	22,870

Source: Department of Statistics and Research, 1992

Those who attended technical classes or an apprenticeship scheme were only 17-20% of the total students and apprentices and 14-18% of the total young people aged 16-18 years old (tables 6 and 7).

It is noticeable that the percentage of girls attending technical schools is exceptionally low at 1-2%. From the total number of girls attending the second cycle of secondary education, only 4% enrolled in technical schools, while the percentage for boys is 27%.

The comparison of young people attending Technical classes and the need for technicians' jobs in the economy gives interesting results . According to the data of the general census of 1985 undertaken by the research and statistics department, the economically active population of Cyprus was 231,000 persons (those doing their service in the National Guard are not included) 77,500 of them which means 33% of the economically active population were occupied in technical occupations. Comparing this to the percentage of students attending technical classes, it is clear that the number of young people trained to have a job in technical occupation is very low.

Similarly, if the needs of the economy for technicians are compared to the offer of trained people at existing branches in technical schools again the demand is much higher than the offer. Here are a few examples.

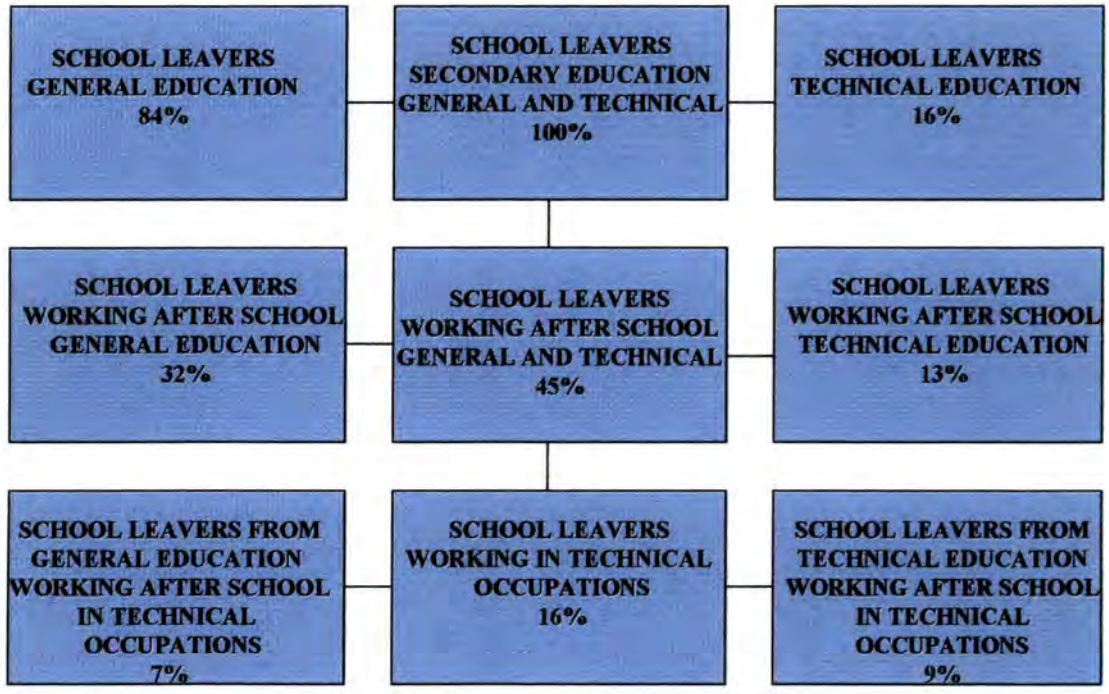
	Offer	Demand
Dressmaker	105	864
Builder	101	519
Cabinet maker	61	182
Metal technicians	42	409

(Source: CITA, 1992, Equilibrium of labour force.)

c. School Leavers and Technical Occupations

From the total number of school leavers of the last ten years, it is found that 84% of them attended General education and only 16% Technical education. Out of those who finished a Lyceum (general education) only 8.33% followed a technical occupation, while of those with a technical education, only 56.25% followed an occupation of technical nature.

SCHOOL LEAVERS IN TECHNICAL OCCUPATIONS



Source: CITA, 1993

Figure 2

It can easily be calculated that out of the total number of those who finish secondary education, only 16% follow a technical occupation, and approximately half of them (56%) are Technical education school graduates. Figure 2 shows the development of school graduates from each branch of upper secondary education and their choices for work or for further studies.

Based on data from a study related to labour market for the year 1989 prepared by the Industrial Training Authority the added offer for technical occupations was 3,570 technicians and the added demand 5,637 persons.

Thus, there is a shortage of 2,070 (CITA, 1989) technicians. Compared to the total number of technicians engaged in industry for the same year this number is quite high.

d. Quality Level of Working Population

The problem of low interest for technical occupations is not just a theoretical one i.e. the need for equilibrium of offer and demand of manpower. The future of industrial and economic development depends not only on the number, but on the quality of the manpower engaged in the transportation and construction industry as well, which appears to be very low. Rolf, (1993) suggests education for the labour force not only for the increase of production but for social reasons as well:

> *" If we want to produce more we do not necessarily need more skilful workers. That can be achieved with more technically advanced machines. But we certainly do need more qualifications for more people if we want to have job conditions worthy of human beings and a human continuation of the industrial society." (Rolf, 1993 p. 160)*

Data of sectoral research carried out by industries like dressmaking, shoemaking, metal industries, cabinet making and structures, which cover 85% of the total number of those occupied in transformation and construction industry showed that, though the total number engaged in these technical specialities (in 1987-89) was about 29,000 only 4,000 (14%) of them finished secondary education (general or technical); 1975 of them were technical school leavers and the rest 2,025 were general education school leavers (50.6% general education and 49.4% technical education). This shows that

the number of technical school leavers is not enough to meet the needs of industry and the school leavers with a general education are unable to respond to the needs of technical occupations.

TABLE 8

School Leavers Engaged in Industry

Sector	Number of Secondary School Leavers			Total Number Engaged in Technical Occupations (7.8.9)
	General Education	Technical Education	Total	
Dressmaking	770	90	860	4,933
Shoemaking	312	107	419	2,072
Cabinet Making	351	173	524	1,076
Metal Industry	122	765	887	3,432
Construction	504	840	1,344	16,715
	2,059	1,975	4,034	29,048

Source: CITA, 1992

Table 8 gives other useful information.

- Metal industry and construction are the sectors where most technical school leavers work and compared to those from general education they account for 86% in metal industry and 62.5% in construction industry
- Dressmaking, shoemaking and cabinet making are the sectors where most general education school-leavers work and especially in the case of dressmaking they are 89.5%. This is because dressmaking is the only industry sector in which girls are used to work.

Regarding the training of the labour force it is clear that in this sub-sector a large majority 80% did not attend any kind of training.

Conclusion

The problem of lack of interest for technical occupations is twofold. On the one hand, there is a need for equilibrium between offer and demand of manpower and on the other hand there must be an upgrading of the level of quality of technical workers, through the attraction of young school leavers who will be used in industry after proper training.

Statistical analysis of the data shows that in spite of the fact that 38% of the active population is engaged in technical occupations, only 14-18% of young people aged 16-18 years old attend courses in technical education. This intensive inequality is shown if the offer and needs of manpower in technical occupations are compared. The relative report of the Cyprus Industrial Training Authority (CITA) for the year 1989 shows a shortage of 2,070 technicians. Another very significant conclusion is that a considerable percentage of technical school leavers do not finally select a technical occupation, and thus the problem becomes more acute. In parallel, a substantial number from the general education enter the industrial sector. But the great majority of people engaged in industry are persons without any proper training and of low educational and cultural level.

As a result, the problem is obvious in both stages when young people have to make decisions. Firstly, the stage when they have to select educational section and secondly, when they have to make their occupational choice after finishing school.

It must be stressed that the problem is more acute for girls. From the total number of girls in upper secondary education only 4% attend courses in

technical education. It was accredited too, that a great number of girls who finished secondary general education are jobless, and for several reasons, they are interested in working in technical occupations. To do this they have to attend training courses after finishing Secondary education.

According to research done by C.I.T.A. (1989) the lack of interest of young people for technical occupations is related to their selection of type of schooling and the impressions created either by their family environment or by their school environment in relation to the existing situation and working conditions in these occupations. After finishing school, the elements affecting the choice of occupation are related more to the existing conditions at work and the level of payment. Parents, even if they declare they do not, do affect their children in their choice of educational sector, especially in their choice between LEM (Lycea of optional subjects) and technical education; they are interested in their child acquiring a recognised certificate of education. Parents' opinions related to technical occupations are in most cases negative concerning working conditions and payment.

> *" According to information selected through interviews with representatives of the parents' Unions, it is evident that parents give great emphasis on the best possible education of their children, irrespective of the chances in finding a job."(CITA 1989, p. 24)*

CHAPTER THREE

DEVELOPMENT, EDUCATION AND DESIGN AND TECHNOLOGY

Education: Its Role in National Development

It is very difficult, if not impossible, to define "development" to universal satisfaction, because it refers in a general way to desirable social and economic progress. People have and will have different opinions about what is desirable. Most people want development and improved living conditions for which industrialisation and economic growth are essential, but "*If there is no attention to the quality of growth and to social change, one cannot speak of development*".*(Brant Commission , 1980)*

Similar views were expressed earlier by Seers (1977) in his paper on "the new meaning of development". He emphasises that growth in itself is insufficient and may even be damaging to a country if it is not accompanied by declines in inequality, unemployment and poverty as well as by wealth redistribution.

Galbraith (1964) suggests as a solution to the problems created by the criteria used to show economic development, the use of "Popular Consumption Criterion". This shift of emphasis is further illustrated by the efforts to move away from the use of GNP and per capita income as a yardstick for development, with the introduction of the Physical Quality of Life Index (PQLI) (Morris, 1979) to measure development progress. The latter is calculated on the basis of three factors: the life expectancy at birth, infant mortality and literacy. There is, thus, an obvious redirection of the focus of

attention from the purely financial considerations to the examinations of the effects of development on the individuals.

This concept of development suggests that the role of education in development assumes far greater significance. For if development is seen as a synonym with economic growth, then the role of education is merely to serve the economy in various ways but mainly by training the necessary manpower . If, on the other hand, improvement in the quality of life is regarded as an essential ingredient of development, then education, first and foremost, will satisfy human needs. Seen as such, education in itself is essentially a basic human need. In addition, education becomes a means of meeting other basic human needs.

Education, is an organic whole, with its various parts or roles inseparable, as one role has no meaning or cannot function efficiently without the other. It is obvious that education is a basic human need, as it is a means of meeting other human needs. Through education, people acquire knowledge, skills, attitudes and values, which can be used as a means of improving their own quality of life and, subsequently, contribute towards the development of the society as a whole.

The economic development process includes the investment of today's resources for the increase of future production of goods and services, such as the traditional Robinson Crusoe example of abstaining from fishing today (and therefore consumption today) in order to make a net for more effective fishing tomorrow; in other words, the economic development process includes the investment of savings on purpose in order to develop economic growth. Consequently, there exists a question; is education an investment or

consumption? If it is considered as a sector offering services of consumption, then the product is of a kind which can be stored up. Since savings are indispensable for investment and because storing up has to do with restricted consumption, it is concluded that in the case of education it is possible for savings to be done. If, on the other hand, education is considered as an investment, then it is turned to an element of production which must not be stored away but must be used in great quantities. To increase production, higher investments must be planned and thus, higher investments on education, too.

In every discussion about the role of education related to economic development, both opposite theories are evident. Galbraith (1964), makes it clear that education is neither exclusively consumption nor exclusively investment, but it is both consumption and investment. To emphasise his view that education is investment he says:

> *"[...] it has been accredited that the investment of one dollar for improving the cultural level of human factor, has often a consequent greater increase of the national product, compared to the same amount of investment in railways, dams, tools etc.[...]" (Galbraith, 1964 p. 105)*

Psacharopoulos (1984) expresses similar view: Education represents both consumption and investment. On one hand, it is valued for its immediate benefits, but, on the other, it helps to create income in the future by providing educated workers with skills and knowledge that enable them to increase their productive capacities and thus receive higher earnings.

The World Bank Education Sector Policy paper (1980) adopts a similar view of the role of education when it proposes two fundamental aims of education. Firstly, education should contribute to the achievement of social justice, which is seen largely in terms of equity, and secondly education should aid economic development by providing skilled manpower.

O'Donoghue (1874), examining the role of education in economic growth, concludes that:

> *"The question is not so much one of precise calculation, but rather whether or not education is a significant factor in economic growth [...] the more general literature on the subject suggests that the role of education is one which varies both with time and place. The almost universal conclusion, however, is that it is one which should not be ignored." (p. 116-117)*

It is obvious from the discussion so far, that when education is seen in the context of national development, invariably there is an emphasis on its utilitarian aspect. It is acknowledged, though that

> *"in some societies the economic function of schooling is regarded as minor - since the cultivation of the mind and spirit, curiosity contemplation and reasoning have more than economic purposes and justifications".*
>
> *(World Bank, 1980 p. 13)*

It is generally agreed that this is a practice that developing countries can ill afford. This point is made very strongly in the World Bank paper (1980) which describes the relationship between education and work as the heart of the problem of the efficiency of an education system.

However, unfortunately, in most countries, the education system, influenced by the intellectualist tradition in the West, fails to relate school and education to the needs of the communities they serve. For example, Schultz (1977) remarks:

> "*The mere thought of investment in human beings is offensive to some among us. Our values and beliefs inhibit us from looking upon human beings as capital goods, except in slavery, and this we abhor.*"

The contribution of education to national development, result of the above thought, was not the one expected by the people in many countries. Even worse is the situation when the kind of education offered not only does not contribute to economic development but actually holds it back. This is because much of education now offered in developing countries is not relevant to the real needs of the countries. The main problem is likely to lie in the inability of the educational systems to respond to the needs of the labour markets. Galbraith (1964) suggests:

> "*The developing country must examine the problem of its educational system from the point of view of its needs which are defined by the basic objectives of its economic growth.*" *(p. 114)*

The concept of education as a form of investment in human capital dates back to the eighteenth and nineteenth centuries (Adam Smith, Alfred Marshall, John Stuart Mill), but until 1960, attempts had not been made to measure the contribution of education to economic growth.

Recent research for the World Bank provides evidence of the link between various aspects of human resource development and economic growth. One such study (Hicks 1980 p. 12) examined the relationship between growth and literacy, in eighty-three developing countries and found that the twelve developing countries with the fastest growth rate, had well above average levels of literacy.

Another approach, using rates of return on education, relates the cost of investment in education to the increase of productivity. Psacharopoulos, (1973, 1984) comparing the rates of return on education, drew the following conclusions:

- Rates of return on education are generally higher in less developed countries.
- Primary education tends to yield the highest return.
- Returns on investment in human capital are well above returns on physical capital in less developed countries, while the two types of return are of almost equal magnitude in advanced countries.
- Per capita income differences can be better explained by differences in the endowment of human rather than physical capital.
- Investment in education contributes substantially to the rate of growth of output in most countries, particularly in the less developed group.

Schultz (1977) is more positive in his view about the role of education in economic growth and development

> *"It simply is not possible to have the fruits of a modern agriculture and the abundance of modern industry without making large investments in human beings".*

If education is seen from the National Development point of view, invariably there should be an emphasis on its utilitarian aspect. Though it is acknowledged that in some societies the economic function of schooling is

regarded as minor, since the cultivation of mind and spirit, curiosity, contemplation and reasoning have more than economic purposes and justifications (World Bank 1980, p. 13) it is agreed that this is a practice developing countries can ill afford. This point is made very strongly in the World Bank paper which describes the relationship between education and work as the «heart of efficiency of an education system» (World Bank 1980, p. 9). The introduction of Design and Technology into the Cyprus Educational System aimed at changing the educational system and making it more related to work and industry.

The meaning of Design and Technology

According to Coggin (1980), great importance has been attached to interpretation in pre-history of man the "tool-user". However, much greater importance can be attached to the use of tools when this physical activity is integrated with existing human knowledge, or experience, as part of the creative process of practical problem-solving. It can be contended that when early man picked up a rock or stone and used it as a tool , this was not an arbitrary action but part of a process, the result of which was the solution to a practical problem. Perhaps it was the need to defend himself or acquire food and shelter for him and his family. The origins of technology lie in the solving of practical problems.

It is obvious that technology as an aspect of human activity goes back much further than science. From the time the primitive man decided to use stone or anything else to achieve something, the development of technology began.

The solution of practical problems, or the problem solving process became a major force for both social and economical change and relatively recently with the introduction of Design and Technology a method of teaching.

If we want to know how we should educate children in and through technology, we must first answer the question:

1. *What is technology?*
2. *For what purposes should it play a part in children's education? (Black and Harrison 1994 p. 13)*

The word technology comes from the Greek word "Τεχνολογία" which is a composite word from the words "Τέχναι» meaning art or skill and the word "λογία" meaning science or study. It is the science, study or theory of a practical art or skill.

Eggleston (1994) refers to Design and Technology as having at its simplest two components - design and technology- in close relationship. It consists in

> *" Using technology to achieve solutions that satisfy sound design criteria and using design to achieve solutions that satisfy sound technological criteria." (Eggleston 1994 p. 21)*

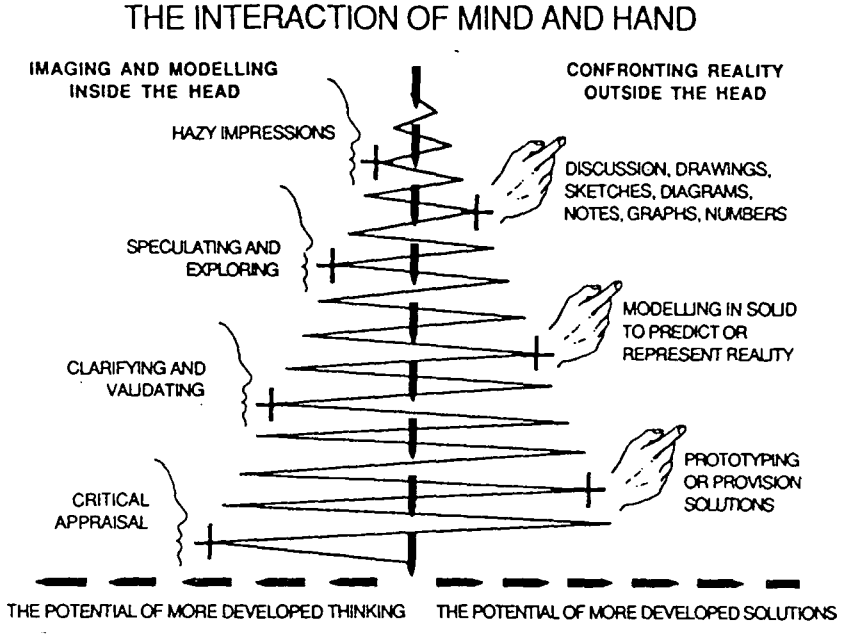
Design

Design has a general meaning and as such it is very difficult to define. In my attempt to clarify the meaning of design I as most people do in such cases, used a dictionary where design is described as:

> *"A plan or scheme conceived in the mind: the preliminary conception of an idea to be carried into effect by action, a project."*

The essence of this definition lies in the phrase "conception of an idea to be carried into effect"

This is very well visualised by APU (1991) under the heading " Interaction of mind and hand." According to APU this conception starts with a hazy notion in the mind's eye of what the solution is like, and this is characterised as crucial starting point. This idea to be developed is necessary to be expressed and trying to express this idea forces us to clarify it. This expression of the idea can be done in words, or pictures or in concrete form. Without this expression any attempt to move forward is like playing mental chess where it is possible to manage only the first or second move.



The APU model of interaction between mind and hand..

Fig. 3 (APU 1994 p. 62)

The second stage, always according to APU, is speculating and exploring in the mind which is confronted in reality by modelling in solid or perception in reality.

Clarifying and validating follows in the mind with prototyping or provision of solutions in reality and at last the critical appraisal takes place.

Designing implies planning and deciding i.e. intentional activities in contrast to events that are unplanned and happen accidentally. In this general sense one can design a system or an organisation. But within the context of artefacts and material products, design implies being involved in the process of modifying or changing the environment in some way. Houses, bridges, clothes etc., have all been designed and each one covered a human need. Thus we talk of objects being well or badly designed i.e. whether or not they fulfil the needs they have been made to fulfil. Besides this technological function there are other, aesthetic, moral or social.

> *"Design is that area of human experience, skill and knowledge, which is concerned with man's ability to mould his environment, to suit his material and spiritual needs [...] There is a sufficient body of knowledge in this area called "design" to be developed to a level which will merit scholarly regard for the future" (Archer 1994 p. 26)*

The danger of design for the sake of design has been very well illustrated by De Sausmarez (1964)

> *"[..] basic design is in danger of creating for itself a frighteningly consisted and entirely self-sufficient form, a deadly new academicism of general obstruction [...] (De Sausmarez 1964 cited by Eggleston 1994 p. 27)*

Design also refers to plans, models etc. produced and the appearance and in-built function of an object, judged as good specifically in the sense of whether its function is fulfilled to the most efficient and aesthetically pleasing degree.

Sometimes there may be views which at first sight look conflicting with each other:

- *Design is such a specialist activity that it is undertaken only by those who have been highly trained [...].*
- *Design is an activity that every one engages in, almost every day of their lives [...]* (Standen and Cormack, 1990 p. 95)

These two views are not in conflict; neither is correct. What links the two is the role that education can play in developing design awareness, understanding and ability at all levels from small children in the infant school through the secondary school and to the degree level.

> *"Design is a human activity in which every one is involved. It is a process of identifying problems and needs and establishing initial priorities. It requires research, data collection, organization of resources and rational analysis and measurement. And a solution evolves, by rational synthesis or practical trial and error, it takes on a form and has to be tested and evaluated. This universal process is what design is about."*
>
> *(Green P., 1974, cited by Murey R. 1990 p. 32)*

While design can refer to the characteristics of some human product or artefact, it can also refer to the embodiment of the ideas of models, drawings and plans. In this sense design ability must be, at least partially, non verbal. Skills of graphicacy, involving the ability both to plan visually by drawing or

modelling, and to visualise situations suggested either by verbal instructions or graphic presentations may be evaluated like a scientific hypothesis, independent of the material form in which it may be ultimately produced. Though it may be evaluated as a self-sufficient unity if it refers to any specific form of design it needs to go beyond the general points, common to most designs, to examine the specifics of the area. In short for some designs we may operate independently and without prior scientific knowledge and research, for other designs this would be unthinkable, and this leads to the examination of its relation to technology.

Technology

Naughton, (1992) considers several definitions starting with equating technology to machinery saying that this definition is clearly valid in the sense that it represents common usage, but it also has severe limitations since there are more ingredients in technology. The extra ingredients are:

1. There must be a goal which is broken into a series of practical tasks.
2. There are people engaged in every programme.
3. People must have knowledge of a certain kind.
4. Social organisation to manage and direct the combined effort.

Naughton (1992) concludes with the definition:

> *"Technology is the application of scientific and other knowledge to practical tasks by organizations that involve people and machines." (Naughton 1992 p. 4)*

In an earlier paper, Naughton (1986 p. 2) referred to the application of scientific knowledge only. The words and other (knowledge) have been added later. The application of knowledge is essential in designing but there is no reason to distinguish between scientific and other knowledge.

Technology as a process

In the design sense technology uses human knowledge and physical resources to solve practical problems. As such it involves an analysis of the practical problem in relation to the particular human needs, drawing on different levels of imagination and creativity, and the testing of the particular outcome, often initially by models or under laboratory conditions and finally under the final condition of its use. It is in this sense that technology overlaps with design, though technology involves processes of manufacture and production which the designer needs to be aware of as they affect the practicality of the ideas and their costing.

Technology as knowledge

In modern societies people are involved in technology at different levels. Thus a person involved in car technology may:

- use a car,
- work on an assembly line,
- maintain cars,
- be concerned about the consequences of the use of cars,
- be involved in designing which includes research, development, designing, manufacturing and marketing.

These different levels of involvement illustrate that one may know about technology or one may use technology without understanding the scientific

principles, or the research basis or even the various functions of the technologies. This leads us to the sense of technologies as hardware.

Technology as hardware

Technology is commonly identified with various types of devices, tools, machines and computer products. These cover cases from screwdrivers to computers. Such objects are commonly regarded as extension of human attributes and capacities. The more the machine or device is developed the less it demands on human strength, skill and attention.

After this analysis how can the subject Design and Technology could be defined?

Design and Technology

The proposal of the Secretary of State for education (1992) offered this meaning of Design and Technology:

> *"Design and Technology involves applying knowledge and skills when designing and making good quality products fit for their intended prepossess." (DFE/NCC 1992 p. 13)*

Later, in 1993, the National Curriculum Council gave a more comprehensive definition of Technology:

> *"Technology is the creative application of knowledge, skills and understanding to design and make good quality products" (NCC 1993 p. 5)*

In this definition the Council does not refer to Design and Technology but to Technology.

"Technology" subsumes applied science, process and concepts of science, aesthetic and design considerations, or even moral and ethical questions.

These may not be the only components which make technology what it is today, but surely they are among the major ones. Lewin (1988) says that technology is to do with production of man made products which reflect functional and aesthetic values, using our knowledge of materials, structures energy and control. Successful products need to be made purposefully and require people with a wide range of ability and skills. APU (1991) describes Design and Technology as a rapidly developing area of the curriculum, concerned with encouraging children to become active participants in the world of products, systems and environments. This area of the curriculum is essentially procedural in nature, using skills and knowledge as resources for action rather than as ends in themselves.

The Cyprus Design and Technology curriculum (1992) offers different definitions of Technology and concludes that Design and Technology as a subject has an entirely different meaning. It includes the triptych:

1. Use of knowledge and experience
2. Use of imagination
3. Solving of technological problems

According to Farrel and Patterson (1993) Design and Technology offers many opportunities for people to develop their capability; in particular, to intervene for themselves in the made world by designing and making products and systems to meet the people's needs. The processes of perception, creation and critical thinking involved in Design and Technology capability are central to the need for continuing education in modern society.

Parkes (1988) recognised the difficulties that the definition of Design and Technology caused and noted that:

> *"A point of definition that requires immediate comment concerns the use of the dual term Design and Technology. Our understanding is that whereas most , but not all, design activities will generally include technology and most technology activities will include design, there is not always total correspondence" (DES 1988 p. 4)*

Defining Design and Technology has caused a problem owing to the differences in definitions that are used in Education and Industry.

APU (1987) suggests:

> *"In education the concern is to expose pupils to design and technological experience in order that they may develop understanding and capability. In industry that design and technological capability is directed toward a product system (APU 1987 p. 7)*

Differences in definitions exist within education too. Because of the different goals, science and technology engage in different kind of research. A good deal of technology is concerned with the development - that is, working up an idea for a new product, artefact or system, so that it will be useful on the open market. In science, research usually means the research for new knowledge and understanding or the gathering together and reinterpretation, of existing but dispersed knowledge relevant to a practical problem. (Sparkes, J., 1992 pp. 25-36)

Black and Harrison, (1994) to the question "what is technology" give the following answer:

> *" Technology is a disciplined process using resources of materials, energy and natural phenomena to achieve human purposes." (Black and Harrison 1994 p. 14)*

This answer leads to educational aims such as:

1. To give children an awareness of technology and its implications as a source for the achievement of human purposes, and of its dependence on human involvement in judgmental issues:
2. To develop in children , through personal experience, the practical capability to engage in technological activities;
3. To help children acquire the resources of knowledge and physical skills which need to be called upon when carrying out technological activities.

Why technology education ?

Education and training are the engines of future success for the country as well as the resources for individual achievements and satisfactions. It may have been possible in the past to succeed economically as a country by combining the brain power of a small educated elite with the muscle power of the majority; that option is no longer open. The new technologies of the 1990s and of the next century, will require a self confident, adaptable and well educated nation. (Aglietta , 1994 p. 257)

It seems obvious that we need knowledge in and about technology to understand a major feature of our age. Such knowledge may help us to make a step forward on the way in which society is going.

Down (1986) concludes:

> *"The aims of technological education must be primarily that of preparing children, morally and politically, for*

understanding and being critically aware of the social issues of technology. Secondly it must be involve learning how to employ technological devices, whenever appropriate. Thirdly, in relation to CDT, it must include some involvement in and understanding of the areas of technology that can be related to designing and making." (Down 1986 p. 128)

Flood, (1989) upgrades the technology education to a human right and as such it not only must be available but it must be offered to all citizens.

> *"Technology education has an important part to play in improving consciousness and capability so that informed choices can be made about the level and style of technology with which we wish to live [...] It should be a progressive entitlement throughout the formal years of education and beyond, not simply because teaching about technology is part of our culture, and because teaching through technology can achieve the long cherished aims of learning by doing - but because, the right to survive in the future, is an inalienable human right."*[1] *(Flood, J., 1989 p. 30)*

States use technology and nowadays the knowledge and the ability to use technology affects their existence. Street, (1992) is very explicit on this:

> *" A state does not get involved with the technology just for its prestige value. Surveillance technology and military technology are crucial elements of a modern state's armoury, part of its survival mechanism [...] The state, for good or bad, finds itself playing a variety of different roles in the development, deployment and management of technology."(Street, 1992 p. 46)*

Lewin, (1986) proposes that:

> *"[...] engineering philosophy should form the core element for a liberal education which would result in uniting the arts and sciences and dispelling the view that is an antisocial and academically inferior activity." (Lewin 1986, p. 17)*

Technology education in the national curriculum marks an attempt to override old distinctions and especially to break out of the low status of technical education into the schools. It is also an attempt to demonstrate that technology is an appropriate and important subject for education of all children including the most able. Furthermore, it is making the point that not only technicians but also technologists and indeed all citizens need to be able to understand, develop and handle technology. (Eggleston, 1994)

Education cannot be divorced from the society of which it is a part; and at the same time there is a need to understand technology in education. There is a need to understand that technology is part of education, not simply a support for it. Unfortunately all too often technologists have failed to point this out, treating technologies as neutral machines. Technology in education today shares with the whole host of movements for vocationalizing education the premise that (in this case) technology needs to be part of the school curriculum because of some assumed needs of the labour market. (Mackey 1991)

The goals of technology may give answer to the question "Why technology education?"

According to Sparkes, (1992) Technology aims at creating successful artefacts to meet people's needs and wants and people have a variety of needs and an even wider variety of wants.

As technological development continues to accelerate, it can either become increasingly difficult for people to follow, understand and use, or it can become easier and friendly to use. Technology education must allow individuals to understand technology in the context of the world in which they live and interact. McCormick (1992) refers to technology as:

> *" [...] the study of technology and its effect on individuals, society and civilisation, with the mission of preparing individuals to comprehend and contribute to technological-based society." (McCormick 1992 p. 47)*

The great majority of learners - whether pupils at school, students at universities, polytechnics, or adults still wanting to learn - are destined for a productive life of practical action. They are going to do things, design things, make things, organise things for the most part in co-operation with other people. They improve their competence by the practice of skills and the use of knowledge; to cope better with their own lives and the problems that confront them and society; to develop their creative abilities and above all, to co-operate with other people. It is these capacities that we want to see encouraged and developed through education for capability. (Royal Society of Arts, 1986 p. 90)

We need to be inventive. We need to develop simple new ways to learn better. Schneider's (1993) simple solution lies in engaging students through dialogue, engaging them with questions and encouraging them to suggest how things might work, how things are related, how things happen.

Technology is a human ability calling for a far wider education than training in occupational skills: Technology education is a preparation for living in a society that has a complex, mutual relationship with technology, both shaping

it and being shaped by it. If technology aims to enhance the quality of human life, then education must open the questions " what is quality?" and "for whom?"

> *"Every technological product is the result of the value - based choices, so that every product carries a value statement, an implicit definition of what constitutes quality of life for the designer, the producer and the user. Technological literacy must include the readiness to made explicit and to justify the basis of which those value - based choices have been made. It also involves facing not just the question how to use a product, but when, why and, if at all, it should be made."*
>
> *(Conway, 1993 p. 4)*

Design and Technology has greater potential than any other subject for problems to be formulated in the context of authentic activity, so that pupils might engage in both reflective and active participation, two aspects identified as important by Kimbel et al (APU 1991)

Shack, (1993) argues that authentic research teaches students :

- *First that their questions and interests matter*
- *Second, it demonstrates that they have the skill and ability to pursue those interests in a high quality way and*
- *Third, conducting real research shows young people that their work has value in real world. (*Shack 1993 p. 3)

It is Piaget more that any other, who promoted the visions of the active learner, the principle that "to learn is to invent" and broke the myth of the child as a passive and empty vessel to be filled with knowledge and skills. Piaget

provided us with an awareness of the child's progressive cognitive development and as Bruner (1986) put it:

> *" [...]respectful explication of the self-sufficiency and dignity of the child's mind in terms of his own logic[...]." (Bruner 1986 p. 141)*

Innovations

The purpose of any innovation in education is to help schools accomplish their goals more effectively. New programmes are not always successful. They may make no difference, help to improve the situation or they may even make the situation worse. However, progress is the result of innovation

Implementation of innovation usually involves "change in practice". This change may best occur as close as possible to teaching - in the learning process.

Bork (1993) distinguishes four problems that, in his opinion, are the roots of difficulties in education. These are:

1. Learning that is not individualised. The majority of students everywhere receive little individualised attention because the number of students in classes does not allow individualisation. In Cyprus, the number of students in secondary education is about thirty five per classroom; this is one of the main reasons why individual instruction does not exist.
2. Learning that is not active. In Cyprus, as in most countries, learning is offered primarily through lectures and books. Class size and common learning methods are also major factors leading to passive learning. In

such settings, it is difficult for learners to be active as they often should be in design and technology.

3. A lack of teachers. Cyprus is lucky since the teaching profession is very popular. Each year the best students apply to universities to become teachers. In the case of Design and Technology, all new teachers have a degree in engineering, and there is a large number of young adults waiting for the opportunity to have a job in education. Those eligible for a post in education apply to the educational committee, are rated according to a point system and wait their turn to get a job. Almost all degree holders are interested in a job in education because teachers are held in high esteem and have good salaries and good working conditions (Department of Statistics and Research, 1993).

4. Negative social attitudes towards learning. Bork (1993) refers to negative attitudes as a handicap to innovation, but in Cyprus this is not the case. Most students and families look upon education positively, though they are selective. They have negative attitude towards Technical Education.

It is clear that change in education is not a single entity. It is to a certain extent multidimensional. There are at least three dimensions to implementing any new programme or policy:

1. the use of new or revised material
2. the use of new teaching approaches
3. the alteration of beliefs (Fullan,1991)

It is possible to add a few other dimensions, but the three mentioned are central. All three aspects of change are necessary because together they represent the means of achieving a particular educational goal or set of goals.

Branson (1993) gives a sequence of changes which took place through ages in education.

> *"In early days of schooling instruction was provided according to the oral tradition. The teacher was the focus in the oral tradition; the combination of the knowledge and experience bases. Through oral presentations to students, the limited knowledge base was transmitted. Gradually, the knowledge-base expanded and printed materials became available. The critical issue was that instruction was presented to the student in one-way delivery. Later students recited orally, or prepared written work to be evaluated by the teacher."(Branson, 1993)*

Unfortunately this type of instruction still exists in Cyprus, for several reasons. These reasons include limitation of time, the amount of material to be covered and even inadequate effort in preparation by teachers.

But the paradigm experienced in most cases in Cyprus is Branson's second one:

> *"The teacher is still the principal source of knowledge and experience and serves as a deliverer of information as well as a gatekeeper and controller of the knowledge base. The model evolved to increase the number of true interactions between students and teachers. Gradually improved instruction was provided by better instructional materials such as textbooks, workbooks, and audio-visual aids. Informal interactions among students were possible."*

This model is the existing model of education in Cyprus. Compared to other countries, this model came to use in Cyprus quite recently. In 1965, the Inspectorate decided to put emphasis on "amphidromic communication"

(αμφί=both ,δρόμος=way) which means two way communication among students and teachers. Previously, the system was "monodromic" (μονό=single, δρόμος=way) one way i.e. the teacher delivered to students. The knowledge explosion which followed technological progress has increased the knowledge base, and the performance of the previously mentioned models has declined. Clearly, a new model was required. In thinking about new models in education, it may be helpful to consider Deming's philosophy (Walton, M., 1986). At a decisive meeting in Tokyo in 1950, Deming pledged to the nation's top industrial leaders that if they would embrace the philosophy of Quality Management, they would "capture markets the world over within five years".

According to Bonstingl (1993)

> *"Although the philosophy of Total Quality Management (T.Q.M.) springs from the world of business, [...] It is, in many ways, a natural fit with the hopes and aspirations of educational leaders in their work to improve schools and communities."*

Bonstingl, (1993), looks upon schools as organisations focusing on all their members. Every one in the organisation (inspectors, headmasters, teachers, students, parents, and others) must be dedicated to continuous improvement, mutually helping in the process of getting better, day by day. The organisation is viewed as a system and the work done as an ongoing process. Success lies in top quality management.

This system has many aspects in common with Branson's third paradigm. It is the technology based approach.

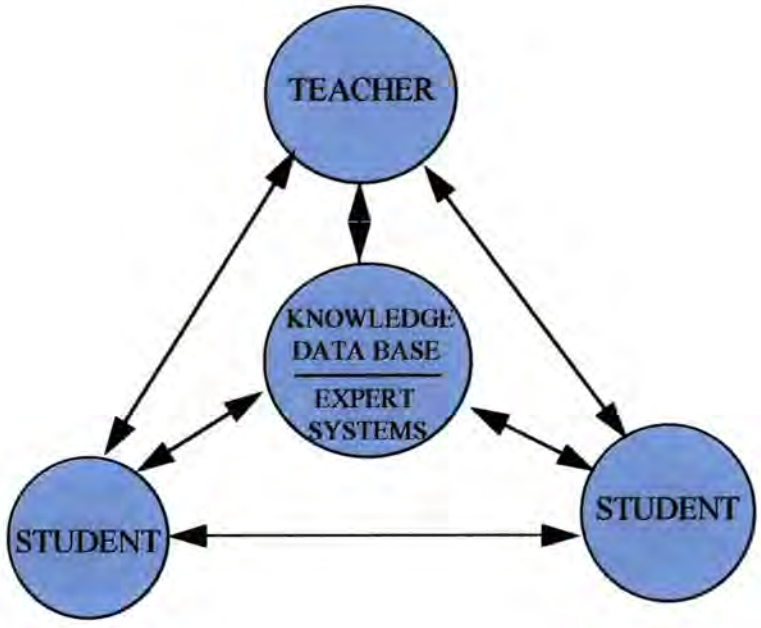


Figure 4

It is a fully interactive process of instruction. Each student interacts with the teacher, other students and the data base and expert systems. Now students may learn from any part of the system - the teacher, the students, the data base or the expert system - without having to wait for the teacher to deliver new material.

Design and Technology, as it is applied in a number of schools in Cyprus, is consciously and deliberately based on the same lines as Branson's third paradigm. From the point of view that students set their own goals by identifying needs and opportunities, they interact with other students, teachers, parents and specialists; on a research basis, they refer to several sources of information besides those found in their workshops i.e. shops, specialists, work places, teachers, parents, relatives etc. They suggest solutions to problems, realise a solution, test it and evaluate it.

This situation is recent. Before the innovation the subject passed through difficult situations.

Curriculum for Design and Technology

In reality there had never been a curriculum for the subject of "Practical Knowledge". The curriculum on which the subject has been based and taught from 1969 to 1990 was a rough plan on duplicated handouts which included the material to be taught in Woodwork, Metalwork and Practical Electrics. In spite of the fact that the subject was taught in schools of general education, the curriculum was exactly the same with the first stages of the curriculum for Technical and Vocational schools. Besides the material, the methods of teaching applied for the teaching of Technology were identical to those applied in technical and vocational schools.

In 1977 there was an attempt to change the curriculum but it remained an attempt. The aim of this attempt was to change the content of the subject so that it would be possible to offer the subject to the girls. Mainly for economic reasons this attempt has been stopped. The first serious attempt for writing a curriculum was in 1990 at the same time as the introduction of Design and Technology. The existing curriculum consists of three parts. In the first part:

There is an attempt to define Design and Technology, analyse the differences between the problems solved in Design and Technology and the problems solved in other subjects like, Mathematics, Physics, Chemistry, etc.

The design process is explained in detail and defined as the method of teaching the subject.

In this part it is given emphasis to the fact that technology is rapidly advancing and creating changes in all aspects of modern societies. The schools are part

of the societies they serve and are asked to educate their students making them capable to live in a world increasingly dominated by technology and continuous changes. The promotion of technology as part of the whole curriculum developed by the Ministry of Education, would appear to ensure a technological element in the future curriculum.

It would therefore appear that technology will become an established feature of the educational scene in the one form or the other.

The second part of the curriculum includes the units and the material to be taught in each grade. It is stressed that the material found in the curriculum is too much to be taught in the time available. So teachers are advised to select material and plan their work according to the level of the students and the facilities available in their schools.

In the third part of the curriculum are found directions about how to assess students' work and how to maintain safety in the workshops.

Having in mind these developments related to the curriculum of Design and Technology in Cyprus it is easily concluded that the subject more or less followed the developments of technical subjects in other countries which have gone through a number of changes of model over the last twenty years. At one stage the craft model dominated with boys taking woodwork and technical drawing, and the girls studying cookery and needlework. The subject was taught largely by teacher instruction and demonstration and pupil copying and practising. It was more practical than academic and its status was relatively low.

During the seventies a number of major changes occurred. Among them the creation of project technology and the end of gender division of subjects. The project technology brought a revolutionised style of learning. Instead of being teacher-driven, the model became a problem solving one in which pupils set briefs or problems which they are expected to overcome by their own design. Further more the materials used in the workshops tend to be much broader than previously.

Throughout this part the attempt was to introduce the meaning of Design and Technology and to examine the background of Design and Technology as a subject in the curriculum. Most emphasis has been given on Design and Technology education and this because of the disregarding and misunderstanding of the educational and social value of the subject and the need to have a place in parallel with other subjects. The introduction of Design and Technology into the educational system in Cyprus is seen as an essential innovation either in the content of the curriculum or the method of teaching.

SECTION TWO

TECHNOLOGY AND GENERAL EDUCATION

INTRODUCTION

This section is in three parts:

- Chapter four examines the period of Practical Knowledge (1969 -1989), the reasons for which the initial enthusiasm for the establishment of the "Practical Knowledge" programme declined year after year because of the repeated mistakes and the unwillingness of the officials of the Ministry of Education to see the subject as one of equal status to the other subjects in the curriculum.
- Chapter five deals with the preparation made by the Ministry of Education for the introduction of Design and Technology into the formal education system
- Chapter six refers to the strategy adopted for the implementation in order to avoid oppositions and to ensure success.

CHAPTER FOUR

The Introduction of Technology into the Educational System

According to the then existing educational programme, technology was taught mainly through the subject "Practical Knowledge". This consisted of Woodwork, Metalwork , Technical Drawing and Practical Electrics and was offered only to boys (not girls) for the three first years of secondary education (11-14 years of age).

The subject of "Practical Knowledge" was first introduced at four pilot schools during the school years 1967/68 and 1968/69 according to a relevant agreement between the government of Cyprus and UNICEF. According to this agreement, UNICEF was responsible for providing basic equipment (hand tools) for woodwork and metalwork, and the government was to build workshops and to staff the schools with properly trained educational personnel.

In continuation, the agreement was expanded so that within four years (1969-1973) the subject was introduced into 20 other Gymnasia.

After the period covered by this agreement, the subject was introduced to all new schools, and the government of Cyprus undertook the supply of basic equipment of the new workshops with a special fund included in the development budget.

The project had been partly suspended after the events in 1974 created refugee and other related problems. In reality, though the subject existed only on paper, it was not reactivated after 1974. The only thing the ministry did was to move extra personnel from other subjects to this subject, knowing that the only thing these people could do was keep students in class. This is why the number of teachers of Practical Knowledge was exactly the same in 1989 as in 1974 (Ministry of Education, Staff Registry)

a. Aims of "Practical Knowledge"

According to the suggestion made by the "Committee for the subject of Practical Knowledge" (Ministry of Education, 1969) and the "Practical Knowledge" curriculum (1970) aim of the subject was to:

- Offer boys opportunities to express themselves freely or under guidance, through various materials and equipment and help them to identify their interests, abilities and talents.
- Offer boys opportunities to become familiar psychologically with manual work, to acquire experience, to appreciate manual work, to acquire elementary ability to use their hands in manual work and to use modern machines and mechanical means.
- Help pupils to understand better their environment through understanding the procedure of making, the use of modern machinery and mechanical means, and the understanding of the structure of materials and their use.

To develop in pupils:

- Imagination, the power of observation, inventiveness and good taste through free creation, research and making.
- Moral qualities, such as perseverance and responsibility which are developed with the effort of creation and making.

- To offer variety to the gymnasium programme and an opportunity for psychological fulfilment and balance to the pupils in theoretical subjects.

Some of these aims, such as "to develop in pupils the imagination, the power of observation, inventiveness and good taste through free creation, research and construction" could be included in any modern programme for technology. But it is one thing to put down aims and objectives on paper and another more difficult thing to implement programmes that achieve these aims and objectives. The Ministry of Education failed in implementing this programme.

A list of reasons could include and the following:

- There has not been any preparations besides the training of personnel and the provision of basic tools.
- The headteachers and other teachers had not been informed about the innovation.
- There were no books or any other educational material.
- The subject was considered as of minor importance by students, parents, teachers and the Ministry of Education.
- Teachers were considered as teachers of lower status.
- There were not any promotions for the teachers of the subject, as they were considered as less educated because they worked in workshops.
- Workshops existed only in few schools.
- There was no provision of material and equipment.

b. Personnel for the new subject

The Ministry, in its effort to find personnel for the new subject, sent a circular (Director of Education, 1969) asking for elementary school teachers interested in teaching the subject of "Practical Knowledge" to apply for a post.

About 600 out of a total of 2200 teachers showed interest and 32 were selected for training. These teachers started work with great interest as one of them remembers:

> *"All of us worked very hard. We spent our summer holidays for two consecutive years in a very intensive course attending it morning and afternoon and with too much homework. At the end of the course we had a final examination besides the evaluation of practical work [...]"*

Soon after their training (Appendix 6), teachers waited for a job in secondary education, but the officials of the ministry were not willing to offer such a job for reasons nobody could explain. The administrative officer of the Ministry of Education told me:

> *"Look, actually there was not any reason. It was a delay because of bureaucratic proceedings and some implications related to the interests of other groups of teachers[...]. We were about to settle the problem and the events of 1974 postponed all our programmes [...]"*

After 1974, the teaching of technology was a minor problem compared to other problems the government had to face with so many refugees and with 40% of the schools being in the occupied territory.

Finally in 1981 the government prepared a scheme of service for the post of the teacher of "Practical Knowledge". Before then for 12 years they belonged to elementary education and were seconded every year to secondary education for the teaching of Practical Knowledge. This unstable condition created a feeling of uncertainty among teachers which reduced their interest and enthusiasm for the subject.

The training course had been organised only once in 1969, and though there existed needs for new staff, there were no teachers qualified to apply for these jobs. The Ministry of Education used any technician or instructor not needed in technical education to cover these needs temporarily. These persons were not interested in the subject, they knew that they were there on a temporary basis and they only wanted to pass this period of time as easily as possible. This situation continued for more than 20 years, and the teachers, parents and students looked upon the subject as one without any educational value (Teachers' Union, 1981-1983).

As it can be assumed from the views of teachers working those years, there had not been serious preparation related to the theoretical support of the new subject. The teachers who were originally appointed to the teaching of Practical Knowledge faced serious difficulties related to their acceptance as teachers with status equal to the rest of the teachers and to the acceptance of the subject as equal to other subjects of the curriculum. The comments of these teachers are very informative. One teacher, as he said, will never forget his first day in the Gymnasium he was appointed to in 1969 where as a welcome he received this comment from the headmaster:

"*I abhor manual work as the devil does burning incense*"

This is a widely used saying in Cyprus to declare a thing most abhorrent.

Another teacher remembers that during his first days in the gymnasium several teachers came to him asking in a teasing way:

"*Can you tell us what science do you teach?*"

or "*Are you a philologist*"

or *"I am sure you have graduated from the University of Athens, haven't you?"*

The reasons for such beliefs are the general view cultivated by headteachers and teachers of other subjects and the absence of any preparation or information about the new subject by the Ministry of Education. The existing situation in those years was that secondary schools were patterned after those in Greece in the types, the curricula, the syllabi, the textbooks and even the laws and regulations governing the functioning of schools. Only slight deviations were allowed, and they were regarded as a practical need and something temporary, not as part of general educational policy.

> *"The typical adaptations which are introduced by our ministry of education are such that they serve, for purely practical purposes, the particular local needs without increasing or extending them (Ministry of Education, .Annual Report, 1966)*

The then minister of education Dr. Spryridakis, (1969) insisted that if Greek education were dropped, this would "leave Cyprus education suspended" and would result in the collapse of its cultural tradition and the subversion of its national orientation and destiny. This is why he had no educational policy of his own but he followed Greek educational policy.

> *"Some people wonder which is our educational policy. My answer is that the Cyprus educational policy has always been the educational policy of Greece." (Eleftheria, 1969)*

For the same reason Dr. Spyridakis (1969) rejected with horror suggestions made by some intellectuals to replace the textbooks printed in Greece by others written in Cyprus:

> *"We reject with disgust the suggestions to replace the textbooks from Greece with others compiled in Cyprus[...]" (Kypros Daily, 1969)*

It is obvious that such a situation is not fertile for innovations like the introduction of the teaching of technology. Any discussion with teachers reveals the fact that they felt they had suffered an injustice. Previously all of them were primary school teachers, seconded after an intensive training programme to secondary education for the teaching of the then new subject. Because of this, they lost all the rights they had in primary education (promotions to deputy headmaster, headmaster and so on) without any advantage in secondary education. It is remarkable the fact that when teachers of practical knowledge applied for promotion, they were given the following answer by the education committee:

> *"According to the law, no provision exists for the promotion of those teaching Practical Knowledge in secondary education irrespective of their qualifications."*

It is remarkable that during a meeting between the secondary schools teachers' union and the director of Secondary Education which took place on the 3rd of December 1984, (Teachers' Union) the union raised all the issues related to the subject and the then Director General undertook to study the problems. Among these issues were the content and objectives of the subject, the textbooks, the in service training of the staff, the promotions of the staff and new staff. Even now teachers of technology have no right for promotion.

For these reasons, the morale of the teaching staff became very low, as the teachers believed that they served in a section of education in which the state was not interested. This lack of interest was expressed in practice by the following:

c. Administration of the Subject

For nearly twenty years (1969-1988) there were no inspectors for the subject, and since the educational system in Cyprus is a centralised one, there was no direction, guidance or help for the teachers. There were no co-ordinators, heads of departments, deputies or headmasters who had knowledge of or were interested in the subject. A headmaster during an interview manifested his weakness to help:

> *"I was interested in all subjects taught in my school but practical knowledge was a subject I didn't know anything more than the syllabus... The teachers of practical knowledge could help me but I could not help them.... I became a headmaster in 1977. Since then I do not remember any inspector to visit my school interested in the subject.... I had problems with parents who wanted to know what was going on with Practical Knowledge. I could not inform them and I asked them to apply to the ministry of education..."*

These comments had been presented to an inspector responsible for the subject at times. First, he smiled and later he added:

> *"I was never inspector for practical knowledge. My job is in technical education and I administer the subject of cabinet making. Several times I had been asked by the director of secondary general education to visit some schools and deal with specific matters. Practical knowledge never had an inspector. Even now, strictly speaking, there is no inspector for design and technology. The inspector who administers design and technology is the inspector for industrial arts and craft."*

There is no such subject in secondary education. This inspector was given the job to make the needed changes in practical knowledge, and as explained elsewhere the name "design and technology" was given later. So, there is inspector for design and technology, though his title is different from the subject's name.

d. Books and Other Educational Material

From 1969 to 1981 students did not have any book to use for the Practical Knowledge course. The only book which was published for the needs of Practical Knowledge in 1981 was one book on Graphic Communication. This was a UNESCO publication (INFO TVE10, 1978) consisting of three volumes, two of them textbooks and one teacher's book. For the other equally essential parts of the subject namely woodwork, metalwork and practical Electrics, there were no textbooks.

As most teachers said, they had no other choice but to prepare handouts mainly on wood as a structural material and on the use of hand tools. A few teachers said that they were not needed, as the subject was a practical one and "*use and practice were more essential*".

e. Workshops

Most schools had only one workshop, which was not enough to cover the existing needs in teaching periods. Because of this, the subject was taught in regular classrooms, without any technical equipment and with the undesirable consequence of the subject becoming a theoretical one.

In some cases the workshops were housed in small rooms which not only did not have the needed room, but because of their proximity to other

classrooms, could not be used for some kinds of noisy jobs. Most of the existing workshops did not have adequate storage rooms.

Finally, perhaps the worst situation but one which gives much insight into the matter is the case of one teacher in Nicosia who said,

> *"The workshop in my school had been turned into a classroom because the number of pupils in my school increased. I complained to the headmaster, to the parents union, to the teachers union and to the Ministry of Education but nobody took the problem seriously. After that, I worked for one year and then applied for a position in primary education."*

f. Materials and Equipment

The amount of money which was provided for the purchase of material and equipment for the workshops was insufficient to cover the needs of the subject. It is noticeable that the average amount of money provided for each student was only 75 cents[1] annually for materials. As for the provision of equipment, besides the original provision which was given at the establishment of the program, there was no other provision in any budget for the renewal, replacement or supplementation of the equipment.

A few teachers said they were prepared to spend their own money and do basic maintenance to the equipment because otherwise they would become useless.

[1] One Cyprus pound currently equals to 1.4 Sterling pounds

g. Teachers' Views About the Existing Situation prior to the project.

These views came out of a semistructured interview with 50% of the teaching staff of "Practical Knowledge" who are still in service teaching the new subject. The first part of the interview was related to the period before the innovation. (Appendix 2, part 1)

g1. Parents Interest

Almost all teachers agreed that very few parents were interested in the progress of their children in "Practical Knowledge" because they considered the subject of very little educational value. The following comment of a teacher describes the situation very well:

> *"I saw parents coming to school and visiting teachers of other subjects to discuss the progress of their children[...]. I waited for them in my room but very rarely I had visitors. I understood that most of them came to me out of kindness rather than of interest about the progress of their child[...]. I preferred not to be at school on parents' meeting days."*

Teachers' responses estimated that 5% to 30% of the parents present at school on parents' meeting days were interested in the progress of their children in "Practical Knowledge". This may explain the low significance teachers gave to the subject.

g2. Demotion of the Status of the Subject.

As for the status of the subject of "Practical Knowledge" all teachers agreed that this is due to the fact that the Ministry of Education did not show any interest in the subject. Opinions about other reasons such as teachers' low

qualifications, practical nature of the subject, links with other subjects, relation to modern occupations, and content of the subject vary.

TABLE 9

Percentage distribution of responses to given statements

Teachers, parents and students considered "Practical Knowledge" to be a second class subject because:

	Yes	No	N. Sure
a. Teachers had low qualifications	45%	50%	5%
b. The subject had a particular nature	75%	25%	-
c. The standard of instruction was very poor	12.5%	75%	12.5%
d. The quality of learning was very poor.	75%	25%	-
e. Only traditional materials and tools were used	75%	25%	-
f. It had nothing to do with Greek history and culture	25%	62.5%	12.5%
g. It was not linked to other subjects	62.5%	37.5%	-
h. It was not related to modern occupations	62.5%	37.5%	-
I. It did not have any pre-occupational value	37.5%	50%	12.5%
j. There were not any machinery in the workshop	75%	25%	-
k. The Ministry of Education did not show any interest	100%	-	-
l. There was complete absence of textbooks	87.5%	12.5%	-
m. The content of the subject was not that needed by standard of living of the Cyprus society.	75%	25%	-

Remarkably enough, their responses say that the standard of instruction was not poor (75%) but quality of learning was poor (80%) . This explains why even the teachers did not believe that their subject had educational value or

that the content of the subject was not that needed by the standard of living in the Cyprus society (80%).

Another interesting outcome of the responses of teachers is their belief that the subject was considered of minor importance because it was not related to modern occupations (62,5%) but at the same time only 37% agree that its pre-occupational value affects its status.

Part two of the semi-structured interview (Appendix 2, part 2) covered the preparatory period for the two-year course.

g3. First reaction of teachers

All teachers reacted very positively when they were informed for the first time (1988) about the intention of the government to proceed with a change in the teaching of technology. A teacher described it as

> *"teachers and others accepted it like a dry sponge absorbs a drop of water"*

To the question "Do you believe there was a need for this innovation?" all teachers gave a "*Yes*", and to the question "*why?*" the generally given answer was because teachers were asking for it for several years. Several teachers also gave the following reasons in their responses:

- It finally will stop sex discrimination.
- Modern technology will be included in the curriculum.
- The subject will finally take its place in the curriculum.
- It will stop being manual work and nothing more.
- Problem solving and research are basic elements of real learning.

- "Practical Knowledge" degenerated. Nobody recognised the subject as essential and it was looked upon as a subject which helped students in a way to relax.

The situation before the commencement of the project is best described by Dr. Michaelides, Inspector and responsible for the introduction of Design and Technology.

> *"Previous to 1989, all schools on the island accepting the age group 12-15 were teaching Practical Knowledge (woodwork and metalwork) to boys only and girls were taught home economics. The type and range of work was the ordinary, traditional woodwork and metalwork. The children were given set pieces of work to make. They were given drawings of those particular pieces of work and the traditional methods of teaching were followed, for example there were specific demonstrations, there was emphasis on the use of tools, hand tools generally.*
>
> *The status of the subject was quite low because it was not deemed to be in any way academic which carries a lot of weight in Cyprus. There was no skill in it and it was just a matter of being seen as a subject which helped students in a way to relax, at the same time develop their fine skills and not much more. The status of practical teachers reflected, in many ways, the status of the subject. The subject was taught by teachers of elementary school who received training and became craft teachers. They were presented as 7 grade teachers. This is for teachers "Class B" and very often they were used to maintain the school and if there was something to be done it was always the craft teacher with his class or alone who would be able to do the undertaking.*

It was against this background that the preparations for the new course were made and the new course was designed.

CHAPTER FIVE

PREPARATION MADE BY THE MINISTRY OF EDUCATION FOR THE INTRODUCTION OF DESIGN AND TECHNOLOGY INTO THE EDUCATIONAL SYSTEM

The Ministry of Education, by understanding its role and responsibility regarding the development of technology infra- structure as an indispensable element for the technology upgrading on the island, could not stay indifferent and appointed a committee for the introduction of the teaching of technology into the Cyprus formal Educational System.

The Inspector General for Technical Education was President of the committee and the following were members:

- One official of the Planning Bureau.
- One official of the Ministry of Industry and Commerce.
- The Inspector General of Primary Education.
- Two District Inspectors of Secondary Education (General).
- Two Inspectors of Secondary Technical Education.
- The heart of this committee was the Inspector of Industrial Arts and Craft.

The Director General (1989) instructed the committee to:

- Study the suggestions made in the two reports of the Institute of Development Studies of the University of Sussex and especially those points which are related to Education. These reports are under the title Industrial Strategy and Technology Strategy.

- Study the report submitted by the educational authorities of Bedfordshire in relation to the introduction of the subject of "Craft, Design and Technology" into secondary education.
- Adopt the General aims and specific objectives of a programme "Introducing Technological Dimensions into Primary and Secondary Education" based on the previous mentioned reports.
- Suggest a plan for the implementation of the programme and estimate the cost for this implementation.
- Suggest a timetable for the implementation of the programme and distribute the costs into the budgets of the years 1989 onwards.
- Suggest ways by which the project could be controlled, as well as the method of its evaluation.
- Further to the study of the previously mentioned reports the committee had to come in contact with representatives of the public and private sector related to the project and note their opinions.

a. Activities of the Committee

In order to complete its work the committee met eight times during which the following documents were studied:

- The notifications which were laid down at the conference on "the role and consequences of Technology on the Cyprus Educational System" which took place in Nicosia from 31.1.89 to 3.2.89.(Comments on this seminar are found under the title: How implementation started.)

- The report from Dr. A. Karagiorgis under the title "Home Economics and Woodwork-Metalwork in Primary Education". Dr. Karagiorgis emphasised that the subject should be placed on a new basis in order for it to become attractive and interesting to students and its content to fulfil the demands of today's society.

- The Report by Dr. A. Michaelides under the title "The Subject of 'Practicae Gnosis'" 'Practical Knowledge' in Cyprus Gymnasia. Dr. Michaelides reported that that the situation with Practical Knowledge is entirely unacceptable and there is a need for the introduction of a new subject to replace the existing one.

- The report prepared for the Ministry of Education of the Republic of Cyprus by the Bedfordshire Education Service in 1986. The Bedfordshire LEA suggested the introduction of a new subject similar in content and methods of teaching to that existing in England and Wales. The report suggested the introduction of the subject in two stages. At a first stage in elementary and lower secondary education and at a second stage in upper secondary education.

- The notice of Dr. G. Austin "The Introduction of Design and Technology into the Secondary Education System of Cyprus".

Among the previously mentioned documents the most essential for the purpose of the introduction of Technology into the educational system of Cyprus was found to be the report of the Educational Authorities of Bedfordshire, and the study of which formed the main work of the committee.

The committee also conducted the following meetings:

- They met with two of the main authors of the report of the Educational Authorities of Bedfordshire and discussed with them the content of the report.

- They participated in the conference on the "Role and Consequences of Technology to the Cyprus Educational System".
- They discussed their conclusions with the representative of the British Council.
- They asked for the opinions of the American Professor Mr. Austin and discussed with him his notification.

Finally, members of the committee visited several Gymnasia in Nicosia and Limassol and observed the real situation of the workshops and the alterations needed for the teaching of technology in these schools to be possible.

b. Conclusions and Recommendations of the Committee

The committee concluded that all the reports - without exception - warmly supported the reinforcement of Technology into the Cyprus educational system for pedagogical and economic reasons. The committee unanimously accepted the previously referred opinion and suggested the introduction of technology into the educational system to be of first priority.

c. Strategy for Introduction Adopted by the Committee

The committee agreed with the Bedfordshire Report, according to which the first and main objective should be the introduction of a new subject into the educational system of Cyprus which would replace the existing subject of Practical Knowledge. The new subject would be introduced progressively starting with Gymnasia. At a later stage the subject should be expanded to elementary education and to Lyceums (14-18 years of age) as well. At the same time, the subject would be related horizontally with other subjects such as Art, Physics, Mathematics, Home Economics and History.

d. Title of the New Subject

The committee considered the titles used in Great Britain "Craft Design and Technology" and "Design and Technology" and suggested for the new subject the title "Σχεδιασμός και Τεχνολογία" which is the Greek version of Design and Technology.

e. Objectives of Design and Technology

The main objective of the new subject is to encourage students to use their theoretical and technical knowledge and abilities to solve practical problems. This can be achieved through the method of research and analysis which aims at developing ideas and applying them on projects with the use of adequate materials and technical processes (Ministry of Education, 1992). More specifically, the subject helps students to:

- do research studies and analysis;
- identify and solve technical problems in a constructive way;
- acquire technical and technological knowledge and abilities and work out ways of their application;
- Apply concepts taught in other subjects i.e. Mathematics, Science and Art;
- understand the economic factors related to projects;
- co-operate properly in groups;
- develop the ability to communicate with others;
- develop the ability of critical analysis of projects made in industry or in schools, especially the ability of self criticism;
- develop aesthetic sensitivity;

f. Content

The subject includes the following sectors:

- Technology in the past and present.
- **Design:** Methods of research, analysis and evaluation of problems and working out of accepted solutions.
- **Graphical Communication:** Free hand sketching, flat and pictorial drawing, use of colour, templates, construction of models and presentation techniques.
- **Visual Elements of Design:** Line and symmetry, shape and form, colour, texture and design from nature.
- **Safety:** Safety as a conception, and especially safety in every concrete technical process and every day life.
- **Materials:** Metal, plastic, wood, and their origin, qualities and uses.
- **Control:** Mechanisms, levers, linkages, pulleys, gears, cams, moments, structures, forces, equilibrium, girders.
- **Electronic Control:** Recognition of components, basic electronics construction of circuits.
- **Energy:** Resources, forms, conversion and use.

g. Integration of Design and Technology into the School Programme

In the then existing programme boys were taught Practical Knowledge and girls Home Economics. With the introduction of the new subject the committee aimed at lifting this discrimination so that both boys and girls would attend the subject of Design and Technology as well as Home Economics. In the then existing programme three periods per week were given for the first year, 3 periods for the second year and 2 for the third year.

The committee accepted the idea included in the Bedfordshire report regarding the abolition of discrimination of students as boys and girls and expressed the opinion that if the number of teaching periods would be 1.5 per week for the first and second years of education and 1 for the third year this would prove absolutely insufficient. The committee suggested 2 periods per week for each year for Design and Technology.

To cover the difference of the suggested increase in the number of periods the committee suggested three alternative solutions:

1. For the first and second years the teaching periods of the school programme would increase from 36 per week to 37 per week and for the third class from 36 to 38. Unfortunately, in the meantime the working periods of schools decreased from 36 to 35 per week due to adoption of the five day week.
2. For the first two years the three existing periods for Practical Knowledge and Home Economics would be distributed between Design and Technology (2 periods) and Home Economics (1 period). For the third year the week periods would be increased from 36 to 37 and the available periods for Technology and Home Economics from two to three, two of which will be given to Technology and one to Home Economics.
3. Transfer of periods from other subjects.
4. The committee decided that possibly with any of the three solutions there would be opposition, and decided to suggest that the second solution to be adopted for the two pilot schools for which there was possibility to start in September 1989. This would allow enough time to study the issue of the schools programme globally.

h. The Teaching Staff

Unavoidably the basic core of those who will teach the new subject will consist of those who already teach the subject of Practical Knowledge. The number of teachers was 90 and fell into different categories as follows:

Practical Knowledge teachers	53
Teachers for technical subjects with a permanent position in technical education	18
Teachers for technical subjects on contract	17
Elementary school teachers	2
Total	90

The committee expressed its fear for probable failure because of the great number of seconded teachers teaching the existing subject of Practical Knowledge, and remarked that it is obvious that the introduction and development of the new subject of Design and Technology could not be based on seconded teachers who as a consequence of their secondment see their work as temporary. It is expected that most of these teachers will return to their duties in technical education. Of course it is possible that a few of them will decide to stay. If they have the required qualifications, a job could be offered to them in the teaching of Design and Technology. The rest of the jobs could be filled with new teachers according to the new schemes of service.

i. The Suggested Scheme of Service

The committee accepted what was recommended in the Bedfordshire Report i.e. those who will be appointed must be university graduates. It was stated that those teaching the subject in UK are university graduates with a B.Sc. or B.Ed. degree. In USA they have a similar degree, B.Sc. in Industrial Arts. In Cyprus it is quite difficult if not impossible to find such qualified candidates at least at present. For this reason, the committee suggested the following additional paragraph to the existing schemes of service.

> *"Especially for the teaching of Design and Technology, in case that there are no candidates qualified with a Degree in C.D.T or Industrial Arts, as candidates may be considered and those who possess a degree in a relative subject. The relative subject will be specified by the Educational Authority at the same time with the proposal for appointment, according to the educational needs."*

j. Training and Retraining of Staff

All new teachers who do not have a degree in this speciality are required to attend a special course, in order to be eligible to teach the subject.

The same course of study should be attended by all those teaching the subject of Practical Knowledge. The Bedfordshire report suggested the course of training to take place during the summer months i.e. June - September and it would cover 302 hours of work.

The committee accepted the idea for the duration of training as well as its content. As to the time of year, the committee had the opinion that the absence of so many teachers from school for two whole months could create

problems in the smooth functioning of the schools. Besides, the summer months are not as productive for training purposes. For these reasons the committee suggested the following scheme:

1. The training should take place during school hours (8.00-1.30).
2. Every trainee should attend training lessons for one day every week for two years (30 weeks x 5 hours x 2 years=300hours).

During the training period, the new teachers would not have teaching duties for one day every week. For this purpose one of the two days which are dedicated to attending lectures at the Pedagogical Institute for the teachers under probation may be used .

Those teachers who have a permanent position, work for 20 periods every week and it is not possible to obtain exemption from their duties in school, since the successful attendance of the training course will help them to have a higher job.

The trainees will be divided into four groups. Two of these groups will have Nicosia as their centre and the other two Limassol.

The four groups will be taught by an English specialist teacher with a Cypriot acting as counterpart. These teachers will be found through the Bedfordshire Link

I. Workshops

Almost all gymnasiums have only one workshop which is not enough to cover even the needs of the existing subject. Thus, the workshops are inadequate either for room or equipment for the teaching of the new subject.

Consequently, a second workshop to be built-attached to the existing one is a must for all the Gymnasia. In cases where this is impossible either

neighbouring rooms will be used or the workshop will be moved to another place.

The workshop problem should be considered for each school independently and according to the existing situation a solution could be found. In some schools, building is impossible because of lack of enough space and in some cases the only possible solution will be the reduction of the number of students.

m. Technology Centre

The committee agreed with the suggestion of the Bedfordshire Report that the establishment of a Technology Centre is very essential and that its main objective will be the delivering of information and awareness on matters related to the various sectors of Technology. This centre will be used for the inservice training of the teachers as well.

To be able to fulfil the above demands, a library must be included in the centre as well as a fully equipped technological workshop. The centre could become a part of the existing Pedagogical Institute.

For the first years, the workshops of the two schools in which the "Pilot projects" will take place could be used as technology centres.

n. Administration of the Project

The committee suggested the responsibility for the implementation and management of the project to be given to the Director of Technical Education. The committee agreed with the suggestion of the Bedfordshire

Report for the appointment of an advisory group (administration group), which would look after the implementation of the project. The committee suggested that this group could be the existing Technology committee of the Ministry of Education which could be reinforced with the Headmasters of the two schools where the Pilot Projects would function.

o. Timetable for the Implementation

The Bedfordshire Report suggested a specific timetable for the implementation of the project.

> *"This three year development programme is offered as a framework for development. It has been based on the experience gained in Bedfordshire with respect to the introduction of the Technical and Vocational Education initiative to all secondary schools and from the project leading to the introduction of computer education into the secondary education system in Cyprus.*
>
> *The framework assumes a number of factors, in particular that the Ministry of Education accepts the need to introduce technology into its schools and is prepared to resource this development to an appropriate level."*

The following timetable, suggested by the Committee, is slightly different from that included in the Bedfordshire Report

Spring 1989

1. Seminar aiming at familiarisation of the Ministry of Education officials, the Inspectors and Headmasters/ Mistresses of schools in relation to the introduction of Technology into the educational system of Cyprus.
2. Selection of two Gymnasia, one in Nicosia and one in Limassol, where the two "Pilot Projects" will function.

3. Approval of the new scheme of service.
4. Starting of translation of the textbook and starting of preparation of the indispensable teaching material.

Summer 1989

1. Preparation of the two workshops in the two "Pilot Schools". For this purpose a demand for the release of a sum of £2,000 from the development budget will be made.
2. Purchase of tools and equipment for the two "Pilot Schools". For this purpose a demand for the release of £6,000 is needed. This sum is estimated to be enough only for the needs of the first year.
3. Carrying out a seminar of six days duration for the awareness of all the teachers who teach the existing subject of Practical Knowledge.
4. Selection of the five schools to which the subject will be introduced in September 1990.
5. Suggestion for budgeting purposes, for building new work- shops and buying their equipment in five schools and the establishment of the Technology Centre.
6. Meeting of the Management group.
7. Detachment of teachers for writing and translating and preparing teaching materials for the school year 1989-1990.

Autumn 1989

1. Sending of two teachers to Bedfordshire for two weeks with the purpose to be trained and undertake the teaching of the subject in the two Pilot Schools.
2. Starting of the programme of connection of the five new schools with the two "Pilot Schools".
3. Meetings of the Management Group.

The committee prepared a time-table for Spring 1990, Summer 1990, September 1990 which was along the lines of the previous mentioned timetable.

After 1990, the subject was to be introduced in five new schools every year until the programme would cover all schools on the island. Before the introduction of the subject in a new school, this school should be connected for one year with another school where the subject was already taught. It is better, at least at the initial stages, for new teachers who undertake the teaching of the subject to be sent to England for two weeks training.

p. Costs

According to the budgets included in the Bedfordshire report the equipment for each workshop will cost approximately £20,000. In addition, it is estimated that the building of a new workshop for each school will need about £15,000.

Based on the above the cost for the implementation of the programme will require £1,790,000.

It is evident from the previous paragraphs that the government of Cyprus wanted this programme to be a successful one and moved decisively, in terms of planning the innovation and investing a serious amount of money.

CHAPTER SIX

IMPLEMENTATION

During the implementation of the project the inspector of Industrial Arts and Crafts acted as the "motivating force" and co-ordinator among the various offices involved and between the government of Cyprus and the Bedfordshire Educational Authorities.

From the beginning, he prepared a schedule consisting of five parts:

1. Introducing the new subject to the Ministry officials and headmasters of the schools.
2. Training the staff and recruiting and training new staff.
3. Preparing new workshops and submitting the available materials and equipment.
4. Preparing text books and other educational material.
5. And last, but in my opinion the most essential, informing all those interested in education, especially educators and parents, about the attempt to introduce Design and Technology into our Gymnasia.

a. The first stages of the implementation

The implementation of the new subject started with a seminar aimed at introducing the new subject to the officials of the Ministry of Education and at persuading them that the introduction of Technology into the educational system of Cyprus was a pressing need. The seminar was very well organised. In the room there was a small but comprehensive exhibition of textbooks and students' work from Bedfordshire schools. The panel consisted of persons respected by the audience for their knowledge, experience and status, as they were well known to most of the officials. Among them was the Dean of

the University of Athens, one member of the University of Sussex, one representative of the Bedfordshire Educational Authorities, the Inspector of Design & Technology in Bedfordshire, the Director of Technical Education in Cyprus, Representatives from the Planning Bureau and the Cyprus Industrial Association and the Inspector of Industrial Arts in Cyprus.

The seminar was critical to the introduction of the new subject for two reasons:

1. The Cyprus Educational System is influenced to a great extent by the Greek one which is based on Nationalism, an ideology which has a long history in modern Greece. Its main characteristics are pride in the glorious past, conservatism and idealism The influence of the Greek educational system upon the Cyprus Educational System is clearly seen in the speech of Mrs. C. Angelides, new Ministress of Education, who, undertaking the Ministry from the previous Minister in March 1993, declared that:

> *"Our education will be Hellenic centred and Christian centred»*

This declaration was a matter of policy and criticism related to the previous Minister and his policy.

In the next issue of the daily newspaper "Philelefttheros" (17/3/93), the chief editor wrote a comment criticising the speech of the Minister and had the answer from "Simerini" daily in these words:

> *"Those harrying to play with those things with which it is not proper to play, must become isolated for the benefit of the country" (Simerini Paper, 19/3/93)*

2. Gross et al, (1971) state:

> *"Members of an organisation usually are unable or find it difficult to diagnose their problems in a realistic and competent manner. Outside change agents with expert*

knowledge are assumed to possess the ability to approach situations in a more objective and a more sophisticated manner. Consequently, their analyses are usually more realistic and penetrating than those of organisational members. It is also assumed that outside change agents can more readily set forces in motion that will increase the amount of flow of communication among members of the organisation, which in turn will result in their greater awareness for the need for change and their greater commitment to proposed innovations»

Having in mind the beliefs of the government officials and the role of the outside change agents who took part in the seminar we can easily understand the role and importance of the seminar.

The composition of the panel (well known Cypriot scientists such as the Dean of the University of Athens and foreign specialists on the subject) convinced the officials of the ministry of education, the inspectors and the head teachers who might not believe in the need for the innovation suggested by the planning bureau, that the teaching of Technology is a need and must be introduced to Cyprus Gymnasia without delay. The presence alone of the Dean of the University of Athens convinced the attendees that the innovation did not fight Greek culture or Greekness and at the same time assured the need for acceptance of the new subject.

The presence of the planning bureau convinced even those a priori opposed to any innovation in education to think twice before expressing themselves. This is because the Planning Bureau has a good reputation in Cyprus due to its role in reactivating the economy after the events of 1974 and the economic progress which followed, as well as for its reputation for facing problems only

after serious analysis of parameters and more serious thinking. The experience of the specialists from abroad assured them that the Ministry of Education did not blindly start experimenting but they used the experience of other countries for the preparation of its own programme and for its implementation.

The Ministry of Education was wise to use foreign specialists not because there were no Cypriots scientists but because Cypriots did not have the experience and also might be more easily swayed by critics from several social and economic groups.

One headmaster during the interview started expressing his views about the new subject this way.

> *"I was among those who attended the seminar held in the conference room of the Bank of Cyprus. I was wondering what is the need for the gathering of so many well known personalities and what they could say about "Practical Knowledge the least subject in our schools.... At the end of the seminar I was sure that the proposed innovation was a serious one."*

The influence of the headteacher in educational changes is well described by Fullan, (1991):

> *" The principal has to become directly involved. He may not know mathematics per ce or science or history; But he can [be] and the teacher can see him as an expert in curriculum planning."*

b. The seminar conducted by the Inspector of Design and Technology of Bedfordshire LE

A second seminar directed by an Inspector of Design and Technology of Bedfordshire Local Educational Authorities took place in Nicosia on the 13th of June, 1990, and was repeated on the 14th of June, 1990, in Limassol. This second seminar aimed at introducing the first part of the two-year Design and Technology course, which would be offered to the Design and Technology teachers during the school years 1990-91 and 1991-92. Keeping in mind the previous paragraph, we can easily assume the importance of this seminar.

The main objective of the seminar was to make clear to all teachers of technology what "Design and Technology" is, and what its similarities and differences are, compared to the current project in Cyprus. For more clarity the attendees worked in the same practical way in which students would work in schools.

Another objective was to outline the purpose of the first year of the course, how the eight units have been organised, who will be presenting each unit, what was expected from the Cypriot teachers during the two year course and the requirements for graduation.

c. The Two Year Course

Based mainly on the suggestions of the Bedfordshire team and co-operating closely with them, the Ministry of Education prepared a two year programme aimed at enabling the staff to teach the new subject. The members of the staff had divergent qualifications. The Manual Arts teachers were Elementary School teachers who had undergone an intensive seminar on technology

(Appendix 6) in 1969. New teachers with one or two years teaching experience were graduates in engineering, mainly Electrical and Mechanical. Though they were all engineers, they had varying qualifications, and most of them had low capabilities in designing and teaching.

The course was organised to train all the technology teachers of the island. It was of a highly practical nature, with teachers undertaking specific projects in order to simulate the experiences of pupils and to raise issues with respect to workshop organisation. The training was undertaken by experts from Bedfordshire working closely with the Inspectorate in Cyprus (Appendix 7). The problem of communication was solved by a Cypriot counterpart who translated from English into Greek and vice versa. Though most of the Cypriot teachers knew English well, a few of them, mainly those graduates from universities in Eastern Europe needed help to communicate.

The training of new teachers is now carried out by teachers trained during the two year course, who act as leaders for the training of new appointees. The content of the original course included such topics in theory and practice as those needed by the teachers to teach technology (Appendix 7).

At the end of the course an impressive exhibition took place, where all the projects made by the teachers were shown. At the inauguration of the exhibition certificates were awarded to all successful teachers.

For a teacher to be considered successful almost 90% attendance was necessary. Moreover, the candidate was expected to show interest during the course and to succeed in a final examination submitting six minor projects and a major one (Appendix 8).

The projects were examined by Bedford College examiners who considered the following.

1. Every teacher had to include in his projects all the topics taught during the course.
2. Every teacher had to succeed separately in every project.
3. The way of marking the examiners used in each project is shown in Appendix 8.
4. Successful teachers were awarded the "Certificate of Further Professional Studies". This Certificate was awarded by "Cambridge Institute of Education, Bedford College of Higher Education, Hatfield Polytechnic School of Education and Homerton College".

d. Problems Related to Staff

In its effort to recruit new staff, the Ministry of Education had to consider several opinions expressed by those constituting the "mixed personnel committee", the body responsible for the preparation of the schemes of service for all teachers. This Committee is made up of the Director General of the Ministry of Education, who acts as chairman, representatives of the teachers', and inspectors' unions, a representative of the Ministry of Finance and the relevant Director of Education in this case the Director of Secondary Education.

The Government suggested a draft prepared by the Administration Department of the Ministry of Education, according to which those who are eligible for the position of the teacher of Design and Technology:

> *"Possess a degree on "Design and Technology" offered by British Universities or on "Industrial Arts" offered by American Universities or equivalent to these degrees*

offered by Universities of other countries. In case that there are no qualified persons available persons qualified with a degree in Electrical or Mechanical Engineering could be appointed for this post." (Mixed personnel committee 1992)

When the committee met to discuss the proposal for this scheme of service several problems arose:

1. The representatives of Technical Education expressed the opinion that the subject should not belong to the Directorate of Secondary General Education but to that of Secondary Technical as its nature and content are technical. Either the Department of Technical Education or the Technical Education Teachers' Union did not like the subject to be under General Education, fearing that the department of general education will become even more powerful and gradually will absorb the department of technical education.
2. The representatives of Secondary General Education denied that the subject would be taught in schools of general education and in spite of the fact that its content is of technical nature it is taught for general education purposes and hence logically belongs to General Education.(Mixed Personnel Committee, 1992) The Department of General Education considered the subject as a subject for general education purposes, as it is in reality, and in no way could accept teachers and inspectors from other departments work in its schools.
3. The Secondary Teachers Union suggested that there is no reason to give priority to persons qualified from English and American Universities and so all persons qualified with a degree in engineering or physics could be considered as eligible for the post.(Mixed Personnel Committee, 1992)The Secondary Education Teachers' Union (Most of its members Greek University graduates)

wanted engineers from Greek Polytechnics to be eligible for the post of a Design and Technology teacher.

After several meetings, the opinions of those in Secondary General Education were accepted for the issues under consideration.

There were also the problems related to the conditions of service and the new appointments. The existing staff felt that they suffered an injustice, because as teachers in primary education they had the right for promotion to Deputy Head Masters, Headmasters and Inspectors, but after they were trained to teach the then new subject Practical Knowledge and seconded to secondary education, they lost all their rights for promotion and they had a lower salary scale compared to that of their colleagues in Elementary Education. They thought that the attendance of the two years course on the teaching of Design and Technology was an opportunity for them to become "A class" teacher, which meant that they would have a position equivalent to the teachers of other subjects. But the problem still exists in spite of the fact that the government offered them sixteen positions on a higher salary scale.

In spite of these problems all teachers attended the two year course.

The government made a serious mistake which is likely to create problems in the near future. The easiest solution was to deal with Design and Technology teachers on exactly the same basis as teachers of other subjects. The fact that old teachers do not have a degree could be dealt with by considering their qualifications (Diploma from a teachers training college, 9 months intensive course for the teaching of Practical Knowledge and the two year course for the teaching of design and technology) as equivalent to a degree -

a method used in the case of elementary school teachers. (Ministry of Finance, Salaries Agreement, 1988)

As regards the possibilities for promotion again it could be dealt with on the same basis. The fact that teachers of Design and Technology do not have the right to be promoted to higher positions soon will create problems and will lead to less interest, as teachers see other younger people with perhaps less qualifications and abilities in higher jobs. The sooner the government faces this problem positively the better for the subject.

Regarding the appointment of new teachers, the acceptance of the opinion of the teachers union created problems affecting the status of the subject. The last two appointments explain the problem very well. According to a member of the educational service committee:

> *"Last January (1994) there were two jobs for design and technology. According to the scheme of service the committee had to select the two persons with the higher number of points from those on the lists of all subjects of technology. A gentleman graduated in Design and Technology from a British college presented himself to the committee asking for a job saying that he was a specialist for the job. Unfortunately, we saw the problem but we could not do anything. He was the best person for the job but according to the law he has to wait until his points will be higher than all other engineers on the lists."*

To my question

> *"when do you think this will happen?"*

He was very explicit

> *"Maybe never. There are so many on the lists before him."*

The result was that the two jobs were given to one civil engineer and to one mechanical engineer (Cyprus Gazette, 1994)

e. Preparation of New Workshops

Recognising the importance and the influence on the quality of the work as well as the educational value of the environment in which the Design and Technology activities take place, care was taken for the establishment of a proper environment. In preparing these places, it was kept in mind that the main working area needs to be flexible, permitting work in more than one medium and capable of supporting design work. For the latter pupils and teachers need the room to be adequately furnished to form groups for discussion and demonstration, but pupils also need room to work individually or in small groups on tasks involving research, writing, talking, drawing, model making and construction. A place for displaying materials is very important, both students as well as projects commercially produced articles, to inspire future work. As already mentioned the facility required for the teaching of Design and Technology should have a multi-material capability within a design studio atmosphere. Considering many factors, mainly economical ones, the Ministry of Education decided to reorganise the workshops gradually. So they decided to prepare two fully equipped workshops, one in Nicosia and one in Limassol, to be used for the needs of the schools as well as for the needs of the two year course aiming at the teachers' training. These two workshops were completed in September 1990, seven other workshops were completed in 1991, twelve more in 1992 and if

the programme continues to be implemented as planned all the Gymnasia will be fully equipped by 1995.

The criteria for workshop organisation were:

1. Resource area. A place to store materials related to the work done in the workshops, such as books, journals, posters, work/process cards, data sheets and any other material from which students can draw information in preparing their project work. These materials are not provided by the Ministry. It is the responsibility of the teachers to acquire these materials by encouraging students and parents to help and by using small amounts of money available to each school.
2. Modelling area: Incorporates light modelling tools and materials.
3. Clean Design area. Flat topped tables. In most cases old woodwork or metalwork benches were covered with new tops and gave the required clean, good looking surface. The area is supplied with drawing equipment.
4. Multimaterial areas. Areas supplied with benches and hand tools to allow a variety of materials to be used. This is the main construction area and, besides hand tools, it is supplied with machinery like bandsaws, plastic strip heaters, vacuum former, disk sander, wood and metal lathe.
5. Materials store. Students in their designs may decide to use any material. It is helpful if these stores are multimaterial to accommodate students designs. This variety of materials include materials from our every day environment such as ceramics, glass, bricks, concrete, fabric, plastic, wood, metal etc.
6. Display area. A place where students can display their work.

The two workshops which have been established since 1990 act as Technology Centres, and it is in these areas where in-service training originally took place and continues to take place for both new staff as well as retraining of existing staff.

These workshops were used by the visiting teachers from Bedfordshire and the Cypriot teachers who undertook the training and retraining of the staff.

Cypriot teachers at the same time acted as advisors visiting schools and supporting teachers in their day to day activities. In this way, teachers new to the subject received a high level of support and advice.

All teachers express their pleasure with the new workshops and the equipment in them. Comparing the existing situation before the innovation to the new situation all of them see tremendous progress. However, there is still room for improvement. On the one hand, there exist needs for more room and equipment in the workshops, but on the other hand there is provision of some equipment which is not needed and will not be used for at least the next five years.

f. Textbooks and Other Educational Material

One of the very first decisions of the Ministry was to have at least one textbook available to students from the very beginning of the project. Among the Educational staff in Cyprus there are excellent scientists and teachers but they were not aware of the philosophy and approach to the new subject. So, instead of publishing a new book, and thus risking writing a book on lines different than those required by the subject, several British editions were examined, and it was decided to ask for the permission to translate the one selected. The book selected was "An Introduction to Craft Design and Technology" written by Steward Dunn. At the same time teachers from the UK were asked to prepare a booklet containing the material they should teach during the two year course.

Other material has been prepared by the Cypriot advisors and distributed to all schools. Besides books, all teachers prepared during the two year course more than ten minor projects and a major one, valuable material as teaching aids.

g. Support Group

The innovation was a very big job for one person. According to the existing structure of education for the teaching of Technology, there are a number of technology teachers and one inspector. If teachers are restricted only to their teaching duties then the only person to look after, give directions and do all the administrative work needed is the inspector. He understood that it was impossible to manage everything himself. So, he established a support group consisting of teachers willing to make efforts and spend time for the implementation of the new subject.

This group was at first very small. It started with two persons, one in Nicosia and one in Limassol. Their first job was to teach new teachers the aims and objectives of the subject, the use of tools and equipment, and the design approach. Steadily, the number of individuals in the support group became larger and larger and today it consists of nine (9) individuals. The selection is not under any law or scheme of service. It is absolutely under the distinctive wish of the inspector. This is why after every selection there are complaints because other persons also believe that they could be suitable.

The individuals working in this group offer their work on a voluntary basis without any benefit besides the goodwill they create and the experience they gain. The only support they have in their work is accessibility to more

resources, mainly books found in the inspector's office and the guidance and information they have from the inspector.

This group, besides the two years training course had a two week visit to Bedfordshire. This gave them first hand information about Design and Technology in the National curriculum, including its evolution, aims and overall objectives of as well as the implications of the introduction of Design and Technology in the National Curriculum. They also shared the Workshop reorganisation in Bedfordshire. This visit included viewing of technology exhibitions, visiting technology units and other support groups, visiting schools, viewing the use of the mobile units in a range of schools, working with a Design and Technology department, taking part in the teaching programme and observing management and organisation practice, observing facilities and courses in Technology section of Bedford College, visiting to Design Museum and Design Centre, etc.

For several reasons, but mainly because they were enthusiasts about the new subject, they helped the implementation of the project in various ways. But this was a temporary - provisional - solution. The enthusiasm will go down in time and the system will work only if new appointees cover the needs of the system.

This group helped in several situations. The first and more beneficial, was its advisory nature. For every new step the inspector called a meeting of the support group and exchanged views with them. After that, he decided alone, as he is the responsible person to the Ministry of Education and the Government as a whole, but kept in mind the opinions expressed in the support group meeting.

Besides this advisory duty members of the Support Group worked on several needs of the subject such as, building new workshops and needed installations in them. The technical services of the Ministry of Education were responsible for this job, but they needed help on issues closely related to the subject. Overall, as in any other case the personnel of the technical service were civil servants and as such they looked upon this work as routine work without any special importance. Special care was offered by the support group members who checked up on every stage in the development of the works.

h. Buying materials.

Previously, the materials for every school were bought by the local school committees. The committees bought them at retail prices and in many cases they used the money or part of it to cover school needs not related to technology, which according in their judgement were more essential and urgent. As from January 1990 there is a special fund in the development budget for Design and Technology. Every school adopting the new subject had an initial support of £100 plus (£5) five Cyprus pounds for each student taking the subject. Eighty percent (80%) of this amount was given directly from the Treasury Department to the store house of the Ministry of Education. The storehouse co-operated closely with the support group and despatched the needed materials to the schools. The remaining 20% of the money was available to the teachers of the subject and they had the right to buy things which were not provided by the storehouse.

All the work needed i.e. invitation for tenderers, check of prices, check of specimens, selection of tenderers, and check for the quality and quantity of goods supplied by tenderers, is the work of the support group.

i. The training of new staff and retraining of existing staff.

British lecturers ran the two year course once. But new staff is needed every year so the course is repeated every year by members of the support group and the assessment is exercised by Bedford College examiners. At the same time, other courses open to teachers run by the Pedagogical Institute are organised for retraining of the staff on special issues i.e. the use of metal lathe, introduction to IBM compatible computers etc. These courses are staffed by the support group.

j. Preparation of educational material.

For the moment, a textbook on Graphical Communication, especially prepared by members of the support group for use by the students in the workshops, is ready for the printers.

In addition, the members of the group are always willing to visit any school and suggest ways for improving the educational environment and give any help, if asked for by the teachers.

k. All Cyprus Exhibitions

For any educational change it is imperative to have support from outside sources and the clientele of the system to be fully informed as to the changes and the developments taking place in the curriculum as well as the approaches used to fulfil the aims and objectives of the curriculum. Every

school has a role in educating parents in its educational area and the ministry has to contribute to this attempt in every available way. The Educational System itself, using the services of counselling and guidance, can offer much towards this discipline.

The inspectorate of Design and Technology realised that the subject could live in the system only if accepted by the parents and the teaching staff of the schools. Much work towards informing the parents and teachers was done by the teachers of Design and Technology in every school.

The most essential and most productive activity was the organisation of two pancyprian exhibitions for the public. These exhibitions took place in July 1992 and in November 1992. The second one was opened at the same time in Nicosia and Limassol in order to allow more students and parents to visit. Both exhibitions were organised in a similar way. The projects done by the teachers during their work at the two year training course as well as students' work from schools all over Cyprus were exhibited. Most of the students' work came from the schools where the new subject was introduced. One of the exhibitions was opened by the Director of Secondary Education in the presence of all Ministerial officials and the second one by the Inspector General of secondary education.

Pupils at secondary schools and a great number of pupils at elementary schools visited these exhibitions accompanied by their teachers. In the afternoons visitors were mainly parents and teachers. The visitors were impressed by the high standard of the projects displayed as well as by the content of the training course and the orientation of the new subject.

The above mentioned were not the only activities focusing on informing parents. A panel discussion took place in the cultural centre of the Popular Bank in Nicosia. The panel consisted of a University professor from Pantios University of Athens, the Inspector General for Primary Education, the Inspector of Design and Technology and a professor from Patras University Greece. The discussion was chaired by the chairman of the Technology Council.

This chapter has described how the innovation was implemented. The attempt of the innovation manager was to have careful preparation either within the schools - teaching staff, teaching resources, workshops and equipment, etc. - or outside schools -information and convicement about the need for innovation of all those who could in any way affect the programme.

SECTION THREE

EVALUATION OF THE PROJECT

CHAPTER SEVEN

DESIGN AND TECHNOLOGY

Dr. Phylaktou (1993), Director of Secondary Education, addressing the 16th educational congress of the "Society for Educational Reform" said:

> *"What is needed by students today is not so much knowledge as some basic abilities such as creativity, ability to learn on their own, ability to think and judge, ability to analyse and synthesise, ability to identify and solve problems, ability to communicate and co-operate with other people." (Speech on the 15/5/93)*

It was against such a background of ideas that the Government of Cyprus decided to introduce Design and Technology into the curriculum of the Gymnasia in Cyprus. The new course was to be open to both boys and girls and would replace the subject of woodwork and metalwork previously offered only to boys.

Aims and objectives

The new course was designed with the following aims and objectives:

- To provide a stimulating educational environment in which students could acquire and develop knowledge, capability skills and attitudes through designing and making, which would enable them to live and work in a changing technological society.

In addition the course would strive to:

- Enable students to understand the nature of technology and its importance to society;
- Increase awareness of the aesthetic and material environment;
- Stimulate ideas and creativity;
- Develop an understanding of practical problem solution through the design process;
- Give students the opportunity to gain personal satisfaction and pleasure

from designing and making;

- Assist in the development of the individual's technological and practical knowledge and skills;
- Develop the awareness needed to become discriminating consumers;
- Develop enjoyment and pursue of creative leisure activities

The course has the following objectives:

Students should be able to:

- Identify, analyse and develop solutions to a problem;
- Collect, select, record and appraise information;
- Communicate solutions clearly in graphic, written, verbal and three dimensional form.
- Develop the use and understanding of language and vocabulary in a technological context;
- Understand the safe use of the workshop, tools, machines and materials;
- Demonstrate the appropriate skills and knowledge necessary to make or model the artefact against its specification;
- Work as individuals and as members of a team to solve problems;
- Show a growing awareness of the relationship between technology and society.

These aims and objectives are met by designing a course that combines a mixture of theory and practical work involving the seven stages in the design and make process:

- Identify the problem
- Create a design brief
- Research
- Generate possible solutions
- Identify the most appropriate solution
- Plan and make the solution
- Evaluate the solution (Ministry of Education, 1992)

Overall Design

The prime concern of the research in this thesis is with observing Design and

Technology in action, as it is translated between teachers and students in classrooms, workshops, laboratories and elsewhere as well as with the related research.

This thesis does not attempt to portray Design and Technology in any particular school, rather it is constructed around emergent curriculum issues and topics within Design and Technology across literature and the schools.

The guiding idea in selecting the method of the research was that:

> *«[...] nothing can give better insight into the life of a gang of juvenile delinquents than going to live with them for a period of time [...]» (Cohen and Manion, 1989, p. 125)*

Having in mind that:

> *"There is no single, all-embracing approach to research in education. There are many approaches [...]. And so it is necessary not only to select the approach that is most suitable [...] but also to demonstrate why it is more suitable than other [...]" (APU, 1991)*

during the planning phase of the evaluation a number of aspects of the curriculum were identified in the research design as foci for attention , such as:

1. The development of the teaching of technology as part of general education.
2. The quality of the new programme as perceived by Headmasters, teachers and students.

In order to gain a picture of Design and Technology education it is necessary to employ documents (this has been done in the previous chapters), to observe practice and to gain the views of those involved in the activity (i.e. through interviews and questionnaires)

The intention was to examine, through the above, the main hypothesis that the new subject "Design and Technology" is a successful innovation and can help upgrade the educational system in Cyprus. Preliminary investigation revealed that there was a complete absence of studies of any aspect related to technology education for general education purposes. This evaluation constitutes the first attempt in the field. Consequently, the material is derived mostly from primary sources. Having decided to focus on the evaluation of the introduction of Design and Technology into the educational system of the country and with the above limitations in mind, the next stage was to decide about the appropriate evaluation strategies. In doing so a number of practical and theoretical considerations needed to be taken into account.

A very valuable source of information was the oral testimony of those involved in the innovation and the events that occurred. Among them are included school administrators, head teachers, teachers, the support group students and parents. In this respect the evaluator is very fortunate in that he was involved in one way or another in the innovation and in that many of these people were his personal friends or colleagues. This relationship coupled with the fact that the writer met many of these people frequently dictated in a way the evaluation strategy. Thus, it was considered that it would be more useful to hold informal conversation with them on various issues, often on a casual basis, rather than hold formal interviews. In this way it was thought that the people concerned would be more at ease, frank and forthcoming.

The evaluator also felt free to raise issues with them whenever he thought such conversations would be useful. It needs to be noted that for ethical reasons, persons questioned in this manner were warned, before they expressed any

view that the evaluator was gathering material for evaluation purposes. This method has been used in order to supplement the quantitative method used in an attempt to identify the perceptions of teachers, headteachers and students. The decision to seek the opinion of these particular groups and not of other groups was taken after careful consideration of the merits, but also of the difficulties of adopting alternative strategies. It was decided to use both questionnaires and interviews as the one method completes the other. A comparison of interviews to questionnaires is given by Tuckman, 1989 (table 10) This decision has been influenced by the writer's belief that irrespective of the content of the curriculum, what is essential is the actual work done in the classroom and the way those directly involved in this process, namely headteachers, teachers and students, face the various parameters related to the subject. It was after such thoughts that instead of a detailed evaluation of the curriculum it was decided to evaluate its implementation. Of course, the above in no way implies that the writer has not included wherever needed, issues relating to the curriculum which he considered to be directly relevant to the present work. Even so, no claim is made that a few references constitute a systematic study of the curriculum.

Much consideration was given to whether it would be advisable to carry out comparisons between classes working with the old system, Practical Knowledge, and the new subject, Design and Technology. In studying this possibility, it was recognised that though the subject has not been officially introduced to all schools, unofficially all teachers introduced the subject in spite of the fact that they did not have the adequate tools, materials and equipment.

TABLE 10

SUMMARY OF RELATIVE MERITS OF INTERVIEWS VERSUS QUESTIONNAIRES

Consideration	Interview	Questionnaire
Personal need to collect data	Requires interviewers	Requires a clerk
Major expense	Payment to interviewers	Postage and printing
Opportunities for response-keying (personalisation)	**Extensive**	**Limited**
Opportunities for asking	**Extensive**	**Limited**
Opportunities for probing	**Possible**	**Difficult**
Relative magnitude of data reduction	**Great (Because of coding)**	**Mainly limited to rostering**
Typically the number of respondents who can be reached	**Limited**	**Extensive**
Rate of return	**Good**	**Poor**
Sources of error	interviewer, instrument, coding, sample	Limited to instrument and sample
Overall reliability	**Quite limited**	**Fair**
Emphasis on writing skill	Limited	Extensive

Tuckman, 1989 cited by Cohen and Manion
Highlighting has been made by the writer

Surveys were conducted among three target groups, headmasters / deputies, teachers and students. The sample in each case has been drawn from the total population of the group which is directly involved in the Design and Technology programme. This in effect means that the sample has been drawn from headmasters, deputies and teachers who, at the time of the survey, were actually directly involved with the programme and students who were attending the programme.

The procedures for data - collection, in addition to various informal methods, which were employed during the study are:

1. Workshop observation
    1. Description of room arrangement and activities

2. Teachers' and students' behaviour in the class.

2. Teacher interviews
    1. Period before the innovation
    2. Preparatory period
    3. The two year course
    4. Period of implementation
3. Questionnaires
    1. Pupil perceptions
    2. Teacher perceptions
    3. Headmasters perceptions.

The emphasis given to classroom observation is because of

> *"its crucial role in making manifest the interplay of underlying curriculum imperatives, the implication of school management and organisation policies, and teachers' strategies in dealing with the implementation of the curriculum." (Beck, R. N., 1979)*

At the beginning of a visit, there was a discussion with the headteacher what classes it was possible to observe and whom to interview. There was always an attempt to have an experience of as different as possible situations. In one school were observed lessons on food technology, structures, mechanisms, practical evaluation project, introduction to a project and development of ideas.

Notes on lessons observations were written in school immediately after the lesson or in the afternoon at home, if it was not possible to be done in school.

Samples of documents were selected (e.g. worksheets, students work, examination papers) for later analysis.

The results from the first interview were disappointing, but after reading the following views related to teachers' comments on their lessons the writer was forced to insert a second and sometimes third question on the same issue in

order to gain the needed information.

> *"Comments from teachers who are teaching a lesson are valuable but of limited use. Teaching is an absorbing occupation, taking almost all the "information possessing capability" of the teacher, so it is not surprising that the comments are normally very few, often amounting to a little more than a bit of information - it did well or it didn't - . Equally the teacher has rarely got a detailed and balanced picture of the intentions of the interviewer. For both these reasons it was immensely valuable to get much more detailed information through observations in the classrooms" (Burkhard H.,1993)*

According to Beck (1979)

> *"The purpose of social science is to understand social reality as different people see it and to demonstrate how their views shape the action which they take within the reality [...]. What the social sciences offer is explanation, clarification and demystification of the social form which man created around himself"*

The nature of the interview structure has been controlled by the amount of time that was expected to be available with each targeted teacher. Though there have been minor alterations the interviewer kept the format shown in appendix 2 for all the interviews. Each interview was expected to last 60 minutes. The responses have been taped, transcribed and typed. The information got are of more subjective nature as teachers and deputies were asked upon their opinions related to Design and Technology. Foddy, W., (1993 pg. 184) suggests that the interviewer ensure that the respondents understand what kind of answer is required by:

- setting the question in context
- informing the respondents why the question is asked
- informing the respondents what will be done with the information they give
- specifying the perspectives that respondents should adopt

There was an attempt to incorporate the above suggestions into the interview structure of all respondents.

The procedure included:

- Interviews with a number of teachers and deputies
- Discussions with teachers
- Discussions with children
- Finding out attitudes of children towards Design and Technology
- Finding out attitudes of teachers towards Design and Technology
- Classroom observation
- Lesson observation
- Estimation of students achievement
- Analysis of children's written and practical work

Though the close interview pattern was not rejected because of their superficiality, the possibility of irritating respondents who find none of the alternatives suitable and the possibility in forcing responses that are inappropriate, (Cohen and Manion 1989 p. 313) several open ended questions were introduced.

Though at first sight it seems that there have been used only three methods for collecting information - interviews, observations and questionnaires-, in reality they are more. Observations have been made on the existing infrastructure, the availability of materials and students' and teachers' work

Interviews targeted teachers, deputies and headteachers. During the interviews the interviewer had active participation and judgement. So in some cases a comment gave the opportunity to the interviewee to extend his views about the topic. In other cases the show of special interest about something, let us say room arrangement, encouraged the teacher to explain in every detail how this arrangement has been done. Such interference have been done with great care. During observations close attention to what went on in class was paid, and everything was noted for later analysis.

Besides the methods already mentioned, the arrival to the school under observation took place at least 30 minutes earlier than the starting time of the lessons. During this period of time, there was an opportunity for asking general questions about the subject and this provided valuable information. It was like an informal "focus group interview". The discussions were tape recorded. This gave the possibility to identify a range of views from different teachers on the same topic.

Every effort has been made to obtain evidence from as diverse and independent range of sources as possible.

The time spent in each school does not allow a participant investigation. However, participation in the life of the school for three to five hours, watching what happens, listening to what is said, asking questions or even helping students - is more reflective of a participant investigation rather than a purely objective study.

At first stage all the material on tapes has been transcribed and typed, and the material from observations sorted out and typed as well

It is obvious that there had been gathered a lot of pages of material. Firstly this material has been reviewed for coding in terms of categories which emerged from the material. Reviewing the material the points of interest had been highlighted (table 11) . This gave a list of words or phrases within which common ideas have been grouped. These groups have been re-ordered. From this list themes have been identified from which general statements and principles have been derived. The same process has been applied either to interviews or field notes.

TABLE 11

HIGHLIGHTED MATERIAL FROM INTERVIEWS

Do students enjoy the subject?

They do. ***Not as much as they used to.*** *I have taught for* ***seventeen years*** *and I taught originally traditional woodwork, and you get pupils there that* ***enjoyed learning a skill*** *and they* ***became very proficient*** *at it and obviously got a lot of* ***satisfaction in producing quality items.*** *We then went to a design and technology which was probably* ***more attractive to bring girls in,*** *so you* ***got a more mixed group.*** *So they would then* ***design the item they made.*** *That* ***caused us to cut down the time*** *they would spend on developing skills, and now you came to the current curriculum which [...] him [...] they are* ***learning more theoretical things,*** *more structures, mechanisms, electronics, things that not always appeal to as many pupils[...]* ***most find it very enjoyable*** *but not all. (A teacher)*

There was a first attempt to group the material from each school separately so that comparisons could be made. A second thought was to distinguish the evidence between teachers and headteachers or deputies. Both the previously mentioned attempts have been rejected as such comparisons or possible

differences in views between teachers and heads of departments or differences in the way the subject is implemented in these schools would be of no interest to anybody, even the close environment of the schools because of anonymity.

Finally after serious thought it was decided to give the results as general findings. So all the coding from responses have been collected together and grouped to facilitate further manipulation.

It was the time for decisions related to reducing the themes in number by putting a number of them under one core theme. The final core themes in reality dictated the subheadings for the findings chapter.

The next stage was the analysis of the original textual material in relation to the core themes. This stage was quite difficult since it entailed a large amount of creative interpretation of evidence. The difficulty was because it was needed a constant comparison of evidences regarding different views on the same issue. In some cases the differences were slight but the underlying issues very important. e.g. two teachers were speaking about problem solving process but they meant entirely different things. There was a need to move back and forth several times between the themes and the original textual material .

TABLE 12

CODING OF MATERIAL AND THEMES

Coding	Themes
C2	
More academic than previously	Upgrade of the subject
It has gone up in their estimation	
It is treated with more respect	
C1	
Other teachers are not well informed	
Continue to have the impression of the old subject	More informing needed
We haven't promote ourselves	Discussions restricted to the department
They do not realise how much of their curriculum we involve	Recognition by the rest of the teachers
Little discussion outside the department	
Y1	
The status compared to woodwork is much higher	
The department is thought of as Technology «Department»	«Upgrade of the department»
We stopped being in the last category of subjects	
Highly regarded by students and teachers	Subject scale
Y2	
There are teachers who did not understand the change	Teachers attitudes
They do have a concept of the style of teaching	
They admire the environment	

C = A school
1 = Headteacher or deputy
2 = Teacher

In enough cases as it has been proved from the analysis of field notes and interviews there have been overlaps and commonalties in the data. e.g. teachers tension in class.

Each method of collecting information by its own is imperfect and suffers from deficiencies. It is not maintained that triangulation techniques have been used

though the information given in the findings chapter derived from several methods of collecting information and the writer feels confident that the data generated are not simply artefacts of one specific method of collecting information. Furthermore some of the methods, on several topics, contrast each other (e.g. teachers interviews and students work observations) and this gave more confidence that the outcome of the research is valid. Here is another example confirming the validation of the findings:

1. Question to teacher. How many projects did you plan for this school year?
2. Evidence from curriculum summary
3. Question to student. How many projects have you finished to date?

Observation of students working on their projects gave evidence how seriously either teachers or students consider their work and what is the real outcome. Here let me remind that the essential thing in Design and Technology is not the quality or the quantity in the final product, but the process. Classroom observation gave the opportunity to the observer to judge the quality and the level of the work done. e.g. How students start their projects? How they select the ideas? How they select the proper tool for a specific job? And so on.

For data analysis from questionnaires there has been used the SPSS package and this made possible for the writer to have access to very powerful statistical tools which saved much valuable time. Every effort has been made to obtain evidence from as diverse and independent range of sources as possible.

Sample for the Evaluation

The new subject of design and technology was introduced into the Gymnasia on a phased basis. At the time of this evaluation two schools had completed all three grades, nine schools had completed first and second grade and twenty one schools completed only the first year.

Following discussions with the research officer of the Pedagogical Institute it was decided to use a sample of 1500 out of 7023 who completed year one or year two or year three. The schools which the students attended were randomly selected. As a result, 1530 returns were received (21.35 percent of the students attending the subject) from students, thus supplying the evaluation with a very good percentage sample. The reason for such a high number of returns was because the envelopes and the seal of the Ministry of Education had been used. Most teachers though they knew that it was a private matter , considered it as official work and helped in distributing, collecting and returning the questionnaires.

A questionnaire was also circulated to all the fifty eight teachers of design and technology and the twenty one headmasters of the twenty one project schools.(Copies of the questionnaires are given in appendices 3, 4, 5)

The first question asked students to state how many years they had studied the subject. The result is given in the following table:

TABLE 13

YEARS OF STUDYING DESIGN & TECHNOLOGY

Years of study	1 year	2 years	3 years
Percentage in the sample	66,4%	27,3%	6,3%

This sample contained 51% boys and 49% girls. The schools that these pupils attended were classified 87,9% as urban and 12,1% as rural. In order to determine whether the size or location of the school played a significant role, students were asked if their school was located in an urban or rural area and if their school had more than 300 students or less than 300. In reality small school became synonymous to rural school as it was found that all schools with less than 300 students were located in rural areas. 97,4% of the schools were classified as urban. A further variable concerned the years of experience of teachers. There is a natural break in the continuity of teacher experience at 8 years and this was used to determine the classification that teachers who had taught for more than eight years[1] were classed as experienced. The sample resulted in 81,2% being classified as experienced with 18,8% having less than 8 years teaching experience.

During the evaluation a number of classes were visited (10 classes grade 1, 6 classes grade 2 and 2 classes grade 3) to observe teaching in action. There was a feeling that it would be useful to gain some external view as to the effectiveness of actual class teaching, so headteachers and deputies had been kindly requested to visit the workshops and observe lessons. Their main task was to fill in the classroom observation form and later to express any view during a discussion with me. The opinions sought from headteachers and deputies were very essential for one more reason. All of them were teachers of other subject areas.

[1]In the group classified as experienced teachers the youngest teacher has 27 years of experience. In the second group the oldest has 8 years of experience.

CHAPTER EIGHT

FINDINGS FROM INTERVIEWS

Findings from interviews are discussed under 23 sub-headings which reflect the importance attached to the project by respondents. There was an attempt to classify these findings. They were grouped and are presented in the following order: Firstly are presented the findings related to the teachers' work and thinking. They are followed by those related to students and the chapter ends with those findings related to the work in class and general issues.

Teachers' Thinking

Most teachers indicated that they had given the innovation considerable thought during its early stages. Their responses revealed that they had thought about numerous aspects of it, including the types of instructional material that would be required and how students would react to them. A typical response was:

> *"I had to think about everything; for example how to arrange the workshop, how to plan the work, how many components or what quantity of material would be needed, how to control children, how to cover the material included in the curriculum, what to teach in each sector and in each class [...]"*

Reading about the Subject

For most teachers the extent of their reading about the innovation was limited to the material provided during the two year course. Most of this material was related to technical knowledge. Nothing was included about the theory on which the whole system is based. One teacher said:

"I know what to do with my students, but I do not know why. I feel that the subject is suspended in air. It has no roots, or if it has I don't know them [...]"

Talking about the Innovation

When questioned about discussions related to the innovation, most teachers reported talking either formally or informally during staff meetings. The discussions in most cases were centred on, "how it is possible to manage the situation in the class since every pupil is doing something different? Where can I find materials, and what is the future status of the teachers"?

When asked whether they felt free to raise questions during meetings with the inspector the responses presented a peculiar situation. Here are a few of them but very explanatory.

"No! The inspector deliberately spent all the time giving directions."

"If somebody asked him questions, he always left things in the air. He answered like this: Do it your- self, try it out, think about it and send me your thoughts etc."

There are so many things still undefined. Perhaps the following opinion explains the inspector's behaviour:

"He knew where he wanted to go. He had a diagram of the room, but he didn't know how to get there. Those who showed the way were the British teachers."

Prospects of the Innovation

A small percentage of teachers - less than 20% - said that they were not sure about the success of the innovation, mainly because of conservatism in education and financial reasons. The remaining majority of teachers were sure for the following reasons:

The new subject is of great interest to students.

The teachers wanted the innovation believing that through it they would have an upgrade in salary scale and status.

The educational authorities started in the right way.

The teachers showed a willingness for training.

The new highly qualified teachers were an asset.

Teachers' Overload

Before the innovation teachers were behaving according to the traditional role model. In parallel with their training they were asked to carry out the innovation. This required teachers to make efforts of the following kind: explore how to use innovative materials in a new creative way; develop new materials; develop and use new procedures to monitor the directions in which pupils were progressing; help pupils to adjust themselves to the new expectations; explain the new subject, its content, the new procedure and what is expected from their children to the teachers of other subjects and to parents. It is not surprising, therefore, that the teachers experienced a heavy degree of overload, especially during the first two years of the implementation.

One headmaster described the teachers' situation as follows:

"I do not dare to ask my teachers to do extra work, because I know they will refuse. The role of technology teachers, at least during their training, was twice as difficult as previously or twice as difficult as the role of other teachers, and they never complained. In my opinion, it is because they wanted the innovation, and they felt happy with it."

This view is reinforced by the teachers' views:

"I have been a teacher since 1960. I worked in several types of schools either in elementary or secondary education and I was happy with any job. Now there is so much pressure that I disregard my family. We have a lot of bureaucratic work. We have to write everything we intend to do and after that everything we have done. The most time-consuming work is the type of students' evaluation the inspector invented. We have to keep a filing system and write every detail for every student's project. This is really good for students but very complicated to continue using."

And another teacher referring to the same issue added:

"It is not only the work in class. There are so many other things every now and then. For example during our training we had three all over Cyprus exhibitions. We had to prepare everything, even the benches on which the projects were displayed."

The Feeling of Being Used

In spite of promises related to the upgrading of the economic status of the teachers made before starting the innovation, the government, after long discussions with union people, offered sixteen positions to a higher salary scale. Besides the teachers who have been promoted to this higher scale, all others

feel that they have been used, either by the government in order to upgrade the subject or by the union.

Any discussion with them soon comes to this point:

> *"We all attended the course and we worked hard to introduce the new subject. I am really disturbed seeing that only sixteen have a benefit. What about all others? And what about me?"*

Another teacher complained about the way the inspector selected teachers to make the support group. In his opinion there is a discrimination between new and experienced teachers:

> *"There are very competent teachers among the experienced ones. The inspector used only two in the support group. All the others are new teachers with no experience and no pedagogical background. I do not feel well receiving directions from a much younger and less qualified teacher."*

This opinion was presented to the inspector and it had been realised that he had his criteria:

> *"I could use any teacher fulfilling the essential criterion of being positive about the subject. Unfortunately, most experienced teachers were not positive, at least during the first stages of the implementation."*

Positive and Negative Consequences for Teachers

Most of the consequences for teachers were expected to be positive and these were attributed to the upgrading of their status in the school family and in the educational hierarchy, the use of modern materials and equipment, the retraining of staff, the confidence they feel in their work and the more substantial

offer. As negative consequences, many teachers mentioned the need for more time for preparation and a few teachers mentioned the feeling of anguish due to the unclearly awaited outcome of the children's work. As for the teachers of other subjects, there exists the view that the new subject will force them to change the way they work. To the question , " How hard were you working during the first weeks of the implementation?", most teachers gave the following answer:

> *" I never worked harder previously. I had to take care for:*
>
> - *Preparation for the other day and everything was new , so more time was needed*
> - *Preparation of the workshop*
> - *Finding of materials for students projects*
> - *Arranging tools, materials and equipment*
> - *Explaining the new subject to students, parents and teachers"*

Impact on Former Woodwork Teachers

One headteacher commented on the impact of the project on his former woodwork teacher:

> *"In the past he worked on his own [...]. I can't say he was an enthusiastic teacher; he just came and did his job [...] Now he has a colleague to work with, a new young teacher who is testing him. He is now more alive [...] he has more enthusiastic pupils and he feels happier offering from his experience to the young teacher [...] All this make him a more enthusiastic teacher."*

Status of Teachers

There is no doubt that this project is doing much to raise the status of the subject and the teachers. This view is universal but there remain barriers to be broken down. Experienced teachers do not feel well. Quite all of them attended the course and teach the new curriculum but only 32,6% of them moved to a higher salary scale. (Mixed Personnel Committee, Agreement of January, 1992). Besides that they do not have any chance for promotion to deputies and head masters. Most of the new teachers have come into the profession from senior posts in industry. Though these jobs were not "permanent" and they were not well paid, they were well respected by their peers. Moving into the education system has been a surprise for some of them who report that they have had to face a rather superior attitude from some colleagues both to the subject they teach and themselves as individuals.

Consequences to Pupils

Most teachers say that there would be positive consequences for bright pupils especially if they showed more interest, as they did creative work and act spontaneously, they use their time more effectively and they actively participate in problem solving. Less able students do not feel comfortable in the classroom because their work cannot be of the same standard as that of the bright ones. But a teacher made this comment

> *"This class is closer to real life. These are the problems less able pupils will face later in real life. Why not start facing them now under the protection of their teachers?"*

Helpful to all Students

Headteachers feel some pride because of the introduction of the new subject in their schools and they see it as a fundamental change taking place in the educational system. The following comment explains clearly their feelings:

> *"I am proud because my school is one of the two schools where the new subject has been firstly introduced. All the staff saw it as something important and every teacher supported it in any way [...]. Children like it [...] they create something by themselves. When I look at the less academic pupils in Math and Greek they look sad, but here they can make and have a very positive contribution [...] it also helps the academic pupil to describe what they are doing, this helps them with their Greek for they have to write down the steps, how to proceed, [...] this is a new way of writing [...] possibly there is too much writing in some projects but overall there is a very positive attitude creating a self confidence and a positive self image."*

Quality of Students' Work

The quality of the pupil's work continues to surprise headteachers. The following quotation, from a headteacher, neatly sums up this view:

> *"You know, I taught physics in the Lycea for several years; I am now amazed at what these students can do [...] If I was not a teacher of physics I would like to be a teacher of technology."*

Links with other Subjects

Teachers, as well as headteachers and deputies, report growing links with other subjects. At the early part of the project they had seen links established at school level in art and home economics, but now teachers are reporting that:

> *"We are receiving very positive responses, particularly physics and mathematics [...] Several times they take objects from here to show to their classes."*

Active Support

Some headteachers have been very active in promoting the subject within their own school and showed that they were more enthusiastic than the teachers of the subject. They tried to diminish previous negative perceptions of the subject:

> *"At the beginning of the project the attitude of the other teachers was negative, but during one staff meeting I analysed the project and I encouraged teachers to visit the workshops to see the lessons. During another meeting I explained that the methodology of teaching and the way pupils work could be applied to all lessons. Now the attitude is very positive especially in mathematics and science, what we found was that although it can be better explained [...] I am very supportive of this applying science, there can be co-operation between science and technology."*

Change of attitude in Class

The following comment comes from an experienced teacher:

> *"The new subject, both the approach to students and the material to be taught, needs a different role on the part of the*

teacher. This new role is that of an assistant co-ordinator, a leader in a common attempt to solve specific problems. We actually abandoned traditional teaching and we help students to creative work. I found it a challenge and an opportunity for renewal at the same time."

A few other comments may illustrate better the change brought by the new subject

"Previously we used to punish people because of not doing their work. Now we have to punish them because of staying and working in the workshops during the break time. "(Deputy)

"The general outlook of the class at work changed. Entering a workshop it is very difficult to distinguish the teacher among the students, and they are all concentrated to their work. I appreciate too much the way teachers and students make use of their time. I should be very happy if all my teachers could work in this way." (A headteacher)

"I am 57. I had in mind to spend the rest of my service in schools as easy as possible. I continue to have the same thoughts; but the nature of the work is such that push me to work as a newcomer to the teaching profession. What can I say? This subject brought to our students a kind of "work disease*". I enjoy the lesson because students ask for work." (A teacher)*

The following extract from an article published in "Simerini" daily on the 6th of March 1994 is well explanatory of the way teachers faced the innovation:

"Educators in Cyprus showed that in general they accept

innovations either on teaching matters or in the content of educational programmes [...]. During the last 20 years they implemented a number of innovations [...]. All these changes were justified [...] people awaited the satisfaction of social and educational expectations [...] these innovations brought more work, more responsibilities and more difficulties in teachers work[...].

In spite of all these, teachers of secondary education never complained and never had a negative attitude against these changes, because they saw that these contributed to the improvement of education [...]" (Koutselini, 1994)

Instructional Material

To implement the new subject, the teachers required special educational materials. Right from the beginning, the inspector faced the problem seriously. The first thing was to find the amount of money needed and secondly to establish a system through which the materials could be obtained by the schools. (Chapter 6)

Almost all teachers , had positive comments on the arrangements in general, though most of them complained for the first year this arrangement was in force. Here are some of their complaints:

"In the school year 1989-1990 the materials arrived in my school at the end of March. Can you imagine how I could work with my students till then?"

"I had too many gears and when I received the proforma document I substituted them with other items. The system works. There may be some problems in case of teachers who are moved to other schools but these are minor problems. The system works; this is the very essential."

> *"During the first year my school was not among those supported by the Design and Technology scheme. I used money which was kindly offered by the parents union. But even so, I had a lot of work; to find these items; to buy them. Now it is very easy. Materials come to the school without any problem."*

I think, however, that the system needs improvement. It relies on the support group which is constituted of teachers, and teachers may like to return to their schools since they do not have any advantages working there. This system must be undertaken as a whole by the Central *Storehouse of the Ministry of Education*; otherwise, sooner or later there will be a problem.

Better Resourced

Most headteachers and deputies interviewed reported that staff, in general, are aware that design and technology is better resourced than other subjects but they have not had any reaction from teachers.

> *" They spend for each pupil each year more money than what we spend for the same pupil for all the period he is in secondary education [...] six years." (teacher of Physics)*

Some reaction was reported with respect to class size, some science teachers commented that the size of their classes prevented them from undertaking practical work in the classroom.

Contribution to other Subjects

The evidence points to a growing awareness among the educational profession that this new subject has implications for the whole curriculum and there is a

growing recognition that the subject can contribute to a variety of other subjects, including Greek. This is being achieved both through the new style of writing demanded of the students and the introduction of new combination of words to describe new concepts that have not been part of the language. For example, there was no direct translation of the term "pneumatics" though it comes from the Greek word "pneuma=πνεύμα" which means air. Through the subject now most teachers and students use the word "πνευματική=pneumatic" which is the real term for this section of science. Previously the phrase "engineering of compressed air" was used. So one can say that this new technological subject is having a very important impact on philology.

Information Technology

Any discussion with a teacher of design and technology soon touches on the issue of curriculum time and it becomes evident that very few teachers use information technology to support their teaching. Two factors seem to prevail the issue of time and the reliability of the machines.

> *"I have two BBC "B" computers. They do not work. I took them to a technician to check and repair them. I got the answer. Nobody is interested on BBC. There are no spare parts. They cannot be repaired."*

The teachers are keen to use what they feel is good software but the pressure under which they work gives them little opportunity to do so. Besides that, most teachers and pupils have their personal computer at home which is IBM compatible. They look upon BBCs as obsolete technology.

Failure to Adjust Organisational Arrangements

The existing organisational system may very soon be an obstacle to the innovation. The subject of Design and Technology is "headless" and perhaps "bodiless". The personnel engaged in this subject are all classroom teachers. There are no advisors, no deputies, no headmasters and even no inspectors. The inspector responsible for the subject and who organised and guided the implementation of the innovation is inspector for "Industrial Arts and Craft" and as he says:

> *"I am no sure if I belong to the secondary general education or the technical education. I was given the responsibility for subjects like Design and Technology, shoemakers and goldsmiths."*

The support group and the advisors that the inspector now uses must continue offering their services in some way, but surely not based on their goodwill. There must be an organisational change and such jobs must be included in the hierarchy of the staff.

This is linked to the following. Views of teachers showed that all of them were willing to make efforts to implement the innovation immediately after it was presented to them, but during the last year their motivation or willingness to attempt to conform to the new role model started declining steadily. Here are some comments.

> *"I applied for a promotion and I got the following answer... but you reached the ceiling. There is no possibility to go higher."*
>
> or
>
> *"Even if I become the best teacher all over Cyprus I shall*

continue to be a teacher. Why do intensive work?"

Importance given to the Innovation

As it appears from the responses of teachers to the question "How much importance did you feel the following people gave to getting the innovation into Gymnasia?" headmasters saw the innovation with great reserve, most of them expressing the idea that they did not believe it was possible for such a change to be successful.

> *" My first impression was that the Design and Technology Inspector was carried forward as he was enthusiast about the subject. I thought that he had been impressed by what he had seen in Britain [...] He liked to transfer the British system to Cyprus [...] You see he is not the only one in decision making in the Ministry of Education." (Headteacher)*

Most of the teachers of other subjects hearing about the innovation smiled ironically. All of the teachers believed that the Inspector of Technology was very enthusiastic but they were not so sure about the attitude of Inspector General of Secondary Education.

Contribution to the Future Economy

Most headteachers and deputies saw this new subject making an important contribution to the future economy of the island. As one of them remarked:

> *"[...] The number of skilled technologists on the island is diminishing [...] we need a lot more [...] It is easier to find an atomic energy engineer than to find a technician to repair your washing machine.... hotels are throwing away air conditioning units and buying new ones because there is no one to repair them."*

This view is similar to that of Helps (1993) published in the I.E.E. News. According to Helps:

> *"Industry needs a large number of engineers and technicians with practical skills to run its factories at the operational level and a small number of professional engineers to research and design new products and to direct the manufacturing process and develop the company's strategy [...] Yet most of our engineers are educated on highly theoretical courses aimed at producing professional engineers. Inevitably, many end up in practical jobs and are frustrated and disillusioned over their failure to do professional work. (HELPS, 1993)*

Appreciation to the project

An inspector of Greek who had recently joined the Inspectorate was, as he said, very surprised when the project was introduced into the school.

> *"I looked at this way this new subject was to be taught and what was happening in the classroom, and I was afraid that we could not manage, as there is no tradition. I know the technology inspector and I discussed with him a great deal and I appreciate his ideas and ways of thinking [...] I wondered if teachers were in position to teach this subject. It was, in my opinion, needed to train first of all the teachers so as not to disappoint students[...]. Then in October went to the exhibition and I was very surprised and very impressed [...]. I congratulated most teachers. I saw something brand new for education and I realised that most inspectors and headmasters were not aware of what was happening.*
>
> *A particular thing that struck me was the quality of students' work. I saw a lot of discipline in the classroom and I was impressed because students had to use exact language when*

writing up their projects, which in most cases were 15 to 20 pages long [...] they have to use the Greek language in a way different from other lessons and this is good for my subject."

This view needs to be compared with that of an inspector of science. He is very supportive of the changes in Design and Technology too and he feels that they are needed. He finds the new developments very interesting, particularly the amalgamation of theory and practical work. He welcomed the involvement of girls and commented positively on the enthusiasm of the teachers. He reported that some students felt that the homework was a heavy burden. He went on saying:

"This will cause problems in the future for the project. This should not happen for I find the project very encouraging and it must continue with prospects of success[...] but we have to be honest and not simply try to impress the teacher [...] There is a lot of copying from each other, children drawing the same thing, colour the same way. There is a need to respect the pupils opinion [...] Too much writing[...] completing the folder is too long [...] need to respond more to the pupils [...] must be careful that pupils should not become dependent on the teacher, moving back to the old system.

I have been critical because I want this project to succeed [...] I do not say that all is well in my subject, science [...] we need more co-operation between science and technology [...] but there is universal agreement by the inspectorate that all is better and we need to protect it."

He feels that there is a danger of the subject becoming isolated from other subjects and that education planners must put the subject in the context of the whole Cyprus education. He continues:

"If teachers of technology remain above without working with

other specialists, it will be difficult to succeed [...] enthusiasm may well be extinguished."

The inspector of Design and Technology showed that he is very pleased about the way his teachers faced the innovation.

> *"There is a kind of professional orientation which I saw in many teachers. I knew they had many problems. We had to introduce a new subject and at the same time a new method of approach [...]. I think that teachers have to be bright, dynamic, imaginative, interested, well read and above all they must have good will toward their work [...] This kind of attitude I can easily say it had been shown by many teachers and I feel very pleased because we (the teachers) made a real offer to the educational system of our country, which would be impossible with another group of teachers."*

It is obvious that teachers were prepared psychologically for this innovation - they waited for it for a long time - and they accepted it, ready to assist in its success. This is why teachers with many years of experience answered that they were willing to change their behaviour in class. There is a case of a teacher who was 59 years old and the age of retirement in Cyprus is 60. After attending the training course for one year he received the notice of retirement. He asked the educational authorities to allow him to continue attending the course in spite of the fact that he stopped working. This incident describes very well the way teachers accepted their new role in class.

In this chapter the findings from interviews have been examined. Though interviews constitute an essential part of the evaluation , without classroom observations these could not be of any value, since the essential thing is what is actually done in class and not what is said that is done.

CHAPTER NINE

FINDINGS FROM CLASSROOM OBSERVATION

Besides the observations made by the writer, who visited personally 6 schools and spent three - five hours in each one, observers, headmasters and deputies, were kindly requested to visit design and technology classes and carry out an evaluation using criteria laid down on the workshop observation schedule. This questionnaire consisted of two parts: The first part focused on the detailed description of the workshop and the activities taking place during the period of observation and the second part focused on the teachers' behaviour in the classroom, the way students work and the workshop arrangement. The observation questionnaire was devised for this exercise and is given in appendix 1. The emphasis given in this questionnaire on teachers' behaviour in class is based on the belief that it indicates the degree to which the innovation has actually been implemented in the school.

The observers did not have an extensive briefing as to the aims and objectives of the designs and technology course and for some this was the fist practical lesson they have seen. The resulting data needed to be treated with caution as results could be heavily influenced by the background discipline of the observer. A total of 15 headmasters and deputies visited 22 classrooms, and this was followed with extensive interviews with more than half of them. Some had very interesting observations. Most observers noted that teachers faced difficulties trying to discuss with each pupil separately. All of them noticed the difficult situation of the teacher, but they added that the teachers knew very well what to do.

Here are a few comments:

Comment of a deputy, teacher of mathematics:

> *"During the period I was in the class one child attempt to assemble a human model. He broke one part in his try to assemble it [...] he asked other children and finally came to the teacher. The teacher was busy with three children who had a project in electronics. He stopped for a minute helped the boy, and then he continued discussing with the three boys. Though the teacher spent most of the time with those three pupils, he was ready to help anybody in the class. All pupils were seriously working on their projects."*

This comment was made by a deputy (observer) who said that he was very pleased with the work done during that period and especially with the interest, order and discipline showed by the students.

Room

Most teachers complain about storage room saying that there is only one store for two workshops. The two workshops are in line and the store is attached to the end of one workshop. Because of this, teachers and students working in the one workshop have to go through the second workshop and cover a distance of ten meters in order to visit the store. This is a problem because they disturb the work of the other class and the teachers cannot look after their students during the time they are far from their workshop. The store could be placed between the two workshops so that both classes could have access to it without the problems being faced now.

Room arrangement

> *Design and technology workshops are planned for sixteen to twenty (16-20) pupils and they include work areas for several specialities. Observers were provided with a blank plan of the workshop and were asked to sketch the various working areas, resource centre and stores. Most of the workshops proved to be identical.*

All observers agree that:

Room arrangement needs more care [...] the resource area is there, but it is poor [...] there are a few magazines, handouts and a few booklets. In my opinion room arrangement and enrichment needs a lot of work both by the teachers and the educational authorities. The overall response of the observers of lessons is reflected in the following chart (table 14)

As derived from this evidence teachers allow pupils to move freely from one activity to another, (question 4), they allow pupils to move freely about the workshop, (question 6) and encourage students to create their own solutions to problems.

Most of them agree that the workshop needs improvement and arrangement into work areas,(question 10), that the resource centre for the pupils is very poor or does not exist, (question 16), that teachers need to give more attention on the offering of instruction on practical skills, (Question 17) , that teachers do not provide enough opportunities to students to observe resources, (question 18) and learn to handle them and that the teachers do not insist enough on the demand for quality work, (question 21). All the issues examined by observation seem to be well above the average.

TABLE 14
LESSON OBSERVATION

School - Observer	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
1*	5	4	3	4	4	4	4	4	5	3	4	4	4	5	4	3	4
2*	5	5	4	5	4	5	4	4	5	4	5	4	4	5	4	5	4
3*	5	5	5	5	4	4	5	4	5	5	5	4	5	5	5	5	4
4*	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
5*	4	5	5	5	4	4	4	4	5	5	4	5	5	5	4	5	5
6*	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
7*	3	3	3	2	3	4	3	4	4	2	3	3	3	3	2	3	2
8*	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
9*	4	3	4	4	3	4	4	3	4	4	3	4	3	4	3	4	4
10*	**3**	**4**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**3**	**3**	**4**	**3**	**4**	**3**	**3**	**3**
11*	5	4	4	4	4	5	5	4	5	4	5	4	4	5	4	4	4
12*	5	5	5	5	4	4	4	4	5	5	5	5	5	5	5	5	5
13*	3	2	1	1	3	3	3	3	3	2	1	1	2	3	1	2	3
14*	5	4	5	5	4	4	4	4	5	4	5	5	4	4	5	5	5
15*	5	4	4	4	4	5	5	5	5	4	5	5	4	4	5	5	5
16*	**3**	**2**	**1**	**1**	**3**	**2**	**3**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**2**	**1**	**1**
17*	**4**	**3**	**4**	**3**	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**3**	**4**	**4**	**3**	**4**
18*	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**3**	**2**	**4**	**3**	**2**	**2**	**3**	**2**
19*	4	5	4	4	3	4	3	3	5	4	5	4	3	4	4	5	4
20*	5	4	5	4	4	5	4	5	4	5	5	4	3	4	4	5	4
21*	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**3**	**4**	**3**	**4**	**4**	**3**	**3**	**2**	**3**	**3**
22*	4	5	4	4	3	4	4	4	5	3	5	4	3	4	4	3	3
23*	4	5	4	4	3	3	3	3	4	5	4	5	4	5	3	4	5
24*	4	4	5	4	3	4	4	4	4	5	4	4	5	5	4	4	4
25*	4	5	4	5	4	2	4	3	4	5	4	4	5	4	4	4	4
26*	4	4	4	4	2	4	4	4	4	4	5	4	5	4	4	5	5
27*	4	5	4	5	4	4	4	4	4	5	4	4	4	4	4	4	4
28*	5	5	4	5	4	5	5	5	5	5	4	5	4	5	4	4	4
29*	4	4	4	4	3	4	4	4	5	5	4	4	4	4	3	3	4
30*	4	4	4	4	5	5	5	5	4	4	4	5	4	4	4	4	4
31*	5	4	5	4	4	5	4	5	4	5	5	4	5	4	4	5	4
32*	4	4	4	3	4	4	4	4	5	5	4	4	5	4	4	5	5
33*	5	4	5	4	4	5	5	5	4	4	5	5	4	5	5	4	5

General code: Not at all 1 2 3 4 5 Completely

* Questions are found in appendix 1

Demonstration Bench

In front of all workshops there is the demonstration bench with a U-shaped top. This bench, though very useful, covers about one fourth of the total area of the workshop. It could be made smaller and arranged for use by both the students and the teacher. Now it is designed to be used only by the teacher. An experienced teacher working for three years now in a pilot school said:

> *"Though I know very well the reason for which this bench is provided, I do not feel well prohibiting its use by students. Its top area is enough for all students to do their written work. With slight alterations it could easily cover the needs of all students."*

Machinery

All machinery is in one workshop, but students of the other workshop are free to move and use this machinery. This creates many problems. It is difficult for the teacher to manage the situation, since a number of his students work in one workshop and the rest in the other. At the same time another class with another teacher is in the workshop with the machinery. The created problems are obvious. When asked how you can manage the situation, the answers from all teachers are identical.

> *"The situation is terrible. We plan to use the machinery but it is impossible because other students work on them."*

One teacher tried to overcome this problem. Here are his comments:

> *"Before leaving school we, the three teachers for design and technology, plan for the next day. We try to cooperate very closely to overcome this problem but is not possible. Students*

work on an individual basis. We cannot plan their progress in their projects. Close co-operation lessen the problem but [...] the problem exists."

Use of equipment

Most of the teachers expressed the view that they do not feel good because there is expensive equipment in the workshops which is not used. As such were referred the wood lathe, the metal lathe and the airbrushes. Several teachers gave two reasons for not using them. Firstly, they do not feel safe to teach students how to use this equipment, as they do not know how to use them themselves and secondly they are very rarely needed. For air brushes they expressed the view that:

"Students 11-14 years old are not able to use them properly even if teachers insist on it and spend enough time helping students to handle them. Besides this , for their use is needed a special place and compressed air facilities which do not exist in most workshops."

Most complaints have been expressed about computers. These refer to the fact that the computers are very old and some of them do not work properly. Finally, teachers feel that more light machinery is needed for use by the pupils.

Equipment not used

Airbrushes

Only one teacher said that he demonstrated to his students the use of airbrushes. All others never touched them. The main reasons for this are the lack of time and the difficulty of their use.

Teachers believe that students at the age of 11-14 are not able to use them unless they have a special course on their use, and there is no time for such a course. One teacher says:

> *"Honestly, I do not feel safe using them. I cannot teach something I do not know very well. I saw a demonstration of their use during my training. I tried to use airbrushes for 10-15 minutes. I do not know how to use them. It says everything."*

Wood lathe

A machine very rarely used. Teachers believe that it could be replaced. Most students' projects are models and a wood lathe cannot be used on such small pieces of wood.

Metal lathe

Metal lathe is also not used. The reasons are shortage of time and that it is very rarely needed. It is used mainly by teachers for very special cases. Most teachers make demonstration of its use to students but students are not allowed to use it.

Equipment needed

Any discussion with teachers comes to the need for machinery for the second workshop. Besides this, there are several views mainly with modern machinery like simple binding machines, personal computers, printers, machine for work with plastics, etc.

Choosing Materials

In the workshop there must be a large variety of materials so that pupils have the opportunity to select the appropriate materials for their projects. All observers gave five or six to the workshops they observed. This means that

materials tools and equipment are available to students. A headteacher made the following comment on the topic:

> *"The pupils have really been choosing materials [...] the room is not so rich [...] children can find the main materials and components they need [...] Being in the workshop, I myself became a teacher of technology. A girl came to me and asked. "Sir are you a teacher?" I smiled and the girl continued. "Sir, I think this (holding a piece of acrylic) is heavy but I like very much its colour and texture." I replied that in my opinion it is not heavy and I suggested to ask her teacher. She said "he is busy" and went to the waste box examining several other pieces of plastic."*

In two cases the teacher asked pupils to try to find components outside of the school. At the end of the lesson the teacher had been asked if this is done in every lesson. His answer was yes, because as he said,

> *"it is impossible to have everything in the workshop."*

It is obvious that, if students try to find some components from the market, they learn more about materials and components and the market itself.

Free movement

All observers appreciated the free movement of pupils in the classroom and the freedom to use any tool, machine or material they liked. Teachers checked if the work done is according to what students had planned in their design folders. Here is a comment made by a deputy:

> *"I heard about free movement in the class and that the workshop is noisy. Children are free to do the different jobs they like individually, in pairs or in groups, and they have free access to the machines any time they like to [...] I waited to see a classroom out of order [...] I was astonished [...]*

Children were really free, but they were serious in their work. The only noise that annoyed me was that of the dust extractor, but I think it annoyed only me as all the others, teacher and students, were absorbed in their work [...] They did not hear the noise."

This view may be compared to the following one:

"I noticed that the only case the teacher stopped students was after a discipline-safety problem. Two pupils were arguing about who had priority to use the bending machine and they were about to start fighting. The teacher stopped the whole class and drew pupils' attention to the safety rules and especially safety in the use of machinery of any kind. Immediately afterwards pupils were free to continue their work."

It is evident from the findings from observations that the learning environment has been carefully planned and that this is entirely different from the classes in which most of the subjects are taught. Students behaviour is the behaviour of individuals seriously concentrated to their work not because they are forced to, but because they are interested in their projects and enjoy this type of work.

CHAPTER TEN

FINDINGS FROM RESPONSES TO QUESTIONNAIRES

THE VIEWS OF THE STUDENTS

The response from students is very positive too. The picture is one of students enjoying the subject, feeling that it is different from other areas and sensing that they are learning a great deal.

The full response of the students to the questionnaire is as follows:

TABLE 15

STUDENT QUESTIONNAIRES AND RESPONSE

No.	Statement	Strongly Agree %	Agree %	Disagree %	Strongly Disagree %
1	In technology it is important to evaluate our work	58,4	37,9	1,8	1,9
2	The things I make in technology I use at home	29,2	46,5	15,9	7,5
3	Technology lessons make me think about the way we live	47,2	49,9	12,8	8,1
4	The technology lesson has taught me the importance of design	47,2	49,9	6,3	2,8
5	In technology lessons I have been able to use my ideas to solve problems	45,7	43,9	7,6	2,6
6	The way we work in technology is the same as other lessons	3,00	44,0	7,6	47,5
		Always	Frequentlly	Seldom	Never
7	I evaluate my work in technology	72,5	18,4	7,4	1,6
8	In technology I have the opportunity to test my ideas	49,2	32.8	15,1	2,9
		Strongly Agree %	Agree %	Disagree %	Strongly Disagree %
9	In technology we make many items	47,5	44,2	5,7	2,5
		Always	Frequentlly	Seldom	Never

10	In technology we spend a great deal of time writing	16,8	27,4	47,6	8,3
11	My parents show great interest	34,1	28,2	29,2	8,5
12	I spend a lot of time at home working on my technology projects	30,8	32,9	30,5	5,8
		Too Much	Much	Little	Not at all
13	I should like to study design and technology after I have left the Gymnasia	19,5	21,8	32,9	25,9
		Strongly Agree	Agree	Disagree	Strongly Disagree
14	I have learned a great deal from my design and technology lessons this year	45,4	39,3	9,8	5,5
		Too Much	Much	Little	Not at all
15	I wish I had more time allocated to design and technology this year	47,5	22,0	15,9	14,5
16	I enjoy my technology lessons	53,6	24,4	14,8	7,1
17	My parents are interested in my work in technology	78,6	13,3	5,7	2,4
18	I am proud of the things I make in technology	57,6	28,0	9,2	5,
		Always	Frequentlly	Seldom	Never
19	In technology we work in a group	24,7	26,8	34,0	14,5
		Strongly Agree	Agree	Disagree	Strongly Disagree
20	In technology I have learned to express ideas by drawing	42,1	48,1	5,8	4,0
		Too Much	Much	Little	Not at all
21	I use the ideas from technology at home to make other things	24,5	29,3	29,7	16,4
		Always	Frequentlly	Seldom	Never
22	Commercially made objects are brought into the classroom for evaluation	9,7	15,5	34,8	40,0

Social impact

To test whether students recognise the social impact of the course they were asked whether Design and Technology lessons forced them to think about the way they live. 77.1% said it did. The government's five year plan (1989 - 1993) places an emphasis on the importance of increasing technological awareness among society:

> *" From September 1989 it is planned to introduce on an experimental basis the scheme for upgrading the lesson of " Practical Knowledge" in the Gymnasia with increased emphasis towards technology. The content and the direction of the subject will be changed substantially so that it corresponds to the needs of modern life and it will be widened that new technology materials are used." (Ministry of Finance, Five year plan, p 218)*

This project has as one of its objectives that students should be aware of the impact of technology on society. This objective has clearly been achieved as far as teachers are concerned, with 98.3% agreeing that the course has enable students to understand the nature of technology and its importance in society. An even more impressive figure is the 100% of teachers who agree that the course is providing a foundation of skills and knowledge that students could use outside school and that there is an increasing awareness of the aesthetic and material environment among students.

Teachers certainly sought to impress upon the students the social implications of technology, and the students responded that the course is encouraging them to think about the way they live.

TABLE 16

Impact of technology lessons

Questionnaire and number[2]	statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Student 3	Technology lessons make me think about the way we live	47.2	49.9	12.8	8.1
Teacher 13	The D&T course has enabled students to understand the nature of technology and its importance in society	39.7	58.6	1.7	0
Teacher 16	The D&T course has provided a foundation for skills and knowledge for pupils to use out of school	56.9	43.1	0	0

Problem solving

Solving real problems and applying knowledge is at the heart of Design and Technology.

> *" An engineer is one who acquires and uses scientific, technical and other pertinent knowledge and skills to create, operate and maintain safe, efficient systems, structures, machines, plants, processes or devices of practical and economic value."* *(Engineering council, 1990)*

This is the view of the engineering council and this is supported by teachers. In addition, teachers feel that students are capable of designing solutions to technological problems. The process is clearly conducted in the classroom, with 89.7% of the students agreeing that they have been able to use their own ideas to solve problems, whilst 81.1% agree that technology lessons have given them the opportunity to test their ideas. Parents confirm that they know very well the way "project work" is done in the workshops.

One teacher had different opinion:

[2] The first column of tables 16 - 35 refers to the question number on the students, teachers or headteachers questionnaire

"I have to be honest. I encourage or I guide students to have similar solutions. Otherwise it is not possible to manage the class. Actually, all students do approximately the same thing. In many cases I in the workshop and their parents at home do much work for them. In my opinion this is a very difficult approach both for pupils and the teacher."

TABLE 17

Problem solving

Questionnaire and number	Statement	Always %	Frequently %	Seldom %	Never %
Teacher 11	The pupils in my class are capable of designing solutions to design and technology problems	15.5	75.9	8.6	0
		S. Agree %	Agree %	Disagree %	S. Disagree %
Student 5	In technology lessons I have been able to use my ideas to solve problems	45.7	43.9	7.6	2.6
Student 8	In technology I have the opportunity it test my ideas	49.2	32.8	15.1	2.9

Commercially made objects

Evaluation is an important component of the design process and the curriculum encourages teachers to bring commercially made objects in the classroom to explore how others have solved problems and to evaluate the effectiveness of the commercial solutions. This theme is one of only two in the evaluation where perceptions between teachers and students differ extensively. In general, teachers are reporting that they bring commercially made objects into the classrooms whilst students are saying they do not. The detailed result is as follows:

TABLE 18

EVALUATION OF COMMERCIALLY MADE OBJECTS

Questionnaire and number	Statement	Always %	Often %	Sometimes %	Never %
Teacher 24	Commercially made objects are brought into the classroom for evaluation	3.5	49.1	47.4	0
		S. Agree %	Agree %	Disagree %	S Disagree %
Student 22	Commercially made objects are brought into the classroom for evaluation	9.4	15.5	34.8	40

This result has been discussed with students in several classes and schools as well as with teachers. The conclusion is that students gave too much emphasis on the words "for evaluation" and that really students and teachers do bring commercially made objects into the classroom. Teachers use these objects for demonstration and sometimes for analysis of specific topics, i.e., show how gears work, reducing of speed, relation of anthropometrics to ergonomics etc. Very rarely are students encouraged to evaluate such products. One teacher said:

> *" The pupils brought in from home a range of moving toys, some of which were very old. They investigated the movements, linkages, materials of toys and energy sources used. After that they started their own projects."*

Attitudes to artefacts made

Design and Technology is different from other subjects in this. It contains a problem solving approach, which is making a very important element of the design process. Teachers and students were asked whether the students took pride in their finished products and both groups gave a very positive yes, though there are students not so proud. 5.2% are definitely negative.

TABLE 19

Pride in articles made in Design and Technology

Questionnaire and number	Statement	S Agree %	Agree %	Disagree %	S disagree %
Teacher 25	Pupils are proud of the things they make in Technology	77.6	22.4	0	0
		Too much %	Much %	Little %	Not at all %
Students 18	I am proud of the things I make in Technology	57.6	28	9.2	5.2

The students' responses showed that the making of artefacts is being undertaken and 91.4% of the teachers believe that students have or acquire the necessary skills to make their solutions. A deputy headteacher in my opinion deliberately tried to say that the knowledge gained in Design and Technology are of minor importance but he succeeded just the opposite. He said:

> *" My daughter tried and made a clock. I acknowledge that this is a beautiful piece of work and we hang it in a very good place at home. But what did my daughter learn? The mechanism was ready made, the pointers too. She shaped a piece of acrylic, made a hole, and stuck the numbers on it. Is it serious knowledge to design a clock, shape the plastic and stick the numbers? It might be easier to tell the class everything about such a clock in 30 minutes."*

Writing up of projects

> *" My son spends too much time preparing the written work for Design and Technology. He does not enjoy making because most of the time is spent in writing. He does not feel good if the writing work does not have a good appearance. He prepares many drawings and in some cases he draws the same thing two or three times because he was told by his teacher that his folder must have good presentation."*

This is what a parent said about the time spent for the writing up of projects. In discussion with deputies, teachers and headteachers and from examining design folders, it became evident that students really spent a considerable amount of time preparing their folders. The response from the students suggests that a variety of practices is taking place, but in the main the view of a headteacher explains the situation:

> *" I usually have parents complaining that teachers do not give enough homework to their children. For Design and Technology I had so many complaints for too much home work that I considered it necessary to call the teachers in my office and ask them to give less homework."*

TABLE 20

Writing up of project

Questionnaire and number	Statement	Always %	Often %	Sometimes %	Never %
Students 10	In Technology we spent a great deal of time writing	16.8	27.4	47.6	8.3

Evaluation

Most teachers use an evaluation form for each student. The same form is also used by the students for self evaluation. This is looked upon as very essential, because besides the educational outcome of self evaluation, parents are informed regularly and even involved in their children's evaluation. This student parent co-operation does not stop in evaluation but extends to student encouragement and parents support. One headmaster told me this:

> *" Look! It is the subject I enjoy helping my son, and this*

because I learn more than him. I acknowledge that I changed my attitudes related to students evaluation after this co-operation."

Responses show that teachers are encouraging students to evaluate their own work and the work of others. Students recognise the importance of evaluation and agree with the statement that they evaluate their work in technology.

TABLE 21

EVALUATION BY STUDENTS

Questionnaire and number	Statement	Always %	Frequently %	Seldom %	Never %
Student 7	I evaluate my work in Technology	72.5	18.4	7.4	16
Teachers 17	I encourage the students to evaluate the work of other students	41.4	50.0	8.6	0
Teachers 23	I encourage my pupils to evaluate their work	87.9	12.1	0	0

Working in groups

Students in the Gymnasia are encouraged to work individually when making projects or writing project folders.

The students may have interpreted this question in a variety of ways as 24.7% said that they always work in groups, which is very unlikely, whilst 14.5% said that they never work in groups.

Visiting some classes it was realised that each student work on his own project. The teachers had been asked if they have students working in groups in other classes and the answer was:

" They co - operate, they discuss their problems, they see what others do, but they do not work on the same project as a group."

Most teachers are afraid that such work needs more preparation, and it may be more difficult to manage the class. Group work often occurs when the initial problem is discussed and in the evaluation of artefacts. Most teachers felt that it is important for students to work in groups.

TABLE 22

WORKING IN GROUPS

Questionnaire and number	Statement	Always %	Frequently %	Seldom %	Never %
Student 19	In technology we work in groups	24.7	26.8	34.0	14.5
Teacher 3	In D&T it is important that pupils have an opportunity to work in groups as well as individually	82.8	17.5	0	0

After the Gymnasium the Lyceum

> *" It is my belief that older children can and will work more seriously on project work. I would like my daughter to attend Design and Technology at a higher than the Gymnasium level."*

This is the opinion of a parent and it is very much the same as the views of other parents. There clearly exist a demand for technology study after the gymnasia. This reflects very positively on the students experience in the Gymnasia. The response to this question is as follows:

TABLE 23

STUDENTS WANTING TO STUDY TECHNOLOGY AFTER THE GYMNASIUM

Questionnaire and number	Statement	Certainly %	V. much %	A little %	Not at all %
Students 13	I should like too study technology after I have left the Gymnasium	19.5	21.8	32.9	25.9

If this 41.3% of students wanting to study technology after the Gymnasium is compared to 3% which was the result of a small scale research done by deputy headteachers under the supervision of the Pedagogical Institute in 1988 under the title " *Factors affecting students in the selection of section of study after the Gymnasium"* it is obvious the influence of the subject on the students decision.

Impact of Design and Technology on the curriculum

> *" It is too early for such results. But it is my belief that the way work is done in Design and Technology may have an impact on all other subjects. I am a philologist. I thought seriously if I could work with open ended projects in my class. I decided that it is impossible with 35 pupils in class, but I tried project work with very few pupils. They worked mainly at home."*

Quite all headteachers agree with the opinion just mentioned which belongs to a headmaster. A substantial number believe that the new course is having an impact on other subjects to introduce project work in every day activities. Usually each year is devoted by the Ministry to one activity. 1991-92 and 1992-93 were devoted to project work. Technology teachers received visits by other teachers to their workshops on purpose to see how the work is done and ask for some kind of help or advice since they recognise their experience on project work. Links with Home Economics teachers are good and there is evidence from headteachers that the design aspects of Design and Technology are beginning to have an impact on Art lessons.

TABLE 24

IMPACT OF DESIGN AND TECHNOLOGY ON THE CURRICULUM

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Headmaster 2	Some other subjects are adopting the D&T approach	9.5	71.4	19.0	0
Headmaster 5	D&T and H. Economics teachers are working closely together	66.7	28.6	4.8	0
Headmaster 11	The D&T curriculum has had an impact on art lessons	5.0	60.0	35.0	0

Teaching methodology

Although methodology is having an impact on the curriculum both headteachers and students feel that the way students work in Design and Technology lessons remain very much different from other subjects, because for most lessons one teaching method predominates: class teaching. I myself made a visit to three schools on the purpose to see the methods teachers use. The three schools had 62 classes and all except one were experiencing class teaching. The exception was a teacher of biology who took his pupils out for field work.

TABLE 25

TEACHING METHODOLOGY OF DESIGN AND TECHNOLOGY COMPARED TO OTHER SUBJECTS

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Headteacher 7	The teaching methodology in D&T is different to other subjects	19.0	71.4	9.5	0
Student 6	The way we work in Technology is the same as other lessons	3.0	6.7	42.8	47.5

Curriculum time

The difficulty of finding appropriate time for Design and Technology has been discussed in previous chapters. To test whether the allocation of time was felt appropriate similar questions were given to headmasters, teachers and students. The reason behind the answer may vary, but the results do point to a belief that more time is required. Characteristically. a teacher of physics said:

> *" I studied the curriculum of Design and Technology because I think this subject is closely related to my subject. I understood that this is an ambitious programme, but the time allocated to the subject is not enough. If the material to be taught and the way students work in class is considered, which in my opinion is really creative but time consuming, then more time is needed."*

This may be compared to the way an official of the Ministry of Education faces the problem:

> *" All sectors of education ask for more time. If the Ministry attempts to give more time to Technology then there will be created a major problem with all other subjects. I think that this can be done only in the future in terms of general reorganisation of secondary education."*

This view was expressed during interviews by many headteachers. Most of them wondered from where the time should be taken and where funds could come from to build more workshops and to buy materials and equipment.

The decision of the Ministry of Education to include technology in the first grade of Lyceum may well explain the way the Ministry faces the problem. This is done in an attempt to change the second cycle of secondary education to Lyceum of optional subjects instead of optional sections. Technology within this

programme is a compulsory subject in first grade where it is taught two periods per week.

TABLE 26
VIEWS ON CURRICULUM TIME

Questionnaire and number	Statement	Certainly %	V. much %	A little %	Not at all %
Students 15	I wish I had more lessons in Technology	47.5	22.0	15.9	14.5
		S. Agree %	Agree %	Disagree %	S. Disagree %
Teachers 19	The students have sufficient curriculum time to complete the technology scheme of work	0	1.7	48.3	50.0
H/teachers 9	There should be more lessons of D&T in the curriculum	14.3	42.9	42.9	0

Teacher training

Teachers are very complementary with regards to the training programme that they received, with 96.6% reporting that the training had prepared them well for teaching the subject. The variety of training is felt to have been important but there are views such as these:

- I had difficulties in attending the course on Electronics or computers
- Some more depth in each unit was necessary
- There was a need for more practical work
- The time - three afternoons- for each unit was not enough.

But even the teachers who expressed these views generally felt satisfied with the two year course.

Training from British teachers has been very specific to the subject. Training by Pedagogical Institute focuses on issues relating to the teaching and learning.

This aim was very well described by the head of the Pedagogical Institute in his inauguration speech addressing the teachers of Design and Technology.

> *" You must know how to organise and administer the expensive workshops for which you are responsible [...] You must be able to analyse and construct courses of instruction and you must be proficient at teaching programmes of multiple activities, at demonstrating to students and at guiding them in problem solving activities."*

The combination of the two courses was very well received and may reflect their higher appreciation of the training. Teachers' responses to the need for further training were ambivalent. There was a common view that they had too much work during the courses and all of them agree that any future training should not require the teachers to produce project work. The responses to the further training question may be well connected to whether the teacher wishes to be considered for teaching the subject at a higher level.

TABLE 27

VIEWS ON THE NEED FOR FURTHER TRAINING

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Teacher 20	I need more training	1.8	47.4	42.1	8.8

Use of materials

All teachers feel it is important that students have experience of working with a variety of materials. Several teachers expressed the view that:

> *" We gave more emphasis on modern materials and we neglected traditional materials such as wood, clay, glass etc."*

Teachers also feel that they have the materials to support the lesson's policy,

with 89.5% of the teachers reporting that they have the materials and equipment to meet the needs of their students.

TABLE 28

AVAILABILITY OF MATERIALS

Questionnaire and number	Statement	V. Much %	Much %	Little %	Not at all %
Teachers 4	In D&T lessons it is important that pupils have experience working with a variety of materials	91.4	8.6	0	0
Teachers 12	In my D&T studio I have materials and equipment that meet the needs of my pupils	33.3	56.1	10.5	0

Lesson planning

Considerable attention has been given to the planning of lessons with extensive support by the central team. This factor is recognised by all head masters with all of them reporting that they felt that Design and Technology lessons are well planned. The following comment of a headmaster is very informative.

> *" A new teacher was appointed in my school. He was the only teacher of Design and Technology for all the school [..] He faced a lot of difficulties [...] Previously he worked in Arab countries as an engineer [...] Everything in school was something new for him.... He needed help [...] I could not help him [...] I applied to the inspector of the subject and he sent one teacher member of the support group to help him [...] The support continued regularly on a weekly basis for nearly two months [...] In a short period of time he could work easily."*

TABLE 29

LESSON PLANNING

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Headteacher 3	Design and Technology lessons are well planned	38.1	61.9	0	0

Enjoyment of teaching and learning

A young teacher had recently joined the teaching staff from industry. When he started attending training and at the same time teaching the subject, he was very surprised.

> *" I finished school a long ago. Though I attended " Practical Knowledge ", during the first week of my career in education I was astonished by what our teachers tried to tell us about Design and Technology and the way we have to work in class.*
>
> *Though our teachers appeared to be very enthusiastic and sure about the success, I could not believe I was able to manage a class working in such a way and the worst, I could not imagine that students were mature enough to work on such projects [...] On the other hand it was a challenge which sometimes it seem to be exciting. After hard preparation I started working with students. The Inspector visited me the second week. He congratulated me for my new job and the way students worked and later he gave many directions. At the end of that day I thought, in industry nobody considered me as a very important in the system. Here children come to me every now and then asking for help.... The headmaster said that he relies on me [...] the inspector showed great interest in my work [...]. Above all I admire the work students do. They do simple things, but the approach is exactly the same as that of professionals and scientists. The more I learn the more I enjoy my work."*

This view needs to be compared to that of an experienced teacher:

> *" Teaching Practical Knowledge for eighteen years my work with children became boring. I needed a kind of renovation [...] I had in mind to retire at the age of 55 but now I'm planning to go on teaching till the age of sixty."*

Enjoyment of teaching has a strong correlation with the enjoyment of learning as shown by conclusions of this research. All the headteachers felt that, in general, the students enjoyed lessons in Design and Technology and this was supported 96.6% of the teachers. The responses of headteachers and teachers were aggregated. Students responses were not so emphatic. The students were asked to tick one of four boxes, either strongly agreeing, agreeing, disagreeing or strongly disagreeing with the statement :

> *" I enjoy my Design and Technology lessons"*

An impressive 53.6% chose strongly agree whilst another 24.4 chose the agree box. A similar technique was used to determine whether students believe they had learned a lot during their course and this was compared to teacher responses in relation to student enjoyment and achievement.

TABLE 30

ENJOYMENT AND LEARNING

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Student 14	I have learned a great deal in my D&T lesson during the year	45.4	39.3	9.8	5.5
Student 16	I enjoy my D&T lesson	53.6	24.4	14.8	7.1
Teacher 15	The D&T course has given pupils the opportunity to gain personal satisfaction from designing and creating	78.9	21.1	0	0
Teacher 7	I have Been pleased with the work of the students during this year	13.8	77.6	8.6	0

These figures illustrate the very positive image that teachers have of the

students' enthusiasm and quality of work. The students responses convey a similar picture.

Parents' comments give the same picture. Here is one:

> *" I Have a problem with my son. He spends too much time working on his technology project, and I am afraid he's disregarding the other subjects. I advised him several times to finish all other subjects first and after that to work on his Technology project."*

Links with home

Many of the objectives of the project focused on the students applying their awareness and attitudes to environments outside the school. The most obvious place to test this was in the home. Headmasters were asked whether, in their opinion, parents welcomed the new Design and Technology course, and the answer was an overwhelming "yes", with 95.2% of headteachers agreeing this to be the case.

Though the questionnaires did not collect background data for comparing responses against other subjects, there exist some data showing the amount of interest of parents in students work. To the question "my parents are interested in my work at school 91.9% of students agree with this statement. This confirms the generally held opinion that the parents in Cyprus hold education in high esteem and students are aware of this fact.

TABLE 31

HEADTEACHERS' QUESTIONNAIRE AND RESPONSES

Number	Statement	Strongly Agree %	Agree %	Disagree %	Strongly Disagree %
1	The curriculum has been improved by the change from traditions handicraft to design and technology lessons	69,9	38,1	0	0
2	Some other subjects are adopting the design and technology approach	9,5	71,4	19,0	0
3	Design and technology lessons are well planned	38,1	61,9	0	0
4	Parents have welcomed the new lessons in design and technology	33,3	61,9	4,8	0
5	Design and technology and Home Economics teachers are working closely	66,7	28,6	4,8	0
6	I understand the aims and objectives of the design and technology curriculum	85,7	14.3	0	0
7	The teaching methodology in Design and technology is different to other subjects	19,0	71,4	9,5	0
8	Pupils enjoy design and technology lessons	66,7	33,3	0	0
9	There should be more time allocated for design and technology in the curriculum	14,3	42,9	42,9	0
10	The teachers feel that design and technology lessons are resourced better than other subjects	28,6	52,4	19,0	0
11	The design and technology curriculum has had an impact on art lessons	5,0	60,0	35,0	0

The percentage of those who agree with the statement " My parents show great interest in my technology projects" is 62.3%, which means that more parents are interested in students work in general or that there are parents (91.1-62.3=29.6) who are interested in their children's work , but are not interested in their work in Design and Technology. This nearly 30% of parents not showing interest in Design and Technology asks for more attention on the subject though it is physical general interest to be higher compared to the interest in any specific subject.

TABLE 32

ATTITUDES TOWARDS DESIGN AND TECHNOLOGY

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
H/master 4	Parents have welcomed the new lessons in D&T	7.5	61.5	4.8	0
		Always %	Often %	Sometimes %	Never %
Student 11	My parents show great interest in my technology project	34.1	28.2	29.2	8.5
Student 17	My parents are interested in my work at school	78.6	13.3	5.7	2.4

In order to test whether the projects made by students had a practical application, they were asked whether they used the items they made at home. 76.6% used these items at home, whilst 3.8% of the students used the ideas from Design and Technology to make other items at home.

TABLE 33

PRACTICAL APPLICATION OF PROJECTS

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Student 2	I never use the things I make in technology	7.5	15.9	46.9	29.7
		Certainly %	V. Much %	A little %	Not at all %
Student 21	My parents are impressed in my work at school	24.5	29.3	29.7	16.4

From interviews and class observations, it was apparent that teachers tended to use the lesson time for practical and theoretical work, whilst home was often the place where projects were written up in folders. Students were asked whether they spend a great deal of time at home working on their projects and 53.7% felt that they did.

TABLE 34
HOME WORK

Questionnaire and number	Statement	Always %	Frequently %	Seldom %	Never %
12 Students	I spend a lot of time at home working on my technology projects	30.8	32.9	30.5	5.8

Most headmasters refer to the home work of students saying that they quite often have complaints from parents that their children's home work related to project folders is too much, and in some cases they spend the whole weekend because their children work on their projects and they need some help. Overall, one is left with the impression of parent population highly interested in the education of their children. The vast majority of students actually use their

completed projects in the home, whilst over half of them take the ideas from the course to make other artefacts at home. Students believe that they spend a great deal of time at home working on their projects and parents and headmasters affirm this fact.

Design

Design is a core concept within Design and Technology, and an introduction to the design process featured heavily intake construction of the curriculum.

> *" The whole programme of Design and Technology, is based on the central activity: - Identifying needs, designing, creating, evaluating -. Because of this students must always work within the frame of this process" (D&T Curriculum p. 4)*

The first essential thing to be recognised by teacher is the importance of design. To the question " In technology lessons it is important that students have an opportunity to use graphical skills to illustrate their ideas " all except one teacher agreed with the statement. All teachers felt that the course had taught students the importance of design and 91.1% of the students agreed with the statement. The students confirmed this view in their response to a different question with 90.2% reporting that they have learned how to express their ideas by drawing

TABLE 35
DESIGN CAPABILITY

Questionnaire and number	Statement	S. Agree %	Agree %	Disagree %	S. Disagree %
Teacher 5	In D&T lessons it is important that pupils have an opportunity to use graphical skills to illustrate their ideas	50	48.3	1.7	0
Teacher 18	The technology course is teaching pupils the importance of design	79.3	20.7	0	0
Student 4	Technology lessons have taught me the importance of design	47.2	43.9	6.3	2.8
Student 20	In technology I learned to express ideas by drawing	42.1	48.1	5.8	4.0

TABLE 36

THE VIEWS OF THE TEACHERS

		V. Much	Much	Little	Not at all
1	I have enjoyed teaching design and technology this year	77.6	22.2	0	0
		V. Well	Well	Quite well	Bad
2	The training prepared me well for this subject	70.7	25.9	3.4	0
		S. Agree	Agree	Disagree	S. Disagree
3	In design and technology lessons it is important that pupils have an opportunity to work in groups as well as individually	82.5	17.5	0	0
4	In design and technology lessons it is important that pupils experience working with a variety of materials	91.4	8.6	0	0
5	In design and technology lessons it	50.0	48.3	1.7	0

	is important that pupils have an opportunity to use graphical skills to illustrate their ideas.				
6	Pupils acquire the necessary skills to make their solutions	34.5	56.9	8.6	0
		V. Much	Much	Little	Not at all
7	I have been pleased with the work of the pupils this year	13.8	77.6	8.6	0
		S. Agree	Agree	Disagree	S. Disagree
8	Pupils enjoy design and technology lessons more than the traditional handicraft lessons	62.1	34.5	3.4	0
9	In design and technology lessons it is important that pupils have an opportunity to spend a great deal of time writing their project folder	41.4	51.7	6.9	0
10	In design and technology lessons it is important that pupils have an opportunity to use their own ideas to show initiative	86.2	13.8	0	0
		Always	Frequently	seldom	Never
11	The pupils in my class are capable of designing solutions to design and technology problems	15.5	75.9	8.6	0
		V. Much	Much	Little	Not at all
12	In my design and technology studio I have materials and equipment that meet the needs of my pupils	33.3	56.1	10.5	0
		S. Agree	Agree	Disagree	S. Disagree
13	The design technology course has enabled pupils to understand the nature of technology and its importance to society.	39.7	58.6	1.7	0
14	The design technology course has stimulated ideas and creativity among pupils	55.2	44.8	0	0
15	The design technology course has given pupils the opportunity to gain	78.9	21.1	0	0

	personal satisfaction and pleasure from designing and making				
16	The design technology course has provided a foundation for skills and knowledge for pupils to use out of school	56.9	43.1	0	0
		Always	Frequently	Seldom	Never
17	I encourage students to evaluate the work of other students	41.1	50.02	8.6	0
		S. Agree	Agree	Disagree	S. Disagree
18	The technology course is teaching pupils the importance of design	79.3	20.7	0	0
19	The pupils have sufficient curriculum time to complete the design and technology scheme of work	0	1.7	48.3	50.0
20	I need more training	1.8	47.4	42.1	8.8
21	The design technology course has increased awareness of the aesthetic and material environment among pupils	46.6	53.4	0	0
22	The design technology course has developed an understanding of practical problems solutions through the design process	50.0	50.0	0	0
23	I encourage my pupils to evaluate their work	87.9	12.1	0	0
24	Commercially made objects are brought into the classroom for evaluation	3.5	49.1	47.4	0
25	Pupils are proud of the things they make in technology	77.6	22.4	0	0
26	My knowledge of Design and Technology is sufficient for me to teach this course	66.7	33.3	0	0

A young teacher had recently joined the teaching staff from the industry. When he

started attending training and at the same time teaching the subject he was very surprised.

> *"I finished school long ago. I attended the course practical knowledge. During the first weeks of my career in education I was astonished from what our teachers tried to tell us about the subject and the way we had to work in class [...].*
>
> *Though our teachers showed themselves to be very enthusiastic and sure about the success I could not believe I could manage the class and the worst, I was not sure if students were mature enough to work on such projects.... On the other hand, it was a challenge which some times seemed to be exciting [...] After hard preparation I started work with students. The inspector visited me on the second week. He congratulated me for the new job and the way students worked at first and later he gave too many directions. At the end of the day I thought in industry nobody considered me as very important in the system. Here all children came to me every now and then for help [...] the headteacher asked me to help him [...] the inspector showed great interest in my work [...] Above all I admire the work students do. They are very simple things but the approach is exactly the same as that of professionals or scientists. The more I learn the more I enjoy my work."*

This view needs to be compare with that of an experienced teacher:

> *"I am not sure about the future. Everything is based on the will of the ministry of education [...] Practical knowledge was an innovation in 1969 but it was left without any care and interest and became an obsolete [...]. I hope that the now existing interest on the subject will continue."*

General Attitude

The views of the design and technology teachers are very positive. They enjoy teaching the subject, feel well trained and well resourced.

> *"The two year course was a need. It gave background information about the material to be taught and the new approach as well as guidelines for the first stages of the implementation."(A teacher)*

Teachers are highly committed and the training and continuous support from the centre has resulted in a very strong feeling of comradeship.

> *"We were a detached part in schools. We did not do creative work. Learning was very low and with narrow horizons [...] Now everything is different. We have materials and equipment and we can offer more. We feel safer to teach the new subject and students feel better and learn more."*

The very positive response of the students to the subject encourages a similar response from teachers. A number of teachers report that they never have a coffee break because the students want to work through break and need help

Variations in Responses

The intention to make comparisons became possible through the use of various statistical techniques by Analysing the questionnaire responses against variables. The writer is aware that the establishment of a statistically significant

correlation between sets of scores or difference between groups does not provide the justification for assumption of a cause and effect link. Further analysis would be required before such connections could be made with confidence. However, the following statistical analyses provide information on relationships between variables explored in this thesis. They provide a useful basis for comment and may provide useful pointers for further exploration.

Some variations, particularly those between sexes, may be cultural. Exchanging views with a statistician at the pedagogical institute, indicated that when given a four box response males tend to respond at the extremes whilst females tend to answer the two boxes in the centre. After that, the head of the computer department was asked to examine this factor However, a useful analysis could not be provided without further background data.

Variation Between Sexes

As mentioned earlier, a background variable in relation to interest of parents in school work in general was assessed and show a significant difference between all years, scoring lowest in the third year and with boys scoring lower than girls. Further analysis shows that this variation is mostly due to the change of perception of the boys. There is no significant difference between the girls responses through the years but there is between boys and girls.

The introduction of this course has done much to break down sex discrimination but the response of the students indicate that design and technology is still a male preserve. Boys use their projects and ideas to make projects at home more than girls, they enjoy the lesson more than girls and want more time for the subject than girls. There is greater demand from boys to study the subject after the Gymnasia as

shown in the following

TABLE 37

RESPONSE TO THE STATEMENT

"I Should Like to Study Design and Technology after I have left the Gymnasia»

Gender	Certainly %	Very Much %	Little %	Not at all %
Boys	25,6	23,5	29,4	21,4
Girls	12,5	20,1	36,4	31,0

Urban and Rural Schools

Though the new subject has been successful in all schools, there are some significant variations between urban an rural schools indicating that it has been particularly successful in rural schools. This is indicated by the fact that 90,7% of students from such schools wish to study the subject after the gymnasium. Students in rural schools compared to urban ones tend to make more use of the items they make at school in the home, they believe that they make more items, are more proud of the items they make and want more curriculum time for design and technology. This may be due to the similarity of the subject to the work of the inhabitants of rural areas and to the occupation with solutions of existing problems in their communities. e.g. One boy designed and made a device for preparation of "cracked olives". Cracking olives is a job exercised in every rural house.

Teachers have greater confidence in students from rural schools to make items and so more commercial material is brought into the classroom. Students in rural schools write less and are more likely to want to study the subject after completion of the gymnasium. An advisory teacher explains this difference considering the different environment in which these students live:

> *"The directions given to teachers are exactly the same and are given during a staff meeting in the same room and at the same time. Either the syllabus or the text- book are the same [...] What is different is the background of the students and the environment."*

Over 50% of students in rural schools reported that they never worked in groups.

Variations Between Years

Earlier sections of this thesis show the very positive response from students and teachers to the outcomes of the project. Within these high scores there are consistent differences between the first year responses and those of the second and third year. The first year is generally more positive. It is certainly the case that first year students find themselves introduced for the first time to a new subject and a new way of working in school to which they react very positively, being very proud of their work and perceiving that they learn a lot. So we have to ask the question of whether it is inevitable that first year students will always score higher or is there some difference between the first and second year course. The only background question in the survey concerns students' perceptions of their parents' interest in their work. This showed a significant drop between the first and second year and between the second and third year. Interviews with teachers and advisory teachers suggest that there is no difference between the first and second year course except in the projects that are under-taken. However, it is suggested by some advisory teachers that the first year contains one or two mini-projects which are generally omitted from the second year. Teachers agree that students in the first year are more interested

and prefer to work with them.

> *"Last year I taught classes of grade one, grade two and grade three. I say that all students prefer practical work to theoretical one [...] those in the first year are more enthusiastic in the subject,[...] work more [...] produce more. Students' interest in the subject is inversely analogous to their age. Younger students means more interest. Older students less interest. I wish I could teach only in the first year."*

Significant variations between the second and third year were few and are referred here for completeness. Students were more likely to work in groups in the third year than the second. Other variations brought in the issue of gender with third year boys believing they evaluated their work less than the second year boys and boys in the second year wanting more time for the subject than boys in the third year.

The following table shows that differences between the years exist and are found throughout the questionnaire. A * indicates that there is significant difference between the first year and either the second or third year.

TABLE 38
SIGNIFICANT DIFFERENCES IN YEAR ONE AND OTHER YEARS

Factor	Year 2	Year 3	Comment
Think about the way we live	*		Less impact in second year
Importance of design	*		Less important in second year
Use ideas	*		less use of their own ideas in second year
Working time at home	*		Second year students spend less time at home working on projects
Study after gymnasium	*		Second year students are less keen to study design and technology after he gymnasium
Learning (quantity)	*		Second year students feel they have learnt less than other years
Time at School		*	Third year wanted less time
Expressing ideas by drawing		*	Second year students least likely to express ideas by drawing
Commercial objects		*	Second year students are less likely to use commercial objects
Proud	*	*	First year students are more proud of the things they make
Enjoyment	*	*	First year students enjoy their lessons most
Interest in technology projects	*	*	Greatest in first year
Making	*	*	Students feel they make more artefacts in year one. The reason is obvious for the difference between first and third year.
Evaluation	*	*	More evaluation takes place in the first year.
Use at home	*	*	More use of artefacts at home in the first year

Common Factors

By statistical analysis it became possible to determine whether there are significant common features to the responses to the questionnaires. Generally, there is a very strong correlation between all the students' answers and less correlation amongst the answers of teachers and headteachers. In other words, there is a tendency for a common pattern of answers from the students but not from teachers and headteachers.

Significant Correlation in Students' Responses

Responses to two questions on the students questionnaire have a few high significant correlations. The first concerns the students' perception that the way they work in design and technology is different from the way they work in other subjects. Students who have this perception also perceive that they:

- use the artefacts they make at home;
- have been taught the importance of design; and
- have learnt a lot.

Similarly, those who feel that they did a lot of writing in design and technology also feel that:

- they spend a lot of time writing at home;
- commercially made objects are brought in the classroom; and
- they consistently evaluate their work.

The other questions show a high number of significant correlations. Students who want more lessons of design and technology tend to:

- enjoy their lessons more than other students;
- are more proud of the items they make;
- feel that they have learnt to express their ideas by drawing; and
- use their ideas from the lesson at home to make other items.

The most significant correlation with the students' perception that a lot has been learnt is with those students who:

- have learnt to express their ideas in drawing.

These clusters draw out the important role that exists in design and technology in expressing ideas by drawing. It is the factor that makes the subject unique in the eyes of the children, makes it enjoyable and leads to greater learning.

Correlation in Headteachers Responses

The responses from headteachers do not show high statistical significant correlation's. In spite of this, common patterns of responses are detectable.

Headteachers who believe that the curriculum has been improved tend to be those who understand the design and technology curriculum.

Those who believe that some other subjects are adopting the design and technology approach tend to believe that students enjoy design and technology lessons.

Those who believe that students enjoy design and technology lessons tend to believe that there should be more time for the subject in the curriculum.

The Number of Projects

There is a highly significant correlation between the number of projects that the teacher offers and views as to the curriculum time. Though all teachers feel that there is not enough time, those who teach more projects do not express this as strongly as those who teach only two projects. In addition, those teachers who show confidence in the students' ability to design solutions tend to have more completed projects by their students.

CHAPTER ELEVEN

Concluding Remarks

This study has described the educational situation related to the teaching of technology in general education and the adopted strategy by the Ministry of Education of Cyprus to introduce into the educational system the new subject Design and Technology. The main objective of the thesis was to evaluate the implementation of the Design and Technology programme.

The method adopted in this research consisted of three parts. The first one aimed at observing how the workshops are organised and what is the method of teaching used in the workshops irrespective of what directions the inspectorate gives or the curriculum includes. For this part of the research besides personal observations were used deputies and headteachers who visited the workshops and selected information either for the organisation of the workshops or the teaching methods and the way students and teachers work.

The second part of the research consisted of interviews mainly with teachers and aimed at getting the best possible picture of the practical realities and problems arising in schools where Design and Technology has been introduced.

The third part aimed at identifying the opinions of teachers, headteachers and students as well as their attitudes towards the new subject.

The guiding idea in this research has been that the whole programme has been successful and this due to the good preparation made related to the training of teachers, the funding arrangements, the preparation of well

equipped workshops and the informing of the ministerial officials, the inspectorate, headteachers, teachers and parents about the need for the new subject. According to Burns and Stalker (1961) and Pilditch (1987) successful innovation tends to be associated with a participative management style and non hierarchical, horizontal in structure, emphasising consultation and a free flow of information rather than direction from above.

The involvement of foreign specialists on the subject showed how true is the opinion of Gross, Giaguinta and Berstein (1970) that outside change agents with expert knowledge are assumed to possess the ability to approach situations in a more objective and more sophisticated manner.

The findings of the research suggest a very serious achievement of the project which is the change of behaviour in class either of the teachers and the students, and the indications that this change affects in some way and other subjects. This change of behaviour is expressed in several ways e.g. room arrangement, free choosing of materials, free movement in class, link with home but the most essential is the fact that students set their own goals, interact with other students, teachers, parents, specialists, they refer to several sources of information, they suggest solutions, test and evaluate them. Barlex (1994) referring to the teacher - student relationship says that:

> *"[...]the relationship with teacher is vital. Encouragement and support that helps pupils solve their difficulties for themselves are required rather than teachers' instant solution [...]. It is worth noting that pupils can help each other with their problems and an atmosphere that encourages pupils to share their experiences will provide support».*

The research suggests that there has been a serious preparation for the implementation and though the educational system is academically oriented because of tradition and culture, the project succeeded. But this attempt must be continually refined and amended, and its objectives and methods kept under continual review. (Deere, 1989, in Dater 88) The preparation was related to teacher training, workshops preparation, funding, etc., but above all the presentation of the project to all those involved much earlier than their involvement. Because of the importance given by the government all others faced the new subject seriously.

The research showed that students enjoy being creative in designing and making artefacts and they are very proud of their finished products. They receive orientation to the problems they may face and the nature of the industrial society in which they live and are helped to become good consumers, able to evaluate industrial products. Holbrook, (1987) suggests: "[...]*Technology course would be geared more to the needs of the society in which the course is taught.*"

The writing up of the projects links the subject with the use of language in a different practical way.

> *"They need to develop a vocabulary to express the what, why and how of their work. They will need help to record and communicate evidence of their thinking and actions during project work."(Farrel, A., Patterson, J., 1993)*

This is a serious contribution to learning the language better and using it in another field,

Both from visits in schools and from discussions with teachers and officials at the Ministry of Education a series of impressions have been gained, most of which have been confirmed by the research.

It has been evident that now pupils leave lower secondary education with technological experiences. Design and Technology is the course which offers a full range of technological experiences. Staudenmaier (1985) considering technological developments concludes that the work of historians of technology favours the view that a disjunction between knowing and doing, is not supported by evidence and the dominant interpretation is of technological knowledge as a unique and irreducible cognitive mode. Making is found in each school as well as the design element. Before the Design and Technology project aspects of making were found in the Woodwork and Metalwork lessons, but these courses were skill oriented without any design element. Now each student suggests a solution to a design brief which in most cases is undertaken by the student in co-operation and reaction with his teacher, his schoolmates or his family. In many cases have been pupils enhancing their products with creative artistic work. As Eggleston (1994) says:

> *"Designing and making is an activity in which very many people participate [...]. It is an understanding that is now widely appreciated by all who design, whether they are product managers, artists, architects, landscape specialists or consumers. It is this socially sensitive concept of technology and design that is the heart of Design and Technology education as it is developing in the schools."*

Experienced teachers had considerable skill in wood and metal and after the massive two year training programme they acquired the needed skills and knowledge for the successful teaching of Design and Technology.

It has been observed that practical subjects before the implementation of the subject were accorded very low status within the schools. After the implementation the status rose substantially but there is a need for continuous care to sustain and raise even more this status. It is very important for all staff to become aware of the pedagogic value of Design and Technology lessons. This responsibility is the duty of the Inspector of Design and Technology and the Inspectorate in general. The role of those involved in the project is significant to the continuous development of the project. These key individuals are the so called "product champion" and " business innovator". (Roy, Potter et al. 1992) The former enthusiastically supports the innovation, especially during its critical phase. The latter, the manager, with overall control of the project is also highly committed to the innovation and plays a key role in welding the different phases together into a continuous innovation process.

The environment of all Design and Technology workshops became attractive and rich in machinery and equipment. Resources are not limited any more because of the significant capital investment to upgrade the rooms and equipment as well as the provision of materials and equipment.

Sex discrimination, with girls taking Home Economics and boys taking woodwork and metalwork stopped existing since all children attend both Design and Technology and Hone Economics. Fox Keller, (1985) suggests that the implications for science and technology when women are truly

involved and add their vision to that of males, will be a thoroughgoing transformation of the very possibilities of creative vision, for every one.

Teachers of Woodwork and Metalwork were keen to explore the opportunities offered by a course in Design and Technology and they looked forward to their retraining as a means of increasing their status within the education system, but they have been disappointed since only few of them had some salary improvement. Besides that most of them feel better as their colleagues students and parents appreciate their work and their subject.

The Ministry of Education made the introduction of Design and Technology its first priority in any development in Technical education and it started preparations for the introduction of Design and Technology into the Higher secondary level (Lycea).

In the vast majority of lessons the teaching style is didactic. After the introduction of the Technology project teachers of other subjects as well as inspectors showed interest to expand the range of teaching and learning styles. Similar interest has been reported and in the UK. As McCormick (1994) says:

> *"Some of the workshop teachers suggested that there would be a great benefit in science teachers associating themselves with the Craft, Design and Technology movement in Secondary education. The idea has much to recommend it. The movement has wide and admirable aims."*

During this research there was no observation of any particular practices either in Design and Technology or in other subjects for pupils deemed to

have special needs. This area needs further research before any commends can be made.

No evidence of Technology across the curriculum was observed. It is generally recognised that this is a very difficult concept. The writer is not aware of any attempt to introduce an across the curriculum theme into the education system and can find no reference being made to such a concept in any syllabus or curriculum policy statement.

It is noted that all pupils in their fourth year of secondary education follow an awareness course in Information Technology and that in most schools this is offered as a complementary course in fifth and sixth year. Design and Technology offers Computer awareness in the first, second and third year of schooling. However there are no evidences that skills and concepts learned in such lessons being transferred across the curriculum so that pupils can learn through information technology.

There was an attempt by the Ministry of Education to introduce Design and Technology into the upper Secondary level in the school-year 1994-1995. The introduction has been postponed for one year after the opposition from a number of teachers and inspectors who are adamant that technological experience is not appropriate for pupils at the Lycea level. In general such teachers and inspectors have misconceptions of what is meant by technology, seeing it purely in terms of vocational training and consequently belonging to the realms of technical-vocational schools. This confusion with conflicting goals is not endemic only in Cyprus. Banks (1994) says of the UK situation:

"The confusion in 1992 about what school technology in England and Wales should be, reflected the confusion in the direction of education policy. The emphasis is now on designing and making and the practical realisation of high quality products combined with work that is rigorous and intellectually demanding. This intellectual emphasis will help to justify its place within a National Curriculum for all, but the Key stage 4 is flexible to allow Technology to be included in a vocation course. The new problem in reconciliation of technology education for all with a specialist curriculum for some."

There will be more non manual jobs in the near future and change will be rapid. People will need to be adaptable, responding to change, with an emphasis on problem solving and making activities. This is in practice a call for different and higher levels of skills among the work force. Design and technology is a good start, but there is a need to extend the project to higher levels in education.

Technology now permeates most areas of human endeavour and is responsible for the phenomenal rate of change in society, particularly in the field of work. As shown in chapter three, the Cyprus work force suffers from a surplus in those occupations asking for high academic qualifications and from an exceptionally high shortage in occupations which need little specialisation. In the future the new technologies will produce further changes in the nature of work. Occupational roles will be substantially refined and will require some qualities to be more highly developed in the individual than they are at the present. A narrow range of specific skills will not be sufficient to meet the needs of the society. This world of increasing complexity and rapid change will require young people to possess an all round range of abilities to make

them sufficiently versatile and effective in their environment. For example, clarity of thought, the ability to communicate clearly and accurately, the ability to analyse and organise, to solve problems, to be imaginative and creative and the ability to adapt to new situations are some of the characteristics that will be valued in tomorrow's world. Perhaps most important of all will be the ability to learn on a continuous basis in order to keep pace with change and to meet new challenges. Bowles and Gindis (1988) argued specifically that: *The current relationship between education and economy is ensured not through the content of education but its form.* The Design and Technology education project is a very good start towards this direction.

The majority of people in tomorrow's world will be users of the technology, whilst only a minority will be involved in the research and development of the technology itself. The previously existing educational system failed by directing more than half of the secondary school schooleavers to universities. Though society has wider expectations of its educational system, in terms of preparing all children for a future where technology will abound, the current and future needs in the work force for specific skills related to the uses of technology in society are of most immediate concern. Dearing (1994) *looks for bridges which will allow students to move between pathways, where this is desirable without undermining the particular identity and integrity of the different courses*. Design and Technology started making clear contributions to the development of children in this aspect. Young people entering the adults society besides being literate and numerate in the accepted sense now will have also technological capability.

ISSUES FOR DISCUSSION

These are very early days in respect of introducing the new subject of Design and Technology into the curriculum. However the responses of all parties are very positive and there is ample evidence to suggest that the implementation will be sustainable. The research suggests that no major policy change is called for but a number of questions are raised in relation to the fine tuning of the course. Definite statements cannot be made; only questions could be asked.

- The project is doing much to raise the status of the subject and the teachers. However, there is still much to be done as misconceptions remain in a number of schools, headteachers and teachers. How can the educational authorities continue to raise the status of the subject?

- The project had done much to break down stereotyping although the response from the students indicates that there is still a challenge to be met. Although teachers report very good results and interest from girls it is clear that a number continue to see the subject as a male preserve. What can be done to convince girls and their parents that technology is a suitable option after the Gymnasia?

- The allocation of time prevents any increase in the number of projects that students may undertake in the school-year. However, is there a case for a core curriculum in the first and second year and is it possible to introduce an element of choice for the students of the third year as to which project they might undertake?

- Just how much use is made of commercially produced objects? There is a discrepancy of views between the teachers and the students. Why this should be so?

- Project folders form an important component of the Design and Technology course and it is clear that students, particularly girls, are

spending a great deal of their time at home to complete their folders. The length of folders varies a great deal. Would there be value in reopening the debate as to what is reasonable to expect the size of a folder to be?

- Has the problem of assessment been solved or is it time to review assessment problems such as the distribution of marks between the made artefact and the folder?

- The new subject offered much to the staff and teachers feel better in their schools. But how and when they will have equal rights to other teachers? When will be the first promotion of a Design and Technology teacher to a deputy?

Issues related to funding, materials supply and equipment need careful consideration and organisational changes so that the provision of materials as well as the provision and maintenance of equipment continue without interruptions.

A number of organisational changes have been made which proved to be very helpful. Similar changes need to be done and in schools and perhaps the establishment of a Technology Department in the Ministry of Education with Technology Departments in each school may be essential. Either the changes in the Ministry of Education or at the school level need to be covered by some kind of legislation and in any way become permanent.

The existing plan of the curriculum needs to be re-examined and with the four year experience of the implementation of the subject it can be reconstructed so that it will be of real help to the teachers. The translated book was a solution , under the then existing circumstances, but it is time for a new book wholly based on local situations.

The design process led partially to student centred learning but the teaching process includes several approaches. Besides that teachers qualifications relate to all branches of engineering. The co - ordinator is a pressing need and asks for organisational arrangements in schools so that it will become a reality. The role of the co - ordinator is not a so easy job. The comments of the teacher who was in charge to co-ordinate the work in few schools are particularly appropriate:

> *"When you bring together teachers from varying disciplines it is inevitable that they will bring a variety of teaching styles on the one hand and on the other deliberately or not they give emphasis on their own speciality. I had to bring them together and create one dimension for all teachers in the same school. Teachers themselves have been identified as a large problem in co-ordination."*

ON FURTHER RESEARCH

This thesis does not examine specialist problems, such as the effectiveness of teaching , detailed needs of students or needs of group of teachers for in - service training. It is hoped however that it establishes a starting point for such special research studies.

As has already been indicated, the role of curriculum materials is crucial to the success of such programmes. This is particularly true in the case of Design and Technology which demands very often quite different teaching strategies from the ones that are used in academic programmes. It is thus suggested that a research which would concentrate on the evaluation of the curriculum materials used would provide extremely useful information.

A systematic investigation of the knowledge and skills acquired by students mainly through Design and Technology subject and the related or not related selection of section of study after the Gymnasium would be of great interest if followed by an investigation of the occupational selection after school.

Doubtless the introduction of Design and Technology posed severe challenges to teachers, who in this programme saw many of the foundations on which education practice has long been based, been shaken. In order to win them over it is essential to find out more about them, especially how they think and how they feel. Research on such topics is severely lacking.

Innovations that depend primarily on changes in teacher behaviour cannot be planned without deep understanding of the nature of current behaviour of teachers. This suggests that areas such as patterns of classroom interaction and teaching styles need to be researched.

The innovation has created a climate for change of attitude and practice in traditional subjects as well. This change in thinking in relation to traditional subjects is challenging to some and inevitably threatening for others.

Many teachers are concerned about assessment of students in Design and Technology. For Design and Technology to become a subject of equal status to all others in the school programme it must be shown that it can be assessed and that the scheme of assessment is effective and reliable.

> *"[..] A reliable assessment of progress and achievement is valuable to pupils, parents and schools in all subjects as a means of providing a clear picture to pupils' current attainment as they look forward [...] and begin to shape their educational priorities.(Dearing R., 1994)*

There is ample evidence that the subject motivates pupils to learn. Several objectives as described in the curriculum are not easily measurable. If we try to enable our students to become capable it is important to assess this capability. Assessing capability is a quite difficult task and needs much more research and improvement.

Much remains to be done. But it is clear that the objectives of Design and Technology can be met. To meet them, however, the educational system has to embrace Design and Technology so as to provide a framework by which pupils can develop the practical capability which they need in the near future in the society.

SECTION FOUR

A LOOK AHEAD

CHAPTER TWELVE

The Future of Design and Technology

Throughout this thesis, the attempt has been made to provide an accurate picture of the nature of the subject of Design and Technology as well as its role in the educational system of Cyprus. Moving from a foundation of the Cyprus economy through a historical reference to the educational system with special emphasis on Practical Knowledge to the introduction of Design and technology and the evaluation of its implementation. A general picture of the present situation has been outlined. But what of the future? And since education is interrelated to the society in which it functions, what kind of society is likely to exist in the next decades. Until recently the present society has been called an industrial society. Rolf (1993) suggests that the society of the future has not been correctly conceptualised.

> *"The best proof [...] can be seen in the numerous labels which have recently been suggested [...] Information society, post-industrial society, service society, scientific society, consumer society [...] high energy society, mass society and T.V. society[...] "information society" seems to me an impressive but empty slogan [...].*
>
> *[..] it seems to me that we are still living, and probably will be for a long time to come, in an industrial society. The future is not post-industrial. In fact, industrialisation is tending to increase [...]. The trend is from an industrial to a hyperindustrial society."*

The future of design and technology in the Cyprus educational system will depend to a large degree on how successfully this curriculum area can adapt to the changing conditions of the society. As Reigeluth (1993) says in his article "Principles of Educational Systems Design":

> *"The purpose of an educational system is to meet the needs of the society and its individual members. An educational system is a subsystem - a part of a larger system - of society. Like all subsystems, the educational system must meet the needs of the larger system of which it is a part or the larger system will act to change it or replace it [...]." (Reigeluth, 1993..)*

Looking forward to the future of Cyprus education it is certain that the next generations will bring many changes. Factors which contribute to a strong and vital Design and Technology program in the future include the following.

Increased technological change and the need for a large supply of trained and technically qualified manpower.

Technology is increasing at a very rapid rate. The known body of content in every facet of our knowledge is increasing at such a rate that in some areas the modem technologies taught today may become obsolete before our students finish school. Science and technological developments are applied to every life manifestation. Since design and technology is concerned with the tools, materials, products, processes, these many developments will provide a great selection of new materials that can be added to the curriculum.

Automation and the use of power equipment in most forms of work will gradually decrease the need for unskilled workers. * The preparation and orientation of students towards technical occupations will be one of the responsibilities of a good design and technology program.

This is reinforced and by the widespread acknowledgement among the leading economic circles of the island that the "easy steps" of industrial and agricultural development are now over (Matsis, 1994). Moreover, the momentous decision of the government to join the European Community asks for a gradual change from an extensive pattern of development to a more intensive one. Both of these issues have a significant influence on the educational system in general and more particularly on technical education an essential part of which is design and technology.

Improved Standard of Living

Each year brings more things for more people. The improvement which took place during the last 40 years is tremendous. Old people remember their childhood and narrate the way their families lived. All the family lived in a big room called (δίχωρο) "double-spaced" without water supply, electricity and the elementary means of hygiene. Today the standard of living can be easily and favourably compared to that of any European country. As the variety of home devices becomes greater, there will be an increasing need for more knowledge and skills concerned with the selection, purchase and use of these consumer products. Design and technology can provide basic knowledge and skills useful not only in their selection and purchase but also in their maintenance and keep up.

Increase of Leisure Time and the do-it-yourself way of life.

The decrease in the work time[1] and the corresponding increase in free time have many implications for design and technology. Our culture helps people to work with their hands for their own self-satisfaction or even to have a second income. As the demand for services becomes greater and the offer available to perform these services decreases or become very expensive, do-it-yourself activities acquire increasing importance. Above this, many people living in towns have properties in the villages they come from. Most of these people visit their villages nearly every weekend and work in their properties. It is well mentioned that the owner of one of the greatest vineyards in Pathos area is a civil servant in Nicosia and he does all the work needed in this vineyard on weekends helped by his family. Since design and technology is concerned with tools, materials, processes and products upgrading of the subject will help to prepare people for these activities and will help people of all ages to learn the skills necessary for work for self satisfaction an self expression.

A number of other factors though not of the same importance as the previously mentioned play their role in the development of design and technology. Such factors are population increase, increased mobility of people, increased urbanisation, better communications and transportation, etc. There are however other factors that will tend to weaken the design and technology program. These include:

[1]The working time in industry in 1960 was 44 hours per week and there was a six day week. In 1978 there was a change to a five day week with forty (40) hours of work. Today there is a five day week with 38 hours of work. Source: Labour statistics, Ministry of Labour.

Demands by Universities for certain academic qualifications.

Universities are exerting more and more influence on Lyceum programmes. Particularly students of superior abilities, above average students, are prevented from having any essential technical experiences at the lyceum level. Even if they wish to select design and technology course it is not possible because they have to choose between Lyceum and technical education. In Lyceums such subjects are not offered and technical education is seen as education for less able students. On the other hand, for engineering courses the university entrance requirements do not include any technical experience. This is true with Greek universities where most Cypriot students have in mind to have further studies. All these eliminate the importance given by students, parents and teachers to the subject in the gymnasium. The government of Cyprus recognised these problems and a committee under the chairmanship of the president of the republic suggested:

> *"[...]. Unification of Lyceums and technical vocational education and the creation of a new type of school - the "Unique Lyceum". This new school will offer both academic and technical subjects. This new school will function on a pilot basis for three years in one previously technical school and two Lyceums".(Simerini paper, 1993)*

In this school the first year is compulsory for all students and include technology four periods per week. In the second and third year students can choose subjects from a long list which includes either academic or technical

subjects. The existing situation weakens the design and technology programme. The unique Lyceum offers perspectives for development.

Lack of understanding on the part of educators and lay people as to the goals and purposes of the programme

It is difficult for many people to think of design and technology as anything but handwork. The fact that this program changed from practical knowledge to design and technology is due to much misunderstanding. Adults today believe that a manual training course in woodworking is a design and technology experience. Teachers complain that most of their colleagues continue to call the subject woodwork or practical knowledge. A headteacher explains why:

> *"[...] in most cases teachers call the new subject woodwork or practical knowledge because they did not recognise the big difference between the old and the new subject or they do not like to recognise this difference.... there are those who do not accept the innovation and deliberately use the old name."*

Though most teachers realised that the new subject includes learning experiences in problem solution, electricity and electronics, power mechanics, metalwork and graphic arts as well as some of the more traditional offerings in woodworking, there are those who will continue seeing the subject as nothing more than handwork and as a subject of minor importance.

Educational fads continue to overemphasise one or another curriculum area

The existing increased emphasis on mathematics, science and language, and the corresponding decrease in the amount of time available for design and technology emphasise how important and how difficult it is to maintain a well balanced curriculum.[2] Every speciality of teachers and the ministerial officials coming from the same speciality try to have as much time as possible for their subject. The weakest group of teachers due to its small number and to the fact that nobody holds any position higher than that of a teacher is design and technology. For this reason and the influence of the educational policy from Greece, it will be difficult for the subject to be given the time corresponding to its importance.

Design and Technology in the Next Decade

In looking ahead to what design and technology in the next decade should be, the following points should be given careful consideration.

a. The curriculum should be geared to changing technology

It seems logical that the courses will continue to be organised around the major materials and processes of our economic life, including wood, metals, electricity and electronics, power mechanics, synthetics and graphic arts. These, with the design process, should form the basis of a good design

[2]For the third year of the Gymnasium the time allocated for each subject is as follows: Religion 2 periods, Greek Language 11, Counseling and Guidance 0.5, Mathematics 4, Science 5, English 3.5, French 2, Music 1, Gymnastics 3, Art 1, Home Economics 1, Design and Technology 1.

and technology programme and the curriculum materials should be concerned with the following factors:

- Wood continues to be one for the most important materials in our country. Wood and its products are found everywhere, though in enough cases other materials are used instead of wood. Not only is it being used in the old familiar way, but also in new combinations.(Meleties, 1986)
- Metal working will be another of the major industries in our economic life. Greater attention must be paid to the science and technology of metal working, including the basic principles involved in changing the form and shape of a metal.
- Electricity and electronics is a section of the economy where more and more people are engaged. This is an area in which design and technology has an excellent opportunity to teach basic principles and fundamentals that will be useful in all types of jobs related to electricity and electronics.
- The learning of technical information is based on communication. Nowadays, besides oral and written communication electronic communication undoubtedly becomes increasingly important. The use in the workshop of all types of communication with special emphasis on the graphic communication in the form of drawing and design as well as the computer communication should be emphasised. The statement that pupils should be provided with a kind of computer "driving licence" as soon as possible is frequently heard. Each pupil should learn to give the computer simple commands and link it into simple programmes. This will give students the opportunity of gaining knowledge and making discoveries by searching in knowledge sources

b. Design and Technology should be designed for students of all ability levels

For clear practical reasons we can distinguish three groups of students in the system: the slow learners, the average ability students and the bright ones. Special attention should be given to the slow learners and the potential dropouts. Table 39 shows dropouts at the gymnasium and Lyceum level. The percentage of those who stop studying in schools is quite high though the tendency for gymnasium level is for drop outs to become less and less, either in gymnasium or Lyceum level. In many cases the right kind of design and technology programme can hold or even raise students' interest and develop in them a desire to continue attending school.

TABLE 39
Students completing grade 3, Gymnasium level, and grade 3 Lyceum level as percentage of those enrolled in grade 1

School Year	Enrolled in Grade 1	Completed successful grade 3 G. level	%	Completed grade 3 Lyceum level 6 years later	%
1970-71	10401	8147	78,3%	6725	64,7%
1974-75	9030	7795	86,3%	7083	78,0%
1978-79	9250	7793	84,3%	6899	74,6%
1982-83	8671	7612	87,8%	7811	78,6%
1986-87	6830	6100	89,3%	Not available	

Source: Statistics of Education. Department of statistics. Ministry of Finance.

Enriched programmes either for the great average group of students or special programmes for the superior students, built around research,

experimentation and problem solving should raise the interest of these students in technology and especially in designing and making of new products. Such courses will be of interest to those students who plan to do higher studies in engineering at Universities or polytechnics.

c. Applied science and mathematics should be emphasised throughout the design and technology programmes

Students should learn the scientific principles involved in the tools, materials, and machines they use in their basic sciences and the technology in industry. Students should also understand the chemical and physical properties of the materials they use. In other words, Design and Technology as a school subject should centre on technology as it is represented in higher education and industry and as it is commonly understood. Perhaps the National Curriculum Design and Technology Working group accepted this issue writing in the Interim Report that:

> *"that area of the curriculum in which pupils design and make useful objects or systems, thus developing their ability to solve practical problems [...] drawing on knowledge and skills from a range of subject areas, but always involving science or mathematics (DES 1988)*

d. Contribution to social value and attitude formation should be emphasised

The nature of the work done in the workshops and the activities which take place require co-operation, sharing of ideas and skill, and responsibility. Instead of creating artificial situations in which to teach these desirable attitudes, teachers might take advantage of design and technology activities.

Noel Thomson an engineer and technologist says that technology:

> *"[...] will draw on knowledge and experience subjects and disciplines; and, in so doing, it will reinforce and develop understanding of those subjects, putting them into context, through demonstrating their practical applications [...] It may be convenient to educators to divide knowledge into discreet disciplines but the world outside doesn't do so, for the simple reason that the problems of real life are not so structured. If educators create demarcations for their own convenience, they should recognise that they are creating with them an artificial world remote from the reality in which all (except, perhaps, some academics) live (Thomson, 1990)*

Pupils of gymnasium age group need experiences which will give them confidence and understanding and help them to start planning their future. They also need opportunities to explore their abilities and the physical world around them. The activities of design and technology should be planned with this thought in mind.

In the writier's view, this thesis is best finished with the following quotation from Koutsakos' book (1986) on modern teaching.

"The final aim of the teaching method and the greater ambition of the educator is, or must be, to make himself, though his approach and method, needless to the student in the learning procedure. Dialectically and paradoxically said: the ideal objective of the teaching and the teacher is, through the development of the student, to reach to the raising of themselves, while the student is still at school."

SECTION FIVE

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APPENDICES

APPENDIX 1

Workshop Observation

Date _____

Time _____

A. General Description

- Detailed description of activities taking place in the workshop during the period of observation.
- Room arrangement and activities during the period of observation (sketch on a plan of the room).

B. Specifically

General Code

Not at all 1 2 3 4 5 completely

To what extent did the teacher

1. Act as a guide, catalyst, or resource person between pupils and materials or processes?
2. Work with as many individual pupils, pairs or groups as possible?
3. Move all around the room?
4. Allow pupils to move freely from one activity to another?
5. Encourage or allow students to interact with each other?
6. Allow students to move freely about the workshop?
7. Encourage students to decide whether they wanted to work individually, in pairs or in groups?
8. Encourage or allow students to create their own solutions to problems?

9. Encourage students to use the workshop according to existed work areas?

10. Arrange the workshop into work areas?

11. Make available to students the existing materials, tools and equipment in the workshop?

12. Control the situation in the workshop?

13. Use A.V. aids?

14. Insists on the Design Process?

15. Help students to identify areas of research?

16. Prepare a resource centre for the students?

17. Offer adequate instruction in practical skills?

18. Provide good opportunities for pupils to observe resources and learn to handle them?

19. Take care for health and safety?

20. Plans catering for the needs of boys and girls in a progressive programme?

21. Insist on the demand for quality work?

22. Create opportunities for students to apply technological knowledge?

23. Encourage students to discuss and analyse their work?

24. Encourage students to justify their ideas, materials and techniques they have used.

25. Encourage students to make modifications and improvements in their projects?

26. To what extent teachers help students to: Continually use and extent their knowledge designing and making products?

27. Use and extent their understanding and skills?

28. Show curiosity in the investigation of the capabilities of different materials?

29. Show confidence in using techniques, processes and resources?

30. Show creativity in designing products to meet particular needs?

31.Persevere in the organising, planning and making of their products?

32.Evaluate their products at each stage and test them against objective criteria?

33.Work independently and as part of a team?

APPENDIX 2

Teacher Interview

Introduction

1. I am interested as you know so well in the programme of Design and Technology. I really appreciate your willingness to help me. Please feel as open and frank as possible. Only in this way I shall be able to understand your thoughts about the programme.
2. While so many people are talking about the introduction of the knew subject, I am not sure about what in fact happened when the new subject was brought in.
3. Since it is my belief that this (the new subject) is a very important step in the development of the teaching of technology in Cyprus, what I am doing here is trying to get a much better picture of the practical realities and problems arising in schools where Design and Technology is introduced.
4. I want you to see the process of the introduction of the new subject and the teaching of the subject as well from the teachers point of view.
5. I do want to assure you about the matter of anonymity.
6. I welcome your afterthoughts about this interview so any time afterwards, please don't hesitate to tell me about any changes (additions, corrections or deletions) you like to make.
7. Do you have any questions?

Part 1 - Practical Knowledge

Let us start with the period before the innovation.

1. What was the percentage of parents who were interested about the progress of their children in your
2. subject?(_____).
3. A.B.C.D. are passing marks E is a failure. How many times did you give an E at the end of the school year? _____
4. Were there adequate facilities for the teaching of the subject? Y N
5. If no: Specify the needed facilities.
6. Most teachers parents and students considered manual arts as a second class subject. Was it because: besides other reasons and:

a) Teachers had law qualifications? Y.N. NS. DK.

b) The subject had a practical nature? Y.N. NS. DK.

c) The standard of instruction was very poor? Y.N. NS. DK.

d) The quality of learning was very poor? Y.N. NS. DK.

e) Only traditional materials and tools were used? Y.N. NS. DK.

f) It had nothing to do with Greek History and culture. Y.N. NS. DK.

g) It was not linked to other subject? Y.N. NS. DK.

h) It was not related to modern occupations and had not any preoccupational value? Y.N. NS. DK.

i) There were not any machinery in the workshops?. Y.N. NS. DK.

j) The Ministry of Education did not show any interest about the subject? Y.N. NS. DK.

k) There was complete absence of textbooks? Y.N. NS. DK.

l) The content of the subject was not that needed by the standard of living of the Cyprus society? Y.N. NS. DK.

Part 2 - Preparatory Period for the two-year Course

So far we have been talking about the subject before the introduction of the innovation. Now let's turn to the nature of the innovation itself.

1. When innovations are introduced into schools, teachers may react in different ways. How did the nature of this innovation strike you when you were first aware that it was going to be introduced? (A)
   Why did you feel this way?
2. After the innovation was first described to you did you think that you had a clear understanding of it? Y. N.
3. What at the time, did you think the Ministry hoped to accomplish by introducing it?
4. Did you think these were worthwhile objectives? Y. N.
   If Yes: why?
   If no: Why not? (omit next question)
5. Did you believe that there was a need for this innovation? Y.N.
   If Yes: Why?
   If no: Why not?
6. How much importance did you feel the following people gave to getting this innovation into Gymnasia.
   a) your school head master.
   b) your inspector.
   c) the Director of Secondary Education.
7. Did you feel that the innovation would succeed? Y.N.
   What were the reasons?
8. You personally, in order to succeed, did you think that you would have to make any changes in your behaviour in class?
   Y. N.
   If yes: Why?
   If no: Why not?

9. When new ideas are introduced into schools they sometimes have positive consequences for teachers, sometimes negative consequences, sometimes both.

a) Did you think there would be any positive consequences for you?

Y. N.

If yes: what would they be?

b) Did you think there would be any negative consequences for you?

Y. N.

If yes: what would they be?

10. What about the consequences for other teachers:

a) Did you think there would be any positive consequences for other teachers? Y. N.

b) Any negative consequences? Y. N.

If yes: For whom? In what ways?

11. How about pupils?

a) Any positive consequences? Y. N.

If yes: For what kind of children? In what way?

b) Any negative consequences? Y. N.

If yes: For what kind of children? In what way?

12. We have been talking about many different aspects of the initial period this innovation was going to be introduced into Gymnasia. What was your basic feeling, how did you honestly react to the whole notion of bringing it into Gymnasia? (A)

Why you feel this way?

Part 3 - The Two-Year Course

Lets come to the preparations made for the introduction of D. & T. into Gymnasia.

1. At the same time with the introduction of the subject to two pilot schools the training of the staff started.

a) Did you meet any difficulties attending the course?

Y. N.

If yes: What difficulties?

b) Did the course cover all the material needed for the teaching of the new subject?

Y. N.

If no: What in your opinion was omitted?

c) Did the depth taught in each unit cover the needs of the subject?

Y. N.

If no: In what unit is needed more depth?

d) Was the practical work and project work in each unit such that it gave you the capability to teach the new subject?

Y. N.

If no: In what units do you need more practical or project work?

e) Did you face any difficulties to communicate with the British teachers?

Y. N.

If yes: What did you do?

f) Was the Cypriot counterpart helpful?

Y. N.

If no: In what cases?

What more did you expect?

9. Is there any case you asked for any help or information and they refused or were unable to satisfy your request?

Y. N.

If yes: What kind of request was it?

Did they give you any reasons?

10. In your work in schools, do you use the booklets provided during the two year course.

Y. N.

If yes: How often?

Which units do you find more useful?

11. Did you spend extra time and efforts during attendance of the two year course?

Y. N.

If yes: How much time averagely per week?

12. What was your overall reaction in regard to the organisation and attendance of the course?

	Initially	Subsequently	Finally (after the course)
Very positive	.....	.....	.....
Somewhat positive	.....	.....	.....
Ambivalent	.....	.....	.....
Somewhat negative	.....	.....	.....
Very negative	.....	.....	.....

13. During the period of the course, how much:

a) thinking did you do about its need (C)

Why?

b) reading did you do about the new subject? (C)

c) writing did you do about the new subject? (C)

d) work did you do besides that done in the workshop to complete your projects? (C)

Why?

e) talking did you do about the new subject? (C)

with whom? Teachers? Union men? Ministry officials? Inspectors? Others?

(specify)

How? Formally? Informally?

Where?

14. Did you have any serious questions or reservations about the course during this period?

Y. N.

If yes: What were they?

Part 4

Period of Implementation

A. Now let's refer to the period when you first started trying out the new subject.

1. Have you in fact started trying to carry it out?

   Y. N.

   If no: Why not? (if not then go directly to the next section)

   If yes: When did you begin?

2. How hard were you working during the first weeks?

   Why?

3. What kind of things did you do?

   (List activities)

   How well did each of these things work out as far as you were concerned?

List of activities	Very Well	Somewhat well	Neutral	Poorly
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	..	..	...	....

What were the reasons for the above?

4. At the beginning, did you find any serious problems in trying to teach the subject? Y. N.

If yes: What were they?

5. How much did the inspector or the support group really try to help you to overcome any of these problems?

	V. Well	Considerable	Some	Little	None
Inspector	.....	.....	.....	.....	....
S. Group	.....	.....	.....	.....	....

6. What did the inspector or the support group try to do to help you?

7. How helpful was the two years course for those first days -weeks in your work? (D).

B Now we want to focus on the period between those first attempts and the present time.

1. Have any of the problems arising during your first attempts continue to exist? Y. N.

If yes: Which ones?

2. Have any new problems arisen during the period of first attempts and the present time? Y. N.

If yes: What have they been?

3. How much have the support group or the inspector really tried to help you overcome any of these problems?

Inspector	.....	.....	.....	.....	....
S. Group	.....	.....	.....	.....	....

Code C

What have they done to try to help you. (List activities)

.....

.....

.....

.....

.....

.

4. Were there people who have been obstacles or have blocked you in any way during this period

Y. N.

If Yes: Who have they been?

What kind of obstacles have been?

In which way they have blocked you?

5. Has there been help or advice that you have needed and you haven't got? Y. N.

If yes, what kind of help? In which cases?

6. Who in your judgement, should be providing this?

CODES

A. 5=Very Positive, 4=Somewhat Positive, 3=Ambivalent, 2=Somewhat Negative, 1=Very Negative.

B. 5=Extreme, 4=Great, 3=Moderate, 2=Little, 1=None, DK=Do not Know.

C. 5=Great, 4=Considerable, 3=Some, 2=Little, 1=None, DK=Do not Know.

D. 5=Very Well, 4=Somewhat Well, 3=Neutral, 2=Somewhat poorly, 1=Very Poorly, DK=Do not Know.

General Code:

Y=Yes, N=No, NS=Not Sure, DK=Do not Know.

APPENDIX 3

A. Pupil Questionnaire

General Underline what applies to you.

1. I am in the **first/second/third** class
2. I am a **boy/a girl**.
3. My school is in **an urban/a rural** area.
4. My school has **less/more** than 300 students.
5. My teacher has _____ years of experience.
6. Last year I completed **1, 2, 3, 4, 5, 6** projects.
7. Pupils will be presented with a series of statements and are requested to tick one of five responses as follows:

		Strongly Agree	Agree	Disagree	Strongly Disagree
1	In technology it is important to evaluate our work	1	2	3	4
2	The things I make in technology I use at home	1	2	3	4
3	Technology lessons make me think about the way we live	1	2	3	4
4	The technology lesson has taught me the importance of design	1	2	3	4
5	In technology lessons I have been able to use my ideas to solve problems	1	2	3	4
6	The way we work in technology is the same as other lessons	1	2	3	4
		Always	Frequently	Seldom	Never
7	I evaluate my work in technology	1	2	3	4

8	In technology I have the opportunity to test my ideas	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
9	In technology we make many items	1	2	3	4
		Always	Frequen tly	Seldom	Never
10	In technology we spend a great deal of time writing	1	2	3	4
11	My parents show great interest in my technology projects	1	2	3	4
12	I spend a lot of time at home working on my technology projects	1	2	3	4
		Too Much	Much	Little	Not at all
13	I should like to study design and technology after I have left the Gymnasia	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
14	I have learned a great deal from my design and technology lessons this year	1	2	3	4
		Too Much	Much	Little	Not at all
15	I wish I had more time allocated to design and technology this year	1	2	3	4
16	I enjoy my technology lessons	1	2	3	4
17	My parents are interested in my work at school	1	2	3	4
18	I am proud of the things I make in technology	1	2	3	4
		Always	Frequen tly	Seldom	Never
19	In technology we work in a group	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
20	In technology I have learned to express				

	ideas by drawing	1	2	3	4
		Too Much	Much	Little	Not at all
21	I use the ideas from technology at home to make other things	1	2	3	4
		Always	Fre-quently	Seldom	Never
22	Commercially made objects are brought into the classroom for evaluation	1	2	3	4

APPENDIX 4

Teacher Questionnaire

1. I teach Design and Technology for **1, 2, 3** years.
2. Sex: **Male - Female.**
3. I work in a **pilot - non pilot** school.
4. My school is in **an urban - a rural area**.
5. My school has **more - less** than 300 students.
6. I work as a teacher for _____ years (fill in).
7. I **attended - did not attend** the teacher's training course.
8. My students in class A completed **1,- 2,- 3,- 4,- 5,- 6,-** projects.

Teachers will be presented with a series of statements and are requested to tick one of the responses as follows:

		V. Much	Much	Little	Not at all
1	I have enjoyed teaching design and technology this year	1	2	3	4
		V. Well	Well	Quite well	Bad
2	The training prepared me well for this subject	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
3	In design and technology lessons it is important that pupils have an opportunity to work in groups as well as individually	1	2	3	4
4	In design and technology lessons it is important that pupils experience working with a variety of materials	1	2	3	4
5	In design & technology lessons it is important that pupils have a opportunity to use graphical skills to illustrate their ideas.	1	2	3	4
6	Pupils acquire the necessary skills				

	to make their solution	1	2	3	4
		V. Much	Much	Little	Not at all
7	I have been pleased with the work of the pupils this year	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
8	Pupils enjoy design and technology more than the traditional handicraft lessons	1	2	3	4
9	In design technology lessons it is important that pupils have an opportunity to spend a great deal of time writing up their project folders	1	2	3	4
10	In design technology lessons it is important that pupils have an opportunity to use their own ideas to show initiative	1	2	3	4
		Always	Fre-quently	Seldom	Never
11	The pupils in my class are capable of designing solutions to design technology problems	1	2	3	4
		V. Much	Much	Little	Not at all
12	In my design technology studio I have materials and equipment that meet the needs of my pupils	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
13	The design technology course has enabled pupils to understand the nature of technology and its importance to society	1	2	3	4
14	The design technology course has stimulated ideas and creativity among pupils	1	2	3	4
15	The design technology course has given pupils the opportunity to gain personal satisfaction and pleasure from designing and making	1	2	3	4
16	The design technology course has provided a foundation for skills and knowledge for pupils to use out of school	1	2	3	4

		Always	Fre-quently	Seldom	Never
17	I encourage students to evaluate the work of other students	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
18	The technology course is teaching pupils the importance of design	1	2	3	4
19	The pupils have sufficient curriculum time to complete the design and technology scheme of work	1	2	3	4
20	I need more training	1	2	3	4
21	The design technology course has increased awareness of the aesthetic and material environment among pupils	1	2	3	4
22	The design technology course has developed an understanding of practical problem solutions through the design process	1	2	3	4
		Always	Fre-quently	Seldom	Never
23	I encourage my pupils to evaluate their work	1	2	3	4
24	Commercially-made objects are brought into the classroom for evaluation	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
25	Pupils are proud of the things they make in technology	1	2	3	4
26	My knowledge of design and technology is sufficient for me to teach this course	1	2	3	4

APPENDIX 5

3. Headteachers

Underline

1. In my school Design and Technology is taught for **1, 2, 3,** years.
2. My school is in **an urban/rural area**
3. My school has **less/more** than 300 students.

		Strongly Agree	Agree	Disagree	Strongly Disagree
1	The curriculum has been improved by the change from traditional handicraft to design and technology lessons	1	2	3	4
2	Some other subjects are adopting the design and technology approach	1	2	3	4
3	Design and technology lessons are well planned	1	2	3	4
4	Parents have welcomed the new lessons in design and technology	1	2	3	4
5	Design and technology and home economics teachers are working closely	1	2	3	4
6	I understand the aims and objectives of the design and technology curriculum	1	2	3	4
7	The teaching methodology in design and technology is different to other subjects	1	2	3	4
		Too Much	Much	Little	Not at all
8	Pupils enjoy design and technology lessons	1	2	3	4
		S. Agree	Agree	Disagree	S. Disagree
9	There should be more time allocated of design and technology in the curriculum	1	2	3	4
10	The teachers feel that design and technology lessons are resourced better than other subjects	1	2	3	4
11	The design and technology curriculum has had an impact on art lessons	1	2	3	4

APPENDIX 6

PRACTICAL KNOWLEDGE TEACHERS' CERTIFICATE

To Whom it May Concern

This is to certify that Mr. ....., a teacher of Practical Knowledge Subjects (Handicrafts) at Secondary Schools, had attended the following courses of Handicraft subjects organised by the Ministry of Education.

i. From 7th July to 30th August 1969: eight weeks full-time. The subjects of the courses and the time allocated were:

(a)	Woodwork Workshop Practice	140 Hours
(b)	Woodwork Technology	8 Hours
(c)	Technical Drawing	38 Hours
(d)	Psychology of Adolescence	8 Hours

ii. From 5th July to 14th August 1970: six weeks full-time. The subjects of the courses and the time allocated were:

(a)	Metalwork Workshop Practise	68 Hours
(b)	Metalwork Technology	24 Hours
(c)	Technical & Engineering Drawing	24 Hours

iii. From 12th June to 22nd September 1972: 14 weeks full-time. The subjects of the courses and the time allocated were:

1. Methodology and Techniques of Teaching Technical Subjects	42 Periods of 45'
2. Technical Drawing & Design	42 periods of 45'

3. Technology of Materials (plastics, building materials, clay)	21 periods of 45'
4. Woodwork Technology	42 periods of 45'
5. Woodwork Workshop Practice	86 periods of 45'
6. Metalwork Technology	42 periods of 45'
7. Metalwork Workshop Practice	84 periods of 45'
8. Basic Electricity (Theory & Practice)	42 periods of 45'
9. Relation & Co-ordination of Handicraft with other subjects of the Curriculum (Theory and Practice)	21 periods

Head of the Department Technical Education

Nicosia 17th April, 1973

APPENDIX 7

Two Year Course - Teacher's Training

First Year Programme

Unit One Design Process & Graphics. 10th - 30th September, 1990
Unit Two Structures and Plastics. 1st- 21st October, 1990.

Unit Three Motion (levers and linkages)
22nd October - 11th November, 1990.
Unit Four Control (Motors/Pneumatics)
12th November-2nd December, 1990.

Unit Five Electronics 1 (Simple circuits)
3rd - 22nd December, 1990.

Unit Six Electronics 2 (P.C.B. Projects). 14th January - 3rd February, 1991.
Unit Seven Computer Control 4th - 24th February, 1991.

Unit Eight Digital Micro-electronic Systems. 25th February - 16th March, 1991.

Second Year Programme

The context of the second year was more practical. The British teachers and the Cyprus counterpart offered assistance to teachers who were preparing their projects for the final assessment. They prepared minor projects on marbles, time, environment, movement, sensing, ageing, automation, electronic systems, and one major project selected from six design briefs provided.

COURSE DIRECTORS

1. The Inspector for Technology, Cyprus.
2. The Inspector for Design and Technology. Bedfordshire L.E.A., U.K.

APPENDIX 8

CRITERIA OF TEACHER ASSESSMENT

ASSESSMENT	WEIGHTING
Brief and specification Understanding of the given problem and the production of a design specification	5%
Research and investigation Evidence of thorough research, with constructive comments made on the information gained	10%
Generation of solution Evidence to show that a range of solutions has been considered, with reasoning for final choice	10%
Development of solution Sufficient detail given to enable the item to be made	20%
Manufacture The production of the chosen solution	35%

APPENDIX 9

Correlation coefficients in students responses

	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	q11
q1	1000	-.2744**	.2925**	.3418**	.3064**	-.0433	.2775**	.2200**	.2361**	.0390	.2426**
q2	-.2744**	10000	-.2471**	-.2529**	-.2427**	.0964**	-.1837**	-.1908**	-.2361**	-.0014	-.2497**
q3	.2925**	-.2471**	1.0000	.4093**	.3783**	.0146	.1964**	.2685**	.3217**	.0762**	.3054**
q4	.3418**	-.2529**	.4093**	1.0000	.3832**	-.0775**	.2246**	.2713**	.3622**	.0182	.3192**
q5	.3064**	-.2427**	.3783**	.3832**	1.0000	-.0182	.2890**	.3281**	.3161**	.0331	.2353**
q6	-.0433	.0964**	.0146	-.0775**	-.0182	1.0000	-.0736**	.0306**	-.0067	.0161	-.0236
q7	.2775**	-.1837**	.1964**	.2246**	.2890**	-.0736*	1.0000	.2544**	.2267**	.0807**	.1907**
q8	.2200**	-.1908**	.2685**	.2713**	.3281**	.o306	.2544**	1.0000	.2825**	.0281	.2095**
q9	.2361**	-.2361**	.3217**	.3622**	.3161**	-.0067	.2267**	.2825**	1.0000	.0174	.3164**
q10	o390	-.0012	.0762**	.0182	.0331	.0161	.0807**	.0281	.0174	1.0000	.0284
q11	.2426**	-.2497**	.3054**	.3192**	.2353**	-.0236	.1907**	.2095**	.3164**	.0284	1.0000
q12	.1372**	-.1197**	.1452**	.1961**	.1310**	-.0276	.2402**	.1554**	.1486**	.2400**	.2618**
q13	2415**	-.3011**	.3392**	.3426**	.3164**	.0318	.1808**	.2193**	.2901**	-.0058	.3209**
q14	-.2693**	.2984**	-.3089**	-.3340**	-.2535**	.1289**	-.2354**	-.2743**	-.3402**	.0104	-.2939**
q15	.2245**	-.2886**	.2407**	.2428**	.2911**	-.0341	.1578**	.2029**	.2441**	.0141	.2448**
q16	.3079**	-.3472**	.3434**	.3922**	.3679**	-.0379	.2301**	.3134**	.3708**	.0002	.3811**
q17	.1757**	-.1184**	.1693**	.1775**	.1290**	-.0050	.1639**	.1509**	.2128**	.0070	.2622**
q18	.2559**	-.3358**	.3347**	.3898**	.3463**	-.0610*	.2811**	.3065**	.3431**	.0629*	.4268**
q19	.1264**	-.1129**	.1846**	.1854**	.1467**	.0541	.0515	.0871**	.1802**	.0463	.1808**
q20	.3147**	-.2387**	.3726**	.4252**	.4055**	-.0153	.2331**	.3111**	.3692**	.0457	.3722**
q21	.2665**	-.2915**	.3299**	.3520**	.3425**	.0740*	.2152**	.2931**	.3190**	.0182	.3593**
q22	.1415**	-.0781**	.1669**	.1535**	.1514**	.0436	.0887**	.1148**	.1639**	.1058**	.1591**

	q12	q13	q14	q15	q16	q17	q18	q19	q20	q21	q22
1	.1372**	.2415**	-.2693**	.2245**	.3079**	.1757**	.2559**	.1264**	.3147**	.2665**	.1415**
2	-.1197**	-.3011**	.2984**	-.2886**	-.3472**	-.1184**	-.3358**	-.1129**	-.2387**	-.2915**	-.0781**
3	.1452**	.3392**	-.3089**	.2407**	.3434**	.1693**	.3347**	.1846**	.3726**	.3299**	.1669**
4	.1961**	.3426**	-.3340**	.2428**	.3922**	.1775**	.3898**	.1854**	.4252**	.3520**	.1535**
5	.1310**	.3164**	-.2635**	.2911**	.3679**	.1290**	.3463**	.1467**	.4055**	.3425**	.1514**
q6	-.0276	.0318	.1289**	-.0341	-.0379	-.0050	-.0610*	.0541	-.0153	.0740*	.0436
q7	.2402))	.1808**	-.2354**	.1578**	.2301**	.1639**	.2811**	.0515	.2331**	.2152**	.0887**
q8	.1554**	.2193**	-.2743**	.2020**	.3134**	.1509**	.3065**	.0871**	.3111**	.2931**	.1148**
q9	.1486**	.2901**	-.3402	.2441**	.3708**	.2128**	.3431**	.1802**	.3692**	.3190**	.1639**
q10	.2400**	-.0058	.0104	.0141	.0002	.0070	.0629*	.0463	.0457	.0182	.1058**
q11	.2618**	.3207**	-.2939**	.2448**	.3811**	.2622**	.4268**	.1808**	.3722**	.3593**	.1591**
q12	1.0000	.2236**	-.1659**	.1928**	.1879**	.1888**	.2376**	.1426**	.2812**	.1628**	.1333**
q13	.2236**	1.0000	-.2737**	.3209**	.5672**	.2046**	.3476**	.1661**	.3588**	.4629**	.1979**
q14	-.1659**	-.2737**	1.0000	-.2667**	-.3861**	-.1714**	-.3776**	-.1531**	-.3726**	-.3016**	-.1192**
q15	.1078**	.5209**	-.2667**	1.0000	.6972**	.1470**	.3663**	.1222**	.3205**	.3878**	.0919**
q16	.1879**	.5672**	-.3861**	.6972**	1.0000	.3126**	.5023**	.1966**	.4467**	.4920**	.1597**
q17	.1888**	.2046**	-.1714**	.1470**	.3126**	1.0000	.2828**	.1397**	.2680**	.2018**	.0740*
q18	.2376**	.3476**	-.3776**	.3663**	.5023**	.2828**	1.0000	.2391**	.4647**	.4366**	.1794**
q19	.1426**	.1661**	-.1531**	.1222**	.1966**	.1397**	.2391**	1.0000	.2684**	.2479**	.3252**
q20	.2812**	.3588**	-.3726**	.3205**	.4467**	.2680**	.4647**	.2684**	1.0000	.4498**	.2455**
q21	.1628**	.4629**	-.3016**	.3878**	.4920**	.2018**	.4366**	.2479**	.4498**	1.0000	.2573**
q22	.1333**	.1979**	-.1192**	.0919**	.1597**	.0740*	.1794**	.3252**	.2455**	.2573**	1.000-

* - signif LE .05 'em - LE .01 (2-tailed)