The Use of the Microcomputer in Teaching Arabic Grammar (Verbal Sentences) in the Intermediate Schools of the State of Kuwait

by

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TEXT CUT OFF IN THE ORIGINAL

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SUMMARY

This study is concerned with the issue of using the microcomputer in teaching Arabic Grammar (verbal sentences) in the intermediate schools of the State of Kuwait. It lays down some of the essential foundation work necessary for bringing about systematic and constructive improvements in the teaching of Arabic Grammar by computers.

However, our main concern in this study is, as we have said, with the teaching of one of the aspects of Arabic Grammar, in the above situation. Although the use of computers for this purpose has only just begun, the perspective of our approach will hopefully , to some extent, encourage their wider use.

The present study is divided into five chapters. Chapter one offers a general introduction to the main subject. The hypotheses made in this chapter constitute the general framework for the following chapters.

The teaching of Western languages by computer as opposed to the non-availability of such methods in the Arab world, is discussed in chapter two.

Chapter three provides a background on which the practical side of our study is based. The sources and methodology of our experimental work in this thesis are also treated in this chapter.

Chapter four is concerned with the results of this experiment and the measurement of pupils' achievements in Arabic Grammar during the experiment. A comparison between the traditional method and that of the computer is established by means of analysing the data concerned.

The last chapter concludes with suggestions for further specific research needed in this field.

ABBREVIATIONS

AG	:	Arabic Grammar
A.G.V.S.S.	:	Arabic Grammar Verbal Sentence Software
Class 1	:	3/3 (N=26)
Class 2	:	3/4 (N=34)
Class 3	:	3/6 (N=33)
Class 4	:	3/1 (N=31)
FA	:	Formal Arabic (al-lughah al-fuSHa)
Group 1	:	Traditional
Group 2	:	Experimental
KFAS	:	Kuwait Foundation for the Advancement of Sciences
N	:	Number of Students
S.T.	:	Statistic Test
Sex 1	:	Male
Sex 2	:	Female
SPSS	:	Statistical Package for the Social Sciences

TRANSLITERATION

ء '	س s	ل l	SHORT VOWELS
ب b	ش sh	م m	
ت t	ص S	ن n	ـَ a
ث th	ض D	ه h	ـُ u
ج j	ط T	و w	ـِ i
ح H	ظ Z	ي y	
خ Kh	ع ع		
د d	غ gh		LONG VOWELS
ذ Dh	ف f		
ر r	ق q		ا a:
ز z	ك k		و u:
			ي i:

GLOSSARY

Section 1. Arabic grammatical terms

1. amr : Imperative.
2. fa:ʔil : Subject of fiʔl.
3. fiʔl : Verb.
4. jamʔ al-taksi:r : Broken plural. The broken plural involves the internal modification of the vowels; the root consonants retain the same order as in the singular.
5. jamʔ mu'annath sa:lim : Sound feminine plural.
6. jamʔ mudhakkar sa:lim : Sound masculine plural. The sound plural involves the adding of a suffix to the singular.
7. jumlah fiʔliyyah : Verbal Sentence. A sentence beginning with a fiʔl followed by a fa:ʔil.
8. jumlah ismiyyah : Nominal Sentence. A sentence beginning with an Ism, known in this position as Mubtada, followed by Khabar, which may not contain a Fiʔl.
9. la:zim : Intransitive.
10. ma:Di: : Perfective Aspect.
11. mafʔu:l bihi : Object of fiʔl.
12. mu'annath : Feminine.
13. muDa:riʔ : Imperfective Aspect.
14. mudhakkar : Masculine.
15. mufrad : Singular.M
16. mutaʔaddi: : Transitive.

17. muthanna: : Dual.

18. mu¿tall : (Root) having one (or more) weak consonant.

19. na:'ib fa:¿il : Subject of passive verb.

20. SaHi:H : (Root) having all three consonants strong.

Section 2. Computer Terminology

1. A.G.V.S.S. : Arabic Grammar Verbal Sentence Software.

2. Authoring Language : A programming language designed for a specific authoring task, for example, the creation of CAL programs or man-machine dialogues. PILOT, MICROTEXT and TUTOR are author languages. Their sets of instructions have to be learned before the author can begin creating CAL material.

3. BASIC : One of the commonest programming languages found in home and school computers. It stands for Beginners All-purpose Symbolic Instruction Code. B.A.S.I.C.

4. CAI : Acronym standing for Computer Assisted Instruction.

5. CAL : Acronym standing for Computer Assisted Learning.

6. CALL : Acronym standing for Computer Assisted Language Learning.

7. Chip : A wafer of silicon which contains all the information necessary for an integrated circuit. The

		circuitry of modern computers is based on silicon chips, which perform a vast range of different tasks.
8.	Command	: Direct instructions to a computer to carry out an operation, e.g. RUN, LOAD, (Basic Commands). Sometimes used synonymously with instructions or statement.
9.	Courseware	: A set of CAL lessons or exercises.
10.	High-level Programming Language	: This includes BASIC, COBOL, FORTRAN, PASCAL, SNOBOL, and many others. Designed essentially for the convenience of human beings to enable instructions to be written for computers. Supposedly machine-independent, but most languages in this category have quirks which are machine-specific. High-level language has to be converted (compiled or interpreted) into machine-code, a low-level programming language, which is the only language the computer really "understands".
11.	Instruction	: Tells the computer what to do. Computers thrive on instructions. A set of instructions forms a program.
12.	Interactive	: CALL programs are usually interactive, consisting of question, response, feedback, and so on. Essentially, this term describes a sort of "conversation" between user and computer.

13. Interpreter : A program which translates the instructions of a high-level programming language into machine code. When a programme written in BASIC is run, it is translated simultaneously by the interpreter, which may be resident in ROM or soft loaded into RAM.

14. Monitor : A TV-like device used to display information.

15. MSX Basic : Stands for Microsoft Extended Basic. An extended, universal version of Microsoft Basic, incorporating graphics and sound instructions. Used on the new range of Japanese micros.

16. Pilot : An author language used in CAL.

17. PLATO : A large, originally mainframe CAL system, but now also available for microcomputers. Owned by Control Data Corporation.

18. Program : A program is a set of instructions which tells the computer what it has to do to carry out specific tasks. Programs are written in various high-level and low-level programming languages.

19. TUTOR : An author language used in CAL, e.g. PLATO.

20. User-friendly : Mainly used to describe software. Software which is easy to use and offers guidance if the user does silly things, is what is described as user-friendly.

21. Visual Display Unit : Usually called VDU. Mainly applied to the display screen plus keyboard combinations connected to larger computers.

Section 3. Statistical Terminology

1. Correlation : In its most general sense Correlation denotes the inter-dependence between quantitative or qualitative data. In this sense it would include the association of dichotomised attributes and the contingency of multiply-classified attributes. The concept is quite general and may be extended to more than two variates. The word is most frequently used in a somewhat narrower sense to denote the relationship between measurable variates or ranks.

2. Covariance : The first product-moment of two variates about their mean values. The term is also used for the estimator, from a sample of apparent covariance.

3. Covariance Analysis : This is an extension of the analysis of variance (q.v.) to cover the case where members falling into the classes bear the values of more than one variate. Interest centres on one of these (chosen as dependent variate) and the question is whether its variation between Classes is due to class effects or to its

		dependence on the other variates which themselves vary among classes. This is discussed by considering the regression of the dependant variate on the other variates and the variation of the regression(or equivalent of covariances) among classes. The technique is similar to that of variance analysis but considerably more complicated.
4.	Criterion	: This word is used in statistics in its colloquial sense in a number of contexts, e.g. the likelihood criterion for testing hypotheses.
5.	Critical Region	: A test of a statistical hypothesis is made on the basis of a division of the sample space (q.v.) into two mutually exclusive regions. If the sample point falls into one (the region of acceptance) the hypothesis is accepted; if in the other region (the region of rejection) it is rejected. Both regions are, in a sense, critical, but it is customary to denote the second by the term critical region.
6.	Critical Value	: The value of a statistic corresponding to a given significance level as determined from its sampling distribution; e.g. if Prob(t.t0)=0.05, t0 is the critical value of t at the 5 per cent level.
7.	Degree of Freedom	: One of the independent unrestricted random variables constituting a statistic.

8. Frequency : The number of occurences of a given type of event, or the number of members of a population falling into a specified class.

9. F-distribution : See Variance-ratio Distribution.

10. F-test : An alternative name for the Variance-ratio test (q.v.)(See also z-test.)

11. Hypothetical Population : A statistical population which has no real existence but is imagined to be generated by repetitions of events of a certain type; e.g. the binomial distribution as generated by the throws of a die, or crop-yields on a set of plots imagined as all the possible ways in which a set of yields might occur under the condition of an experiment.

12. i^{th} and j^{th} terms :

Class	1	2	3
$\bar{x}_i$	$\bar{x}_1$	$\bar{x}_2$	$\bar{x}_3$

$\bar{x}_1$ denotes sample mean of 1^{st} class

$\bar{x}_2$ denotes sample mean of 2^{nd} class

$\bar{x}_3$ denotes sample mean of 3^{rd} class

$\bar{x}_i$ denotes sample mean of i^{th} class

13. Level of Significance : Many statistical tests hypotheses depend on the use of the probability distributions of a statistic t chosen for the purpose of the particular test. When the hypothesis is true

this distribution has a known form (at least approximately) and the probability $P(t>t_1)$ or $P(t<t_o)$ can be determined for assigned t_o or t_1. (For more details see Kendall M.G. & Buckland, W.R. 1957 p. 161)

14. Mean : A statistic obtained by multiplying each possible value by its probability and then taking the sum over the range of the variable.

15. Non-random Sample : A sample selected by a non-random method. For example, a scheme whereby units are selected purposively would yield a non-random sample. Again, a sample obtained by taking members at fixed intervals on a list is a non-random sample unless the list was arranged in a random order.

16. Percentiles : The set of partition values which divide the total frequency into one hundred equal parts. This particular set of values is most used in education and psychology.

17. Probability : A measure of the relative frequency of occurrence of an event.

18. Standard Deviation : The most widely used measure of dispersion of a frequency distribution. It is equal to the positive square root of the variance (q.v.). The standard deviation should not be confused with the root-mean-square deviation (q.v.).

19.	Statistics	: Numerical data relating to an aggregate of individuals; the science of collecting, analysing and interpreting such data.
20.	t-distribution	: See Kendall, M.G. & Buckland, W.R. 1957 pp. 289-290.
21.	T-test	: A test based on the distribution known as "student's" (See t-distribution).
22.	Two-by-two (Frequency) Table	: A term for the presentation in tabular form of data subject to double dichotomy (q.v.). If each member of a set of N can bear or not bear an attribute A and an attribute B.
23.	Variable	: Generally, any quantity which varies. More precisely, a variable in the mathematical sense i.e. a quantity which may take any one of a specified set of values. It is convenient to apply the same word to denote non-measurable characteristics, e.g. "sex" is a variable in this sense since any human individual may take one of two "values" male or female.
24.	Variance-ratio Distribution	: The Distribution of the ratio of two independent quantities each of which is distributed like a variance in normal sample. (For more details see Kendall M.G. & Buckland W.R. 1957 p. 312.).
25.	Z-test	: A Significance test based upon the z-distribution . In most cases it is tantamount to a variance-ratio test

(q.v.); but also is used as an approximation to tests with more complicated distribution in which case variance-ratios may not be involved.

26. α_i : Population mean improvement for the ith group when the pre-test score is zero.

27. β_i : Population mean rate of change of improvement per unit change in the pre-score.

28. δ_i : Population mean improvement score for group i.

29. Σ : Summation sign.

$$\sum_{i}^{n} a_i = a_1 + a_2 + .. + a_n$$

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CHAPTER 1

1.0 INTRODUCTION

1.1 Statement of the Problem

The relationship between Formal Arabic (al-lughah al-fusha), that is, the only written form of the language, which is also used as an oral medium in certain circumstances, and what are conventionally known as the 'dialects', which are not written, and which vary considerably from country to country, is a disputed one. Some would maintain that there is a difference between Latin and Arabic, in that," while Latin produced a number of separate Romance vernaculars, French, Spanish, Italian, Portuguese, Romanian, etc., Arabic did not split up into separate languages over the same period and in a comparable geographical area. The reason was that Arabic was the language of a religion, Islam, as well as of government." (Haywood, J.A. and Nahmad, H.M., 1970, p. 496) Others would maintain that, on the contrary, the cases of Arabic and Latin were almost identical; others again would claim that the process was somewhat more complicated, and that it was far from certain that al-fusha was ever anyone's native spoken language. There is no need to pursue the matter here. It is sufficient to remark, for our purposes, that, however it came about, FA (as we shall designate Formal Arabic from now on) is distinct from the spoken

dialects/languages, which we shall refer to, for convenience, simply in terms of nationality, e.g. Kuwaiti, Egyptian, Lebanese.

Again, some people suggest that Arabic 'declined' from some notional peak of excellence, reaching its nadir under the ottoman Empire (Chejne, G.A., 1969, p. 81). This suggestion appears to confuse language with literature, for, while there is no doubt that Arabic literary production did gradually decline from about the 10th century AD, there is no reason to suppose that general proficiency in the manipulation of FA among the literate showed any marked deterioration. Since, from very early times, anecdotes and other reports concerning particular linguistic solecisms have been common, it seems more realistic to consider FA as having, as an acquired language, always presented serious problems to some of those who have attempted to use it.

The diglossic (or more accurately spectroglossic) situation is described thus by Mahmud Taymur:

> They [the Arabs] have lived in one tongue, but whenever the occasion has arisen for expressing themselves in writing, they have been obliged to switch to another tongue which did not reflect the

life they lived and do live at home, in the market place, in everyday transactions between men. (Taymur, A. 1951, p. 18)

This linguistic situation has psychological implications that are very deep-seated in the Arab psyche. There are for them 'two levels of life, the real self and the ideal self.' (Shouby, E., 1951, pp. 284-302)

1.2 FA in Kuwaiti Schools

The problems presented by the teaching of FA in schools, at all levels, but particularly perhaps at the intermediate, are likely to be similar in the various parts of the Arab world. Here we shall address ourselves exclusively to these problems as they manifest themselves in Kuwait. We shall therefore be concerned with the differences between FA and Kuwaiti, but such differences may be presumed to be much the same between FA and the spoken language of any other Arabophone country and to occasion much the same difficulties for the students of FA in these countries.

The principal difficulty is the learning and application by the student of the 'grammar' of FA. This 'grammar', although of course existing for the student's native spoken language, is thought of as belonging only

to FA and accordingly as constituting a tiresome and confusing set of rules applicable only to what is essentially a foreign language.

The accidence of FA is fairly complex, although hardly more so than that of any other inflected language. It has some elements in common with Kuwaiti, particularly as regards the inflexion of the verb, agreement of gender and number and the suffixing of object and possessive pronouns. However, there are sufficient differences, and additions, to cause confusion. The syntax, again, has certain elements in common, but similar qualifications may be made. For example, the Kuwaiti word order in a sentence such as 'the men hit the boy' will normally be S V (agreeing in gender and number with S) O, and the nouns will not be marked for case; in FA, on the other hand, the order will be V (agreeing in gender but <u>not</u> in number, since a verb preceding its subject remains singular) S O, and the nouns will be marked, in a vocalized text, for case. The words in Kuwaiti for 'the men' and 'the boy' will be similar to the corresponding words in FA, but the verb will be quite different, apart from the plural inflexion, which would be used also in FA if the verb followed a nominal subject or if it had the equivalent of a pronominal subject, but <u>not</u>, of course, in our example.

There are two main obstacles in the way of the learner, as far as accidence is concerned. One is inherent in the Arabic script and consists in the fact that many of the inflexions do not alter the shape of a word as it appears in writing, except when it is fully vocalized, since they consist in markers that are placed above or below the final consonant. Vocalization is not normally employed in written Arabic, so that the learner is not aware of the nature, or indeed of the presence, of the inflexion. The situation is further complicated by the fact that such inflexions are often not articulated either. Whether this is a consequence of the nature of the script or the nature of the script reflects the oral state of the language at the time when it was first written down is immaterial. It might, in any case, be thought that since such inflexions have a somewhat nebulous existence, it is hardly worthwhile going to great trouble to ensure that they are learnt. The fact is, however, that it is necessary to be familiar with them for the reading and recitation of the Qur'an (the text of which is always vocalized). In addition, FA is greatly respected as a language - justifiably so, in view of its constituting the principal bond between the Arab nations and between the various non-Arabophone Muslim communities - and an ability to speak and write it correctly (which implies, ideally, the ability to inflect it properly, even in speech) is greatly prized.

The other main obstacle is interposed by the traditional concepts of Arabic grammar and the terminology used to refer to them. Much of the description of a word in a sentence has to do with the form that it takes, rather than its function. Thus, what would be called in a European language the subjunctive or conjunctive - themselves not perhaps particularly informative terms - is called in Arabic al-muDa:riʕ al-mansu:b = 'the form ending in -a of the part of the verb that resembles the noun (that is, in its vowel endings)'. 'The form ending in -a' is also used in speaking of a noun to designate what a European language would call the accusative case (sometimes the genitive case, if this happens to have the same ending).

It is, then, not altogether astonishing that schoolchildren find learning of FA both difficult and distasteful. Even if they can master the grammatical terminology, it is still a form of incantation for many of them, rather than something that has a practical application. If to this is added a method of teaching that depends largely on learning by rote and parrot-fashion repetition, one will not be surprised that many children consider FA a subject to be left behind in the classroom, rather than a language to be used in real life.

1.3 Purpose of Study

No-one can deny the wealth of information that has been gained in the last seventy years, all over the world in relation to what happens in classrooms, and about relationships between teachers' behaviour and other variables related to teaching techniques, such as microcomputers.

The main purpose of this study is to show that teaching Arabic grammar (verbal sentences) by microcomputer is more effective than the traditional method of teaching.

In addition we hope that there may be other results:-

1. This study may provide a justification for the Ministry of Education not only to implement more computer application in teaching Arabic grammar; but also stimulate the development of new methods and techniques to train those qualified teachers in the higher levels of the education system.

2. It may result in the next generation being more sophisticated . This could be achieved by applying the results of this research (e.g. by implementing further computer applications in the educational curriculum).

3. It may inspire further planning and co-ordination within the Kuwaiti educational system, which may help to build or establish a new centre for applying computers in language learning.

4. It may encourage the exploitation of the advantages offered by the application of computers to solve the apparent individual differences of the "weak" and the "intelligent" student.

1.4 HYPOTHESIS

Applying the microcomputer in teaching Arabic Grammar (verbal sentences) is more effective and provides a better method of language learning.

In order to test the above hypothesis, the following methodology has been applied :-

Design of Experiment

Group 1: Boys' class (31) and girls' class (33) of the same age group and proficiency level.

Group 1 were given a written pre-test in language ability exercises.

Group 1 received tuition in the conventional method of verbal sentence teaching for three months.

Group 1 were given a written post-test in language ability exercises at the end of the experiment.

Group 2: Boys' class (26) and girls' class (34) of the same age group and proficiency level.

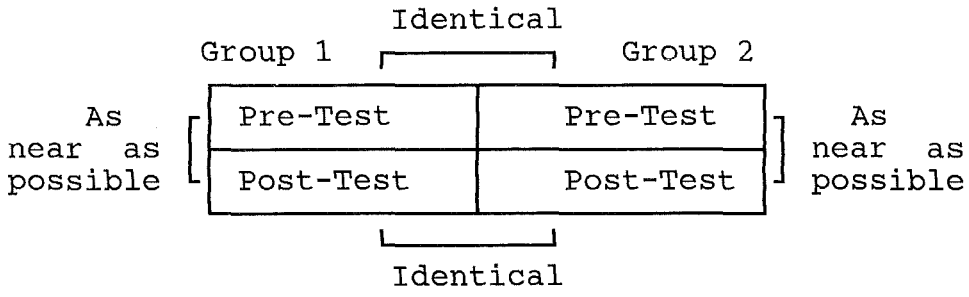
Group 2 were given a written pre-test in language ability exercises.

Group 2 received tuition by CALL, for three months, in verbal sentences.

Group 2 received a written post-test of language ability at the end of the experiment (i.e. after three months).

To avoid extra variables, the post-test was designed to be as close to the pre-test[1], in terms of structure and content, as possible.

(1) There was a slight modification in the post-test, for both groups, in the first two items (from 100 items). This modification was made for two reasons: firstly, to avoid a random guess (see Appendix C-4) and secondly to ensure that the students gave their own answers (see Appendix C-5).



1.5 The Education System in Kuwait

Education in Kuwait was started in rudimentary schools where a middle-aged man (muTawwaʕ) or woman who had a satisfactory knowledge of reading, writing and some arithmetic, worked as the main teacher. Such people contributed to the teaching process in Kuwait by opening their houses to teach the children of the community. The school system in Kuwait took a different form for boys and girls, the sexes being segregated, as indeed they still are. At that time boys were taught, by the muTawwaʕ, the recitation of the Koran in addition to writing and some basic mathematics. Girls, however, were only taught how to recite the Koran. Teaching the children how to recite the Koran in turn helped them to read and write Arabic. Also, basic methods of adding and subtracting were practiced. Because of the need to master the Arabic language and memorise the Koran, many Kuwaiti families sent children to those rudimentary schools. The Headmaster was the teacher, the organiser and the administrator of the school at the same time.

In 1910 the first state-funded boys' school was opened, while an organised girls' school was opened in 1936-37. Groups of distinguished merchants and responsible individuals in Kuwait responded positively to the request to improve the Kuwaiti educational system, which appeared in an article written and published by Sheikh Yousef bin Essa Al-Quinae, who was the distinguished leader of the education movement in the country at that time and the developer of the Muba:rakiyyah School. The money which was donated for the project was 77,500 rupees. The Muba:rakiyyah School was the first boys' school to lead the way to modern and organised education in Kuwait.

During the year 1920, the progressive educational leaders established another new school called Al-AHmadiyyah, and in 1921, it opened its doors to the public. Financial difficulties were the major problems affecting the Muba:rakiyya and Al-AHmadiyyah schools at that time, but after the discovery of oil, these difficulties disappeared.

After the discovery of oil in Kuwait in 1935, tremendous changes were made in education. In 1936 the Government levied a special tax for public education. The tax provided for a council to administer public education. This council was called the Department of Education; it was changed to the Ministry of Education in 1962, (Middle East Service, 1976, p. 10). In 1946,

the budget of the Department of Education did not exceed 30,000 dollars, and there were few schools, teachers and students. During the reign of his Highness Sheikh Abdulla Al-Sabah, who is considered to be the Father of culture and education in Kuwait, experts in education were invited from many countries to establish the foundations for new development. By 1954 there were 41 schools.

In 1974 there were 53 Kindergartens in the public sector, 116 primary schools and 38 secondary schools. This made a total of 265 general education schools. Vocational education was provided at 24 schools. These vocational schools included a secondary school for girls and commercial, industrial, religious, teacher-training and special training institutions.

Education has thus been considered the corner-stone of the renaissance and prosperity of the country. Hence the annual increase in the number of schools in the various educational stages which coincides with constant growth in the school population. In this way, each citizen receives an equal opportunity to learn, in order to contribute positively to the national development plans and become socially, culturally and economically productive.

It is no exaggeration to say that education in Kuwait has become a fine, and at the same time,

pioneering example, because it makes use of the most modern techniques in the realization of educational innovation and development, in so far as they suit original Arab values and principles, which constitute the basic foundation in bringing up the young people who will take over responsibility in the future.

1.5.1 Structure of the Education System

At present, there are four main school levels in Kuwait: kindergarten, primary, intermediate and secondary. The educational ladder is divided according to stages[2], 2-4-4-4 (for details see below). This system was adopted in 1954-1955 after a comprehensive evaluation of the educational system by Dr Akrawi and Ismail Kabani. They recommended that

> "All children should be given an opportunity of completing the primary and intermediate courses (eight years of schooling) as a step towards making this period of attendance compulsory." (UNESCO, World Survey of Education, 1961, V3, p. 772)

Their report has since been the basis for educational reorganization and development. Thus, in 1965 a law was issued by the Government adopting universal compulsory

(2) The Educational ladder:
First Stage lasts for 2 years.
Second Stage lasts for 4 years.
Third Stage lasts for 4 years.
Fourth Stage lasts for 4 years.

education for every Kuwaiti child up to the age of 16 which covers the kindergarten, elementary and intermediate levels.

First Stage: Kindergarten (age 4-6 years)

The teaching staff at this level is restricted to females who have either graduated from the Women's Training Institute or who possess equivalent diplomas. At the kindergarten level children have 30 periods, each about 45 minutes long, per week. Their academic curriculum at this level consists of: Islamic studies, Arabic language, library, arithmetic, elementary science and hygiene, social science, art education, physical education, musical education and extra-curricular activities. (Ministry of Education, 1978, pp. 1-6)

Second Stage: Elementary (age 6-9 years)

This stage starts at the age of six and lasts for four years. The main goals of primary education are to help the child to familiarise himself with his wider environment, teach him to read, write and calculate; provide him with the general knowledge he needs to prepare him for the next stage of education: and finally to help him develop spiritually and normally through

appropriate religious and ethical instruction. (Ministry of Education, 1974, p. 10)

Education at this stage is not co-educational and, in general, only teachers of the same sex as the pupils are to be found. There are, however, also a number of boys' schools (18 schools in 1984) where the teaching and administrative staff are female. These primary schools have the first four classes only. Such schools are experimental and aim to find out how appropriate it is to have boys taught by female teachers.

Promotion from one class to another in the first two years of primary school is based on regular attendance, daily class work and teachers' and head teachers' opinions. In the second two years it is based on (a) the mid and final semester examinations; (b) monthly tests and (c) daily classwork. The students who successfully complete primary education are promoted to Intermediate education.

Third Stage: Intermediate (age 10-14 years)

Intermediate education consists of four years of course work and is a continuation of elementary

education. The aims of the intermediate school are :

- developing the student mentally, physically, morally, socially and providing him with the basic culture required to be a good citizen.

- providing necessary studies and aids to explore and develop the student's abilities and talents, and to prepare him for life or for Secondary education with its various streams.

- helping the student to acquire good habits, skills and attitudes for self-learning and to develop his talents and abilities independently.

- developing values and attitudes towards work and respect for manual labour, and instilling an appreciation for hand-crafts.

The curriculum includes more new and detailed knowledge in the subjects taught, for example, girls have an additional curriculum of feminine education and the boys have practical studies. At the intermediate level all students are required to take English as a second language. (Ministry of Education, 1978, pp. 1-6) (see Appendix A)

Fourth Stage: Secondary

There are two categories for secondary education:-

(a) General education

(b) Specialised education

The general secondary school entails four years of study. It is open to intermediate school graduates only. General courses are taken in the ninth (15 years old) and tenth (16 years old) grades by all students. After that, they are required to choose either the literary or the scientific section of the curriculum. In both these sections students are prepared for higher education. "The textbooks in every field of knowledge are reviewed by a Professor from Kuwait University, particularly for grade twelve." (Al-Ahmad, A., 1978. p. 8)

In the literary section the eleventh and twelfth grade students take a specialised course in Arabic literature , English literature, history, geography, economics, philosophy and French Language as a second foreign language. In the scientific section the students study mathematics, physics, chemistry, biology with basic requirements of Arabic language, Islamic studies and English as a second language. (Ministry of Education, 1978, p. 41)

1.5.2 Technical Education in Kuwait

The growth of technical education in Kuwait has been slow; the only formal technical education provided in Kuwait prior to World War II was concerned with shipbuilding. This technical education was apprentice oriented. Learning occurred through observation and on-the-job training. Some blacksmith's skills were also included in this apprenticeship programme since blacksmiths fabricated many of the accessories for the shipbuilding industry.

In 1951, the officials of the Kuwait Oil Company Ltd, a joint British and Kuwait company, established a training centre to teach trades. With the opening of the Technical High School of Kuwait in 1954, the Kuwait Oil Company closed its centre and began to employ graduates of the Technical High School.

The curriculum and administration of the Technical High School was patterned on an Egyptian technical high school. The physical facilities included an administration building, thirty classrooms, six drafting laboratories and eight chemistry laboratories. In addition, laboratories for the following were included: woodworking, building construction, auto-mechanics, metalworking, electricity, electronics and foundry. (Ministry of Education, 1969, p. 31)

During the 1968-69 school year the Kuwait Ministry of Education requested that the United Nations Educational Scientific and Cultural Organisation (UNESCO) help develop a new curriculum for the Technical High School. A team of UNESCO experts came to Kuwait and helped in organising and developing a new curriculum replacing the original Egyptian model in use since the 1950's. Moreover, laboratories were remodelled and modern equipment was installed.

Today, with technological development and the explosion of information, there has been a corresponding increase in what is to be learnt in every aspect of our modern life. Schools are no longer capable of performing such new tasks without seeking the help of other media. New sources such as television, satellites and computers have entered the scene. Teaching and learning situations have now to be reorganised in order to make use of research findings in various fields of knowledge in as far as their materials, equipment, techniques and facilities will permit. This has given rise to the new concept of educational technology, which basically implies the utilisation of science and technology in the art of teaching.

In the light of a theoretical and practical study of the role of educational technology in Kuwait, one educationalist stated that :-

"instructional equipment and materials are available at varying rates in schools. Their use also varies from one subject to another, and from one instructional aid to another. Satisfaction with availability and use of equipment and materials varies from above average to very low, depending on various subjects. One of the main difficulties facing teachers in the use of instructional technology is the lack of sufficient knowledge of how to use and maintain equipment and materials. Another difficulty lies in the lack of sufficient time to use them. Most demands emphasised the need for the provision of sufficient materials and equipment for various subjects, and training of teachers and other staff in the production and use of instructional technology." (Al-Ahmad, A., 1986, p. 68)

CHAPTER 2

2.0 Using The Microcomputer in Teaching Languages

2.1 Introduction

The following chapter will mainly present the situation of the application of computers in teaching language in general, and attempts to describe the importance of such application in our real practical world.

The chapter will stress the importance of the computer application in language learning and seek to explain why computers are not widely applied in Arabic language learning as an educational technological investment.

2.2 Background

Computers are being used more and more in all spheres. One of the recent applications is in the educational field. Education has become one of the most important fields in the progress towards prosperity. Education has come to be described as a building block of society.

The evolution of this application of the computer in teaching and learning did not simply appear suddenly, it has evolved over a period of time. This development in Computer Assisted Language Learning, "CALL", can be traced back to the early 1960's (Davies, G.,1985, p. 8), to the "PLATO" project, a large system developed at the University of Illinois, and the computer-based foreign language-teaching project at Stanford University, which led the way in the evaluation of "CALL", which "involves the use of the computer as a tutor by presenting textual material and asking questions about it, as an electronic sketch-pad to encourage experimentation with language, or simply as a partner in linguistic games." (Davies, G., 1985, p. 8). In addition, there has been a considerable degree of unrelated activity in "CALL" over the last few years.

The following projects are some of the examples of computer applications in the educational field which have been mentioned above.

2.3 The Stanford Project

During the 1960's Van Campen, from the Slavonic language department at Stanford, designed a computer-based self instructional Russian programme where most of the teaching material was on the computer. " The students were asked to type answers to questions put in Russian, to inflect words and to perform various types

of transformation exercises." It is interesting to reveal that those students who used the computer-based material in this project "scored better than those who were taught conventionally." (Ahmed,K; Corbett,G; Rogers,M; & Sussex,R. 1985. p. 27). The Van Campen introductory Russian course was later the basis of further computer-based courses. A great amount of different material was developed for various languages such as Bulgarian, Russian and English.

2.4 The "Plato" Project

Another pioneering project in computer-based education is the Programmed Logic for Automated Teaching Operations (PLATO) system, which was developed at the University of Illinois, in order to serve the needs of computer-based education across the range of disciplines taught at a conventional University.

The aim of the Plato project was to teach students to translate written Russian into English, by taking three main components: (a) vocabulary drill (b) brief grammar explanations and drills and (c) translation tests at intervals, concluded by a final translation test, which measured the students' comprehension of written Russian.

During the 1970's the Plato system made considerable progress, by covering a range of languages including Chinese, English, Esperanto, French, German, Hindi, Latin, Modern Greek, Norwegian, Russian and Swedish.

In addition to the wide range of usage of the Plato system, it has managed to keep up with State-of-the-Art computer technology; for example, it was given an interactive facility, accessed by VDU's. In the early 1970's, a sophisticated graphical and text display was also introduced into the system, which allowed the language teachers to generate complicated graphics and to display text in a variety of non-Roman scripts.

Another aspect of the Plato system is the other programming language called Tutor, (see below, Chapter 2, Authoring Languages 2.7), which allows the teacher to produce a tutorial drill or other type of exercise. In addition the Tutor language helps to formulate and lay out the text to be displayed.

The teacher in general can highlight, underline and paginate the text, box specific items, and so on. However, as a result of these technological advantages, the Plato system is also extremely expensive. (Ahmed.K,and others 1985 and Last.R, 1984). Thus, the developments of CALL are complex; several projects like Plato, Stanford and others are considered the mainstream

of such developments, all of which have made a significant contribution to the educational field.

2.5 How can Computers be used in Instruction ?

There are five general ways that computers may be used in instruction to develop a fairly good system:

1. drill and practice
2. data generation
3. simulation
4. gaming
5. the use of the computer as a tool

Each of these has its own place in education, and none can displace any of the others. Also, each of these methods can be applied with varying ease and success using a computer as the medium of delivery. These approaches have been described in greater detail by Castellan,Jr. (1983, pp. 270-279) & (1986, pp. 251-256).

Drill and Practice

Drill and practice is one of the earliest techniques of computer-based instruction. For some basic skills, drill and practice can be a fruitful way to learn. The computer should be presented "as a

flexible classroom aid, which can be used by teachers and learners, in and out of class, in a variety of ways and a variety of purposes." (Jones,C & Fortescue, 1987, p. 5)

"The use of personal computers in schools is seen as relevant to the question of motivation. Students gain increased control over their educational experience, with the added benefit that development of computer programs can have a significant game element." (Simon, G.L, 1980 p. 136)

Although it is often maligned, especially by those who would like to see more esoteric uses made of computers, research in cognitive psychology has shown that expertise in any field comes only after a person acquires certain basic skills at such a level that they become automatic. "Moreover, research on experts has shown that a critical prerequisite for expertise is a large body of facts which can be recalled and organised easily." (Reed, S.K., 1982). In order to learn and understand different subjects, one must attain certain prerequisite skills that must become automatic. "For such skills, computer-based drill and practice systems, properly designed, provide an ideal way to learn." (Atkinson, R.C. , 1972, pp. 124-129)

Data Generation

In many disciplines from anthropology to sociology, political science, statistics and even physics, it is often desirable to have students analyse data in order to better understand the procedures and concepts involved. For example, in learning sociological research methods, it is desirable for students to test their understanding of basic concepts by analysing and interpreting data. Traditionally, this has been done with relatively small data sets that may be included in a text.

Using computers, students are able to sample a wider range of data than can be produced by conventional methods. Moreover, the data may be more realistic in that the constraints often imposed on artificial data are not present.

There are other advantages as well. If a student is having difficulty with a concept or procedure, in most traditional learning situations, he or she must analyse the same data again and again. While this may have some pedagogical value, at the same time it is desirable to have other data available for analysis to ensure that the student understands and can generalise to new and different problems.

Another characteristic of the generation of computer-based data is that these need not consist of factual data. If the phenomenon is known to follow some model - such as a linear model- then the model itself may be used to generate samples of data for analysis. This technique has become especially popular in the behavioural and social sciences where the cost of laboratory data is high.

Simulation

Simulators in many ways resemble the data generators described above. However, the similarity is superficial at best. In data generators, it is obvious to everyone - including the student - that the computer (or other device) is providing only a sample. The data are not expected to be realistic, and the computer is analogous to a data archive or data bank which is questioned by the student.

In simulation, the student interacts with the computer to help produce the outcome. An example would be in the psychology of learning courses; students study the various cognitive phenomena associated with learning. While textbooks may contain summaries of experimental results, in a simulation the student may serve as a subject in an experiment designed to

demonstrate the phenomena being studied in the course. While such quasi-experiments are no substitute for laboratory research, when properly designed they are able to give the student a greater understanding of the relevant concepts.

Gaming

In teaching concepts in many areas, computer games may be used to teach higher-order skills, "In fact, the value of a computer adventure game lies essentially in its use as a stimulus - for discussion, for planning, for later narration." (Jones.C & Fortescue,S. 1987. p. 74). The choice of the term game for such programs, while apt, is unfortunate, because of the negative connections which many people apply to them. Sometimes we can teach concepts and skills by participating in games which are analogues of the context in which the skill, once learned, is to be applied. "Although many computer-based instructional games have been developed, only very recently have researchers begun to study them seriously." (White, B.Y., 1984, pp. 69-108)

By using a game which is interesting to the student, it is possible to have a student specify several dozen equations and plot them within an hour. This should be contrasted with the very small number of plots which could be done "by hand" during the same period. Also, considerable research has shown that

information is learned more easily if it is acquired in a meaningful context in which the learner is actively involved. (Bower, G.H., 1970, pp. 18-46 & Bransford, J.D. and Johnson, M.K. , 1973, p. 54)

Use of the Computer as a Tool

Each of the illustrations of the use of computers in instruction given above is predicated upon having special purpose software available to meet a particular instructional goal. There is another use of computers in instruction which may be more important than any of the others and that is the use of the computer as a tool. Scientists, engineers, accountants, businessmen, teachers and other professionals use computers daily in their work. A report in The Mathematical Sciences Curriculum K-12, (1982), stated that "it is becoming more common for teachers to expect students to use computers as a tool in their courses". Simons, G.L. (1980, p. 138) in his book The Uses of Microprocessors, stated that "It had been found that students taught with a computer performed as well or better than those in comparison groups, and that they may learn two or three times as quickly, with lower failure rates and expressed satisfaction with CAI techniques."

For example, in the Mechanical Engineering Department of a leading American University, students receive (with their textbook) a software package called

"T/K Solver" which includes "coded algorithms for most of the functions and formulas used in the subject. Thus the student not only learns the substantive skills of mechanical engineering, but also obtains a tool which can be used as a reference, much like the engineering handbooks of a generation ago." (Castellan Jr., N.J., 1987, pp. 39-48)

A lot of software which is used as a work tool has "a game-like element, which allows learners to compete against each other, against their own 'previous best score', or against the computer." (Jones, C. & Fortescue, S., 1987, p. 6)

2.6 The Microcomputer in Modern Languages

The language teaching profession has always shown a curious weakness for leaping on bandwagons, whether they have involved the very latest and most "scientific" teaching method or simply the newest technological gadget. The following are a few typical claims for the latest electronic aid:

> "This technology will revolutionize the teaching of foreign languages; it will bring pedagogy up to date with technology". (Last, R., 1984, p. 20)

"Finally we have a means for true individualized practice: one-on-one, self-paced without need for supervision. Students can practice what they want, whenever they want, for as long as they want.

These devices will do all the things the teacher has neither the time nor the inclination to do; at last we can take drill out of the classroom." (Last, R., 1984, p. 21)

That was twenty years ago, when the latest fad was the audio language lab, not the computer. But note the remarkable similarity in the claims being made today for computer-assisted language instruction. So strong is the sensation of déjà vu that it would probably be instructive to reflect on the language lab experience to see if there is not a lesson there.

There are four language skills associated with learning the Arabic language, these are; listening, speaking, reading and writing. Microcomputer use and related activities can assist with the development of all four language skills. Most activities in the classroom are multi-skilled, but the skills may be looked at separately in order to show the contribution the computer can make. The microcomputer has infinite patience and can take pupils through work over and over again until mastery is achieved. The microcomputer presents the information, sets the questions and gives

the feedback. In small doses, with well motivated pupils, they have their uses, if they have good software facilities for sound and visual stimulation.

All pupils must be trained to be able to use computers. They should have "hands on experience" of using a microcomputer. That experience will be extremely helpful for relevant programs if it is obtained through practice. Most of the pupils are familiar with high technology systems through video and computer games. Their attention is attracted by movement and animation, reinforced by their interaction in the process.

The potential function of the microcomputer in the acquisition of the four language skills may be briefly examined.

Listening

Computer software is very limited in this area, and "Dalek" type speech is not easy to decipher. However, there has been some development work done in this field using a computer-controlled cassette recorder. This device allows learners to make a response to the computer, based on what they have been listening to. The computer can then react by moving on or replaying the taped materials.

Speaking

Computer-generated speech is as yet unsatisfactory for teaching proper pronunciation and intonation.

Reading

The computer has a major role to play in assisting with the development of reading, by using Cloze procedure, gist extraction and detailed reading comprehension.

Writing

This is helped when pupils' responses are guided and checked, with varying degrees of sophistication, by the program. Word-processing allows teachers to demonstrate to pupils the value of drafting and re-drafting work.

Good computer programs can generate language activity in all four modes. If the program is properly followed up, it will complement exciting communicative class work and be integrated into it. "At no previous time has it been possible to create learning resources so responsive and interesting or to give such free play to the student's initiative as we may now." (Nelson 1970, p. 30)

2.7 Authoring Package System[3]

The first generation of computer users produced their educational programs by using assembly language, but after a while, alternative forms of computer languages, "High Level Languages", were used for educational purposes, such as Fortran, Pascal, Basic and C. After that, the idea of producing a special language such as Pilot, Microtext and Topclass, which are authoring systems for educational programs, arose; these save a lot of programming time and effort and are very efficient. They are also easy to use without going through complicated language programming. In this case, the programmer does not require a great deal of knowledge of computer programming. It is the opinion of Davies, G. and Higgins, J. that "the most efficient way in which an educational institution can build up a reasonable software library is by using a range of authoring packages or, for the more ambitious, an author language." (Davies, G. and Higgins, J., 1985, p. 58)

> "In contrast, industry has been using authoring systems to develop courseware which can facilitate the development of materials. In the form of

(3)"The difference between author languages and packages which are authoring systems or teachers' kits is a bit like the difference between a set of carpentry tools and the blueprint for a chair: although the tools were designed for a particular type of work, their possible range of application remains enormous. The blueprint, on the other hand, is much more restricting: you can vary the type of wood to be used, the colour, or possibly even the overall dimensions, but the end result will always be a chair." (Kenning & Kenning, 1983, p. 13)

suites of programs, they include text and graphics editors to create frames, compiled languages that have been developed specially for routing and answer handling, plus numerous utilities to facilitate the development process." (Barker & Yeates, 1985, p. 37)

It rapidly became clear that there were two major types of language from which one could choose to develop one's own software. They are:

a. Authoring languages
b. Programming languages

a. Authoring Languages

These languages have their origin in the days when computer languages were much more difficult to use. The authoring language shielded the user from the complex of the primitive languages, allowing him/her to concentrate on the educational content of the program. Davies, G. and Higgins, J. believe that the essential difference between an authoring language and an authoring package is that "an authoring package opens the door to do-it-yourself software, shielding the user from the complexities of the logic of programming and offering a simple framework into which the CALL material can be slotted." (Davies, G. & Higgins, J. 1985, p. 56) and (Davies, G. 1984, p. 39)

Authoring provides teachers with an easy non-technical way of writing lessons, and thus creating CALL material that is suitable in level and content for their students. The data is written by using a special "writer" program which gives the teacher simple instructions to follow. (see below) "An author language is a computer language which has been developed with the specific aim of facilitating a certain range of applications; in other words, it is a purpose-built programming language for the non-specialist programmer." (Kenning & Kenning, 1983, p. 12)

There are two ways in which authoring languages can be used, both of which are supposed to be easier than writing in conventional computing languages (high-level programming languages).

1. The authoring language can be used in what may be termed "create" mode. This means that the user of the CAL material is presented with a series of questions or commands by a "create" program and constructs the CAL program automatically. "The teacher sits at the keyboard and simply answers the computer's questions as they appear on the screen: how many items does the teacher want to exercise, how are they to be sequenced, what explanations are to be provided, how many tries is the pupil to be allowed, what are the items, what are the correct

answers, etc?" (Kenning & Kenning, 1983, p. 11). These questions and commands usually come in forms such as :

a) "Would you like to have a title page?"
"Please enter the title"
"Are you sure this is as you wish it to be?"

b)

Computer	:	What would you like to call your test ?
Teacher	:	Opposites
Computer	:	How many questions do you want to ask ?
Teacher	:	12
Computer	:	Please enter your general question.
Teacher	:	What is the opposite of .....
Computer	:	Enter question ending number 1.
Teacher	:	high
Computer	:	Enter answer number 1.
Teacher	:	low
Computer	:	Enter question ending number 2.
Teacher	:	expensive
Computer	:	Enter answer number 2.
Teacher	:	cheap
Computer	:	.....etc.

2. The second way of using an authoring language is to allow the user to write the tutorial by using an

"Editor". This editor is a program which allows the user to enter a series of instructions to the computer, which then forms the tutorial. "Many programs running on the now legendary PLATO system have been created by professional programmers using an author language known as TUTOR." (Davies, G. & Higgins, J. , 1985, p. 58)

b. Programming Languages

Conventional computing languages (high level languages) are those such as Pascal and Basic. These languages only allow the user to write in the editor mode. Some microcomputers contain a high level program language interpreter stored in a ROM chip (Read Only Memory) (see Interpreter in Glossary).

The user of a high level language e.g. Basic, will have to spend some time learning to program. This is inescapable, but then it is necessary in whichever type of language (authoring or otherwise) is chosen. It is also true that learning a programming language will take longer than learning an authoring language. Davies and Higgins state in Using Computers in Language Learning that "It has been estimated that it takes a proficient programmer at least 100 hours to create a robust, user-friendly program which will keep the learner busy for one hour. Some programmers would consider this figure far too optimistic; estimates of 300 programming hours

to one learning hour are often quoted.". "Software for CAL is expensive: a one-hour teaching program can take several hundred hours to prepare." (Simons, G.L. 1980 p. 142) This is due to the command availability in the conventional languages; authoring languages have 30-50 commands whereas conventional languages have 120-160 commands.(see Appendices F-1 & F-2)

Both of these languages use the Procedure System in which the user can write his/her own instructions for the languages. Authoring languages boast that they have specific commands for the production of CAL packages, which are lacking in conventional languages. However, in a conventional language it is perfectly easy to write these specific commands, "The attractiveness of BASIC to many microcomputer users has encouraged the development of BASIC-related languages for CAL and other educational purposes." (Simons G. L. 1980, p. 139) As an example, several authoring languages have Structure-like commands[4]. This allows the CAL package to examine a student's input in response to a question and acknowledge the input as correct. This is not a normal command found in a conventional language. However, it is possible to build up a procedure in a conventional language which performs exactly the same task as the authoring language command, then to use this procedure just as if it were a command. In BASIC this procedure might take the following form :

(4)Commands which examine the structure of the responses.

```
10   Print "Ahmed is eating an apple."
20    Print "find the verb and type the past tense
     in the blank." :  "Ahmed .......an apple"
30   Input A$
40   If A$="ate" then goto 90
50   Print "incorrect"
60   For I=1 to 1000 : Next I
70   Print "the correct answer is ate"
80   Goto 100
90   Print "you are a clever boy"
100  End
```

The output of the same procedure in PASCAL might take the following form:

```
Program   Test;
Const     No of letter=3
Var
Verb=Array {1..no of letters};
Begin {Test}
Write_in ("Ahmed is eating an apple");
Write_in ("find the verb and type the
           past tense in the blank");
Write_in ("Ahmed ....... an apple");
Read LN (verb);
IF verb=Ate Then
   Write_in ("Well Done");
Else
```

```
        Write_in ("Sorry, wrong answer...");
    End . {Test}
```

Authoring programs enable you to create your own software. They are content free programs. Using an authoring program you can enter and save your own texts and materials. These are then manipulated by the program for teaching and testing purposes. All sorts of computer assisted language learning routines can be created, e.g. transformation and substitution exercises, gap-filling, multiple-choice, Cloze and reading exercises.

Authoring programs are designed for simplicity of use, to enable the non-programmer to produce software for specific purposes without having to learn a computer language. "An authoring package designed specifically for creating CALL software enables the non-programmer to create usable material for his or her students exceptionally quickly." (Davies, G. and Higgins, J., 1985, p. 58) The best of them are very "user friendly", having clear instructions on the screen to take you through the process of typing in your text. Good documentation is provided with most of the packages.

The largest programming revolution in CALL in recent years has been the use of authoring systems for producing educational programs and the challenge to make

the computer easy to operate. This may be described as a Menu Driven System, the obvious goals being to avoid the necessity of programming skills.

The Disadvantages of the Authoring Packages

Although the authoring packages play a splendid role in developing CALL software, they have disadvantages:

1. They can be restrictive and result in rather unimaginative courseware. "The user is saddled with the framework set up by the creator of the authoring package, and although the CALL material itself can be infinitely varied, the form of presentation tends to become monotonous. For example it is difficult, though not impossible, to produce interesting screen displays with moving text or graphics." (Davies, G., 1984, p. 15). A similar view is expressed by Kenning, J. & Kenning, M. in An Introduction to Computer Assisted Language Teaching (1983, p. 10), who suggest that teachers who are using the Authoring System will still be restricted to specifying parameters and will still be dependent upon the preconceptions of the designer of the system.

2. They are often lacking in many of the control structures which are available in conventional languages such as BASIC and PASCAL. These control structures are statements such as If.... Then.... Goto.... Else...., or If.... Then.... Gosub.... Return. They allow the programmer to control the flow of the program. Their absence from authoring languages means that complex interactions are impossible to build into the CAL package.

3. Most of the packages contain demonstration texts. Unfortunately, these are often very poor and do not give a good indication of the program's potential. Black (1987) states that "much of CAL's origins in programmed learning are reflected in packages that are primarily drill and practice with immediate feedback, while its connections with high-level language programming show up in mathematically-based simulations. All too often, a schools-based courseware package will employ a single delivery mode, which can attract user criticism that it becomes boring after an extended period of use. One possible cause of this is that much courseware has been developed by individuals using high-level languages like Basic, who are either

programmers with limited educational experience or teachers with limited programming skills." (Black, T.R., 1987, pp. 204-205)

4. All the authoring packages come in a completed form which does not give the user the chance to control the package or vice versa. "They are less versatile [see Appendix F]. In addition, like authoring systems, they are less widely available, being often tied to a particular [hardware] system." (Kenning & Kenning, 1983, p. 13)

5. They occupy a lot of the system's memory, for example, the A.G.V.S.S. occupies more than 1.5 Megabytes, the average size of each text screen being 3K and each graphic screen 25K, regardless of whether the screen is filled or not.(see Appendices E.1,2 & 3)

2.8 Computer Applications in Teaching Languages

In this section, some of the computer applications in teaching languages, throughout the world, will be briefly examined.

2.8.1 Computers in English Language Teaching

There have been many computer applications in the field of English language teaching. The following are examples:

An article from "Journal Announcement" 1976, describes a computer project which aimed to provide the school district of Lancaster (Pennsylvania) with an in-service programme for teachers in bilingual education and to develop a computer assisted bilingual education teacher training programme.

In addition to providing in-service training, these workshops collected and experimented with material for the computer - assisted bilingual education teacher training program (CAI). A two week summer workshop was also held for about 20 participants for two reasons:

(1) To review and assist with development of the CAI program.
(2) To participate in seminars.

It is worth noting that CAI offers mutual benefits for the students and teachers for instruction. CAI can provide language teachers and students with a tool for individualised instruction, with immediate feedback and interaction which requires active involvement from the individual student.

Recently, however, it was thought beneficial that CAI should be integrated with another system, CMI, to make the teaching/learning process more effective and efficient. This combined system called the CAI/CMI, is directed towards the establishment of automatic multimedia language classrooms, together with the computer, as a combined unit, for better services.

Knowles, who in 1986 surveyed the uses made of computers in the teaching of English phonetics at Lancaster, stated in his paper The role of the Computer in the teaching of phonetics that there are several reasons for the use of microcomputers in teaching phonetics, firstly, "innovation and increased efficiency are essential if phonetics is to maintain its position in linguistics and language teaching. A more positive reason is that the subject can be taught more effectively with a computer than without. A third reason is that it is actually jolly good fun, and makes teaching more enjoyable and more interesting than it was before." (Knowles, G., 1986, pp. 133-148)

Imlah, W.G. and Du Boulay, J.B.H. have discussed in their article Robust Natural Language Parsing in Computer Assisted Language Instruction (1985, pp. 137-147) the role of robustness in programs for computer assisted instruction which attempts to parse natural language input. A program has been implemented which checks for certain grammatical errors in French sentences entered by a student. The article described the work as an attempt to build a program which can trap and comment on grammatical errors such as subject/verb disagreement by a purely syntactic analysis, i.e. without recourse to word meanings. The aim is to increase the educational effectiveness and reduce the number of separate stored answers required in programs for checking translation.

The article went on to describe a program FROG (French RObust Grammar checker) where the student interacts with the program by typing in an arbitrary French sentence. The program responds by checking the sentence for certain grammatical errors and reports them to the student.

2.8.2 Computers in French language teaching

There have also been many different computer applications for French language teaching :

In March 1982, The French Socialist Government opened one of the most distinctive computing centres in the world. "One of the projects chosen for a pilot demonstration was a video-disc approach to teaching French to native English speakers by using existing motion picture sequences, still images, and audio. In addition, a demonstration video-disc has been developed." (Eastmond, J.N. and Mosenthal, R., 1984, pp. 8-12)

Some of the unique features include:-

(1) Learning control of instruction by a hand-held mouse or touch sensitive screen.
(2) Extensive cultural interaction in a veritable linguistic forum.
(3) An elaboration of word meaning, portrayed for selected key words.

Some social commentators have given their opinions on the new technology such as Alvin Toeffer from the U.S.A., Christopher Evans from the U.K., and Jean-Jacques Servan-Schreiber from France that computers hold the key to the world's future, "if well used, this technology can provide leverage for human brainpower, can employ to full capacity the potential of humans from all parts of the globe and can eliminate much of the

drudgery and routine long associated with human life. If used negatively, this new technology can build our already extensive capability to annihilate the human race, and short of that, can wreak havoc with the world's economics and with the personal lives of millions of workers replaced by automation." (Eastmond and Mosenthal, 1984, pp. 8-12)

Another article has been written by Decker W Henry from the University of California featuring the Computer-Aided Instruction in French Syntax Project which could be applied to the teaching of a foreign language. Decker was convinced that interesting programs for instruction in grammar "must be able to deal with syntactic problems" (Decker 1976, pp. 263-267) This project has two goals. The first of the two goals for the project was to explore techniques uniquely required for writing programs on French syntax, on the assumption that the first-year course (as far as grammar is concerned) is a course in how to make sentences in French. The second goal relates to justification of the use of computer programs in such a course.

A package called CLEF has been designed for the French student. The program aims to cover the essential vocabulary and structures of modern French language. In this program, after the student has selected one of the program options, the program usually begins by cffering an optional grammar review, followed by a routine check

that the learner is familiar with the vocabulary contained in the drills. If,however, the learner is confident about the vocabulary, then it is possible to skip the above routine and move directly to the Question/Answer dialogue which is the heart of the program. (Davies & Higgins , 1985 p 36 & p60)

One good example in the use of computers in teaching languages is self teaching computer software (LANGUAGE STUDY CENTRE) presented at the University of Illinois by Hart, S.R. and Garrett, N.. The software consists of drills, tests, learning games, and tutorials. It comes with twelve lessons, four each in German, French and Spanish. The program contains both matching and completion drills and tests. In these sections students are allowed to review material in a tutorial format, work through a drill, or take a test. This software has been described by the authors as "easy to use". Instructions are clear on the screen throughout the program, and a user's questions are addressed in a special "Help" part of the program, "The documentation on this program is excellent." (Hart, S. R. and Garrett, N., 1985, pp.164-167)

In a paper presented at the International Conference on Computers and the Humanities (2^{nd}, Los Angeles, California, 3^{rd}-6^{th} April, 1975), a pilot program was described in an integrated media presentation of foreign languages and the production and

usage of seven computer-generated video tapes which demonstrated various aspects of French syntax. This instructional set forms the basis of CAI lessons in which the student is presented with images identical to those on the video tapes which have been tailored to his/her particular needs. A study of the logical concepts underlying transformations teaches the student how to transform sentences to alter emphasis or meaning, and shows the relationship between the transformation and the intonation of the spoken sentence. The student's goal is to understand the transformational process hence developing competence. The visual writing material was under computer control. The computer is used to write the terminal phrases on the screen in a pre-determined manner and with desirable timing. The blanked write mode permitted storing phrases in the terminal memory so that the entire phrase could be made to reappear instantly. The result of the informal student evaluations of this program revealed that the students found the course more interesting and easier than they expected, and that they believed the audio-visual presentation definitely aided their learning the necessary material.

A project, designed by M^{c}Ewan, Nelly, Robinson and Arthur, was presented as a report called "Computer-assisted Instruction In Secondary School French" (1976). This was a project called "FRAND", a computer-assisted instructional program based mainly on the "CAI"

program, as part of regular grade ten French instruction. The program, which was designed at the University of Alberta, was designed to teach French beginners to read and write. The program consisted of approximately one semester of introductory French instruction.

The subjects consisted of two classes of grade ten French students who used different texts during regular class hours, and who were bussed to the University during regular French periods for one and a half hours of CAI twice weekly for a period of 10 weeks. Results of achievement comparison tests between CAI and control groups indicate that the CAI students did not suffer in terms of prescribed school curriculum even though they spent up to 30 hours less time in its use than regular groups. A questionnaire designed to measure attitudes toward FRAND was administered to the students when they had completed the final achievement test. Attitudes in both experimental groups were very positive. Advantages of CAI include the individualised nature of the instruction, the immediate feedback given to each student and the necessity of mastery of given material before advancement to new material.

Another important recent report is entitled The Communication Computers; A CALL design project for elementary French, Kyle, P. J., (1985) was presented as a paper to the annual meeting of the Northeast

Conference on the Teaching of Foreign Language (32nd, New York,25th-28th).

A program called "Aux Jeux Olympiques" was designed to simulate an on-going situational dialogue between the French student and the Plato computer system. The program focuses on student understanding and use of comparative constructions, selected verbs and other linguistic forms in French, and provides communicative language practice.

The courseware is used in the first three semesters of college-level language instruction. The students' task is to describe simulated sports events, including French team trials, international eliminations and final rounds seen on the computer screen. The program occasionally provides a sports news recap of events with team rankings. Visual psychomotor and cognitive domains are exploited to enhance language learning, linguistic production is minimised so that even one-word responses have fixed forms, and no penalties are given for mis-spellings, grammatical errors or typing mistakes. Communicative feedback is given continually by using slightly more complex structures to reinforce or correct student responses and build reading comprehension from the outset. The use of this and other computer-assisted language learning units (CALL) has proven to be cost-effective, efficient and motivating for the students.

The disadvantages in the use of CALL arise from the restraints of the academic environment and of a developing technology. The current task is to use and improve the existing resources for CALL.

An article by Terry entitled "Students work with Monique and learn French" (1977, pp. 191-197), describes the use of computer aids in learning French grammar. He describes a computer-assisted program called "Monique"[5] which has been designed to help students learn French grammar (and to overcome the lack of motivation and interest of students who are enrolled in foreign language classes that are required for graduation), which offers a wide variety of optional accessible drills on various grammatical and cultural topics, is inexpensive to store and operate, and is varied and personalized.

2.8.3 Computers in German Language Teaching

Some other computer applications have also been designed for the German learning/teaching process. A report by Cornick entitled, Microcomputer Software for Teaching German, an evaluation, (1983) examined the

(5)Monique is not a native French-speaking aide or instructor, but rather the name given to a computer program for beginner and intermediate French students at the University of Richmond.

strengths and weaknesses of the following 12 microcomputer processes:-

1) Language Teacher Series TRS-80;
2) Language Teacher Series: Atari;
3) Apfeldeutsch;
4) Author I;
5) Dasher;
6) The Definite Article;
7) Flashcard;
8) German Packages I, II, and III;
9) German Vocabulary Builder;
10) The Linguist;
11) Micro-Deutsch;
12) Voice Recognition.

In this program, a development of software evaluation criteria was used, which as a result embodied an evaluation form addressed to 46 specific program features. The evaluation results presented, with commentary, for each of the 12 programs, focus on program features which involved content, support materials, presentation, stimulation of student interest and utilization of computer techniques. In addition, a general evaluation in the above areas is summarized first, together with a list of level system requirements, price and source.

Morrison, H.W. and Adams, E.N., in their article "Pilot study of a CAI Laboratory in German" (1968, pp. 279-287) describe a comparison study made between two introductory German Sections at the State University of New York, Stony Brook, one of which had a conventional language laboratory, and the other a computer-assisted instruction laboratory. Some of the selected features of the introductory German Course included:-

1) Computer-assisted instruction,
2) Programmed language laboratory manual,
3) Study guide,
4) Recitation sessions,
5) The "Guten Tag" television series,
6) A mini-course in linguistics.

The second session had the computerised technology which provides the advantage of immediate feedback for the students, regarding their speaking and listening skills and some other aspects that were not possible in the traditional language laboratory.

The interesting thing in the above study is that the student who had his study in the computerised laboratory gained significant knowledge and skills compared to the student who had his studies in the traditional laboratory, which meant that the computerised method of study had positive results compared to the traditional method of teaching/learning.

2.8.4 Computers in Spanish Language Learning

Again many computer applications exist for the Spanish teaching/learning process; the following is a summary of these.

Robinson, Gail and others, in their (1985, pp. 93-150) report entitled "Computer Assisted Instruction in Foreign Language Education, a comparison of the effectiveness of different methodologies and different forms of correction", give a comparison of the effectiveness of different ways of organising instructional materials and different strategies for error feedback. They used the computer as a research tool and took as subjects first year Junior High School students, who were randomly assigned to experimental and control groups. To investigate materials organisation, computer exercises were designed in Spanish to measure the effect on achievement of such factors as integrated context versus discrete items, personally meaningful material versus impersonal material, student choice of background content versus program choice, and the effect of the problem-solving activities on the acquisition of language skills.

To compare error feedback methods, the study considered the relative effectiveness of student-

controlled help versus program-controlled error correction, types of error repetition, and the role of student discovery in the error correction process. Post achievement test scores were consistently in favour of the experimental group. The findings, and their implications for the design of instructional materials, computer-assisted instruction and testing, are discussed. Appendices include questionnaires, materials, descriptions, sample achievement tests, student interest questionnaires, transcripts of taped interviews and programming strategies.

A study was carried out in 1979 concerning the Spanish language, which was investigated by Allen, J. R. (1979, pp. 125-128) in his article Two Routines for use in CAI language Programs. This study investigates the relative effectiveness of two teaching technologies, television and computers, as compared with traditional language laboratory instructional audiotapes in introductory Spanish. The dependent variables examined include the following: overall achievement level; reading, writing and grammatical skills; and improved speaking and listening skills, all as measured by tests of reading, writing, listening and speaking. The subjects were 144 introductory Spanish students divided into eight recitation groups. Half of these groups (control groups) were assigned to 40 minutes a week of audiotape laboratory; two were assigned to 40 minutes a

week of tele-lessons and two were assigned to 40 minutes a week of computer drills.

Other features of the course were the same as the standard introductory curriculum. Results indicate that the computer-assisted instruction method was clearly the most successful of three tested, but only in enhancing writing skills and not, by extension, other language skills. Use of the computer for a variety of skill development exercises is recommended only in combination with other instructional methods.

In addition to the above projects, other works exist in the Spanish Educational field, for example, Christensen and Rick Page's Software which was called "Episodios Elementales", consisting of a set of 24 reading passages in Spanish with additional activities for recognizing cognates. Furthermore, the software aimed to accomplish three sets of objectives:

1) To improve the ability to read Spanish;
2) To increase the student's repertoire of vocabulary;
3) To facilitate the use of oral Spanish. (Baltra, A., 1986, p. 432)

Another example is Professor Barrett's own program "Habla Español". This program consists of sample quizzes and grade calculations, which were generated by his Apple computer. This program helps Barrett to keep

up with the number of exercises his students practise at the computer, and also to record their highest score for each exercise.

The s2400 Program is also another computerised educational package, which aims to help students learn, review, and reinforce their knowledge of basic Spanish grammar. The computer itself contains the entire body of knowledge which will be taught, and presents it to the learner in a predetermined manner by an external instructor. (Smith Jr, P.D., 1976, pp. 182-190)

The following programs are some of the many available for the user:

(a) Gapkit (Camsoft): A useful program which allows the teacher to gap out any chosen element in the text (up to three pages long, 60 lines per page) and can disguise the length of any gap. Moreover, some clues may be given to the user with each gap if requested. This program gives pupils two attempts to fill each gap correctly. If the first attempt is incorrect a flashing cursor hangs over the gap where the error has occurred and the program asks him to try again. The program provides a printed-out exercise facility, if required.

(b) Choicemaster (WIDA): This program is for the production of multiple choice exercises. The program contains a Master disc, a User disc and a booklet. When writing the exercises the teacher can opt for 3,4 or 5 choices and also, if desired, include error messages to be shown upon each incorrect answer. This program is suitable for reading comprehension, sentence completion, vocabulary reinforcement, verb testing in context and many other situations for which the multiple choice format is appropriate.

(c) Clozemaster (WIDA): This program is designed to produce gap-filling exercises, but it has limited feedback since it can only recognize one correct answer for each gap. Clozemaster provides the same kind of facilities as its companion Choicemaster

(d) Matchmaster (WIDA): This program enables teachers to write a variety of matching exercises. Typical matching exercises include question and answer, synonyms, opposites, translation equivalents and missing words, phrases and part sentences.

2.8.5 Computers in Arabic Language Teaching

As the above illustration shows, many computer programmes have been used or applied in the field of language education throughout the world. Most of them were aimed to develop courses for a particular language through computer applications.

As for computers in Arabic language teaching, unfortunately there has been no wide application of such techniques in the Arab world, due to social, academic, economic, educational and other factors. In the past, Middle Eastern consumers have had to be content with electronics which were designed by the West for the West. These products, especially those connected with the field of personal computers, have, more often than not, been linguistically and culturally unsuitable for Arab users. "The Arabic market has become much more discerning, refusing to buy equipment which does not fully meet their requirements, one of which, one would have thought, was the ability of the computer in Arabic." (Darke, D., 1985, pp. 8-9).

This might explain a small part of the problem, for example, in a recent survey conducted in Kuwait concerning the application of computers in Arabic language learning in the high school, it was found that 67% of the respondents thought "It is difficult to use computers in Arabic language learning due to the

unavailability of a suitable computer program in Arabic script. 69% of the respondents agreed, however that there should be a wider application of computers in Arabic language learning." (Institute News, 1985, pp. 8-9) (see below Figure 1, p. 65)

There have been some commercial attempts to Arabise the computer in the public education field by some of the manufacturing and commercial institutions by producing Arabic programs; however these have not been appropriately oriented for several reasons: firstly, because the program contents and the design objective have not been designed for certain age groups, nor for certain levels of knowledge. This is a common problem in the design of computer instruction materials. "Linguistic content may cause levelling problems; lexis is often unusual and difficult in relation to structure and discourse." (Odell, A., 1986, pp. 61-77). In other words, Arabic programs have been produced to suit users who intend to test their Arabic Grammar background rather than to learn from the program. Secondly, there is not an interaction facility in these programs. The student's task, in this case, is to follow the computer's commands, such as "Press space bar", "Choose a number" or "Press return" and others, without letting him type a single letter onto the screen. Programs are therefore typically of the drill and practice type. (See above) Finally, their contents are not designed using educational teaching methods. The initial

The Application of Computers in Arabic Learning in High Schools

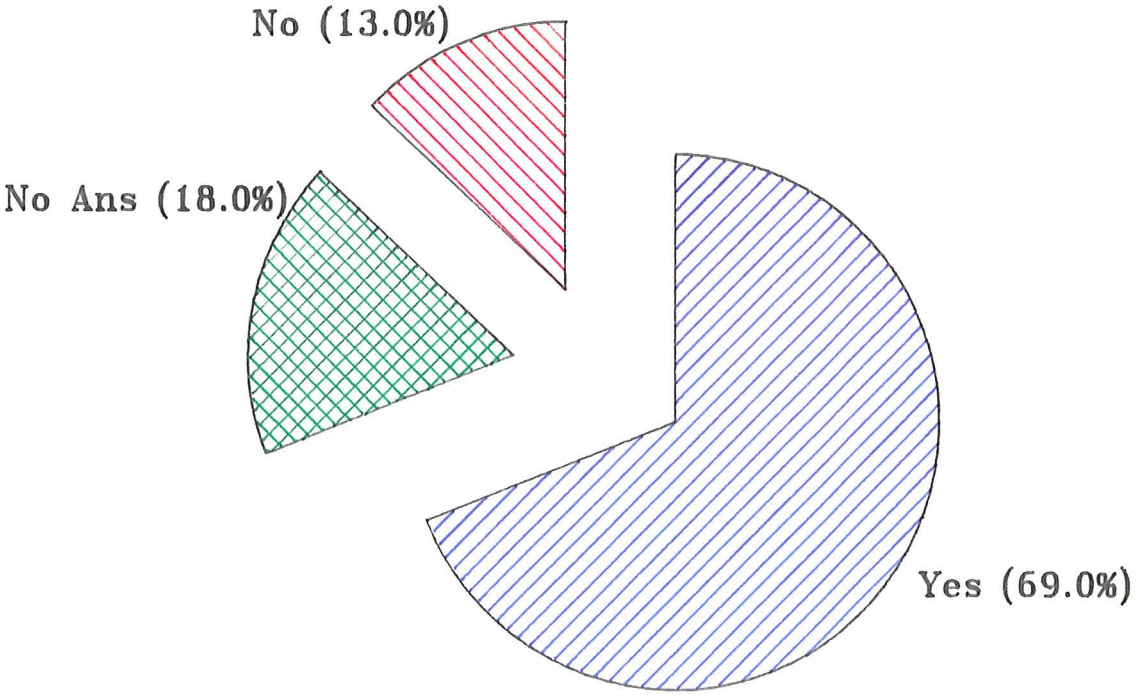


Figure 1

pedagogic system is intended to provide clearer guidelines for student needs, to suit his language needs, age and interests (see ibid pp. 61-77).

Various English-Arabic programs have been designed in order to enrich the Arabic software library, such as "IBN Malik" (produced and manufactured by Alalamyyah 1985), which aims to help learners in distinguishing Arabic parts of speech and developing their knowledge of grammar. In addition, it deals with verb/noun consistency, hence increasing the ability to express and expand Arabic vocabulary. (Alalamiah, 1985)

Another factor which may be related to the above situation described by Khurshid Ahmed, Orenville Corbett, Margaret Rodgers and Roland Sussex, in their book entitled Computers, Language Learning and Language, is the cost and the inconvenience of installing computers in the schools. In addition, there are also fears that the installation of computers would cancel out the role of the teacher in the classroom. Judd, W. A. in his article entitled "Computer-Assisted Instructional Problems and Prospects" (1971, p. 124), estimates the costs for developing an Arabic educational program to be around $13,000 , not counting the cost of evaluation of such a program. Thus he believes that to design and produce an Arabic educational course could cost a fortune.

Bikri Sa'd al-Haj further explores the problem in his article "The Computer knocks at the School Doors"(1984, pp. 68-75). He believes that textbooks must be printed in Arabic with a glossary of terms in Arabic and English. More research should be carried out on the possibility of designing a computer programming language using Arabic script.

It is clear from the above details, that there is room for greater and wider use of computers in the Arabic educational process. This view is developed in Chapter 4 (below).

If Arab Society is to advance and progress , Arabic must be used and adapted for computer use. Not only should computers be used for word processing functions but also in various functions of the society, one of the most important functions being Education.

2.8.6 The Arabic Authoring System "SAAD"

The Arabic Authoring System "SAAD" is bilingual - Arabic/English. It is the only such package for Arabic for MSX Computers. It has the same characteristics as other authoring systems, such as the M^{c}Graw-Hill Authority System, IBM Tutor. There is ease of use and no necessity for the programmer to be skilled; it contains various formats to help present the educational material, which covers most of the programmer's

requirements, from explanations to exercises. Moreover, it enables the lesson to be presented to the students whilst the system retains and analyses their results according to their answers. The SAAD system has been designed especially for the Arabic teacher to produce course programs and is divided into three principle programs:

1. The Authoring Program

   This enables the user to edit and enter the educational material in different formats, like explanation, exercise tests, graphics, simulation, sounds and music. (see below Chapter 3, 3.9 & 3.10)

2. The Presenter Program

   This program presents the lesson being entered by the authoring program and registers every student's results.

3. The Teacher Program

   This program, when developed, will gather all the students' results, update their files and analyse them.

2.9 Conclusion

> "Computer-Aided Learning (CAL) is based on the interaction between a student and a microcomputer, programmed with suitable teaching software." (Simons, G.L. , 1980, p. 141)

It is worthwhile mentioning that there are three areas of advantage in using the computer in language learning (Ahmed, K. and others, 1985, pp. 4-6). These are:

(a) The inherent advantages of the computer

Computers can handle a much wider range of activities more powerfully than any other technological instrument. Moreover the computer can offer interactive learning. In this case the computer can conduct a two way learning process with the student, unlike the textbook. In addition the computer can display messages, take the student through subsequent attempts at a question and also take the student to a different section of the package, depending mainly on the nature of the response. As for the human nature of the computer, the Authors believe that computers are quicker in terms of response, are unfailingly accurate and precise, do not tire or let their attention wander.

(b) Teacher

The second advantage in using computers in the learning process is that, unlike the textbook, computers can handle different kinds of material. Among them is the one-way presentation of information, in the form of text, graphics, audio and video. In addition the computer can also handle question and answer routines, simulated dialogues, hypothesis testing; it can choose questions in sequence or at random from the list of questions supplied by the teacher. As a result of the above various advantages, more time will be available for the creative and imaginative teaching interaction between teacher and student.

(c) Student

The third advantage that the Authors explain is related to the student. They believe that time flexibility allows the student to study a particular topic and decide how long to spend on it. Moreover, the computer can allow students to take courses or parts of courses at a distance, since many computers can be linked by telephone lines or special land-lines; or teachers can send tapes or discs related to their material through the mail. The learning process can also be more concentrated than the normal classroom sessions, since the student will have the exclusive attention of the computer. The student receives quick

reply and feedback from the computer, compared to that from the teacher.

As we mentioned before, computers sometimes can teach people more than textbooks which are based on words. The computer as a teaching resource can offer a number of various teaching processes. For example, Baker, P. and Yeates, H., in their book Introducing Computer Assisted Learning (1985, p. 25), explain some of the above advantages differently. They believe that computers can provide some interesting and useful facilities including:-

(1) Sound effects and analysis.
(2) Static and dynamic imagery through computer graphics.
(3) Text handling facilities.
(4) Control of external devices and of learning progress.
(5) A variety of data capture techniques.
(6) Facilities for data archiving, retrieval and dissemination.
(7) A means of achieving highly individualised instruction.
(8) A highly interactive learning environment.
(9) Facilities for pattern matching, computation and decision making.

Together they believe these basic facilities provide a wealth of resources from which to construct instructional material.

Moreover, experiments have proven that the student is attracted to, and able to respond to, the challenges of the computer. The student and the computer work together on a one-to-one basis, the computer fulfilling the needs of the individual student. Thus, the student benefits from the time and the individual tutoring of the computer.

Thus the computer has become an integral part of the Educational system. Consequently, Educational Authorities encourage the use of computers in schools.

Expert knowledge of computers is not required by teachers or students in order to make or follow a program. The student has only to follow the instructions displayed on the screen by the computer. Computer Aided Learning is dependent on the subject provided in the software. Thus the student interacts as follows:-

(1) The computer provides a Pre-test for the student, in order to check his background knowledge of the subject.

(2) Following this initial test, the computer tutors the student in several ways including a

question and answer program. When tutoring the computer takes certain factors into account, the age and ability of the student.

(3) Throughout the program, the computer makes random checks on the student's progress by asking him questions on the material covered so far. The computer is then able to ascertain the student's weak points by analysing his answers. If the student fails to understand a certain point, the computer either revises the material or moves on to another program.

(4) In conclusion, the computer is not a replacement for the teacher, it is merely a Learning Aid, helping the teacher in teaching language to the students. The computer reduces the work load of the teacher, thus giving him more time to allocate for individual student tuition.

CHAPTER 3

3.0 Methodology

3.1 Introduction

The present experiment involved in the first place, a computer-based exercise for reviewing the basics of Arabic Grammar. It then attempted to train the learner to highlight a word using an appropriate colour on the screen according to its grammatical function in a sentence. It was planned that this training would take a whole term. During this term, the student was to recognize the categories of A.G. such as mubtada', khabar, fa:ʔil, mafʔu:l bihi, fiʔl, and jarr wa-majru:r. Every stage had its own lessons and tests, taking its examples from the student's environment. (This is described more fully later in this chapter.)

At the same time, the computer could monitor the student's progress and store information about his progress, particularly his scores in exercises. It was possible, if desired, for a whole range of data about the student's presence and progress, in individual lessons or in the whole course, to be reported back to the teacher, either on the VDU screen or in hardcopy. All these functions, built in to the program, would be of great benefit to the teacher. The Arabic Authoring

Packages System (SAAD) can provide these monitoring facilities.

The information which could be reported was of two principal types:

1. Assessment data.

2. Error data.

1. The assessment data are essentially the student's scores, plus any relevant information about the attaining of the scores; for example, how many times a particular student attempted the package, how long the session(s) lasted, and so on.

2. The error data cover the errors the student makes, together with background information such as questions answered incorrectly even at a second attempt, questions where the time limit was exceeded, and so on. This information is some of the most important which the teacher registers in everyday classroom teaching.

Two or three screens were desirable to display, to the teacher, all the students' names and their progress in one exam or exercise, as a report-back data system for the teacher.

Data could, of course, be presented in a different lay-out according to the teacher's requirements. In addition to the information about the student's progress, monitoring could also present the teacher with information about the errors students made along the way.

There were two main kinds of error data:

1. Anticipated or "trapped" wrong answers which the teacher has specifically anticipated and singled out for comment, remedial treatment and possible re-sitting by the student. It is helpful to have a record of trapped errors which have indeed been made by students, to check whether the teacher has anticipated correctly.

2. A record of untrapped wrong answers is also very useful. It is here that the teacher will identify oversights or unclear points in the formulation of questions, as well as cases where the student simply does not understand. If the untrapped wrong answers are very systematic, or show a preference for certain types of error in the trapped answer specification it is necessary to give the student the most positive and useful help as early as possible. The error data may also be useful for research in language learning.

There are, then, two fundamental ways in which the reporting of the data can be organised. One is orientated towards the student (assessment), and the other towards the lesson (evaluation). Collection of error data may help the teacher to spot an individual student's problems, as well as to identify the most frequently occurring error types. But there is a real ethical problem as well as a pragmatic problem here. Students are sufficiently concerned about an impersonal system collecting their marks. They are sometimes even more concerned about the system making permanent records of their errors. This situation must be handled by the teacher with discretion and tact, since the collecting of errors is in the student's interest.

3.2. Assumptions of the Study

The following assumptions formed the basis of the present research:

1. A.G. is easy to learn if it is combined with a well orientated A.G. package.

2. The verbal sentence is the first step in learning A.G..

3. Pupils will gain knowledge during the school year, regardless of the methods of teaching being adopted.

4. The use of the microcomputer has a strong effect on the pupil's achievement and creates the motivation for further learning.

5. Pupils in the Kuwaiti intermediate schools have the ability to deal with microcomputers appropriately.

3.3 Questions to be answered in the Present Study

1. How is A.G. presently being taught in the observed Kuwaiti intermediate schools ?

2. What is the effectiveness of CALL in the student's achievement in A.G.?

3. In what way does the computer help the student to understand A.G.?

4. Do the teaching methods that Arabic language teachers adopt have any effect on the pupil's results?

5. Does the sex of students have a significant effect on their achievements?

3.4 Statement of Hypotheses

A research hypothesis is recognized by Mason and Bramble (1978, p. 33) as a tentative declaration statement concerning the relationship between two or more variables. The research hypothesis is looked upon by Tatsuka and Tideman (1963, pp. 142-170) as a source of prediction, by which a researcher may predict the existence or the lack of relationship between the measured or studied variables. Research hypotheses are either stated in a directional or non-directional form. The directional form (i.e. alternative) states the existence of a certain relationship between the different studied variables. The non-directional, on the other hand, states the lack of such a relationship and is called a null hypothesis. (For more details see Chapter 4).

The previous questions, which were the basis for the major hypotheses of this study, are each stated in the form of a null hypothesis and in an alternative form as follows:

1:H0 There is no significant gain in pupils' intellectual achievement after studying the verbal sentence during a four month period.

H1 There are significant gains in pupils' intellectual achievement after studying the verbal sentence during a four month period.

2:H0 There are no significant differences between the achievements of pupils who were taught the same subjects by different methods of teaching.

H1 There are significant differences between the achievements of pupils who were taught the same subjects by different methods of teaching.

3:H0 There are no significant differences between the achievements of male and female pupils in the verbal sentence.

H1 There are significant differences between the achievements of male and female pupils in the verbal sentence.

In order to answer the above questions and to test the related null hypotheses, the following steps were taken:

First, an appropriate category system had to be found to analyse the existing A.G. classroom interactions and to describe the behaviour of students engaged in the Computer Assisted Arabic Grammar-Learning processes in Kuwait.

Second, pupils' perceptions of A.G. had to be assessed.

Third, a method of measuring pupils' progress had to be designed.

As a result, the A.G. schedule was considered by the investigator to be the most appropriate instrument for observing and categorizing the teaching of A.G. in Kuwaiti intermediate schools. (See Appendix C-3).

Achievement tests were devised to measure the results of the observed pupils in A.G.. (See below 3.5).

3.5 The Achievement Tests

In order to discover the students' level of achievement before and after the experiment in A.G., it was necessary for the investigator to use a measurement and evaluation system which is common today in the field of education.

"An achievement test is a systematic procedure for determining the amount a student has learned". (Gronlund, E.N., 1977, p. 11). In other words, it is a way of determining a pupil's "present level of performance". (Best, W.J., 1970, p. 189)

The main objective in the construction of the achievement tests was to obtain a wide range of items that would differentiate between pupils' abilities measured in terms of their results.

A criterion-referenced test was constructed rather than using a norm referenced one, for the following reasons:

1. Test items should be constructed so as to be relevant to the objectives of the experiment.

2. Tests which might be suitable for determining pupils' achievement are often repeated every year. As a result, these tests could be obtained from previous students.

Before constructing the achievement tests, preliminary achievement-test items were constructed with the help of four Arabic language supervisors who were members of the committee which participated in the

development of the Arabic Language Curriculum, from the Ministry of Education in Kuwait; there was also help from the Arabic Departments in the selected schools and the Arabic Department of The University of Glasgow.

A total of 100 items was developed, covering the verbal sentence (verb, subject and object) intended to be learnt during the period February- May 1987:

1. Two kinds of test items (for measuring the desired learning results) were developed:

   a. The first type of test item was questions which had to be answered by pupils, either by recalling or by recognizing some ideas, terms, facts, principles, theories or rules, of which they had experience in the educational process. In other words, they consisted of lower level thinking-ability questions.

   b. The second type of test item was questions requiring more effort from pupils to achieve correct responses, such as data manipulation and problem solving. These kinds of questions are often referred to as higher level thinking-ability questions.

2. The items developed covered the major topics within the subject areas intended to be studied.

3. The tests were designed to cover the goals to be reached (as given in the text-books used by the pupils) as a result of following the study of the Arabic Language Course.

All of the achievement-test items were of the objective type, where pupils had to select the most appropriate from among the four alternative responses given for each question (see Appendix C.3). The reasons behind constructing such an objective achievement test and not using a traditional essay test, were that an essay test introduces many factors such as spelling, arrangement and punctuation which may affect one's judgement of the pupil examined . "However, the newer objective-type of test gets rid of some of these misleading elements". (Long, A. J. and Sandiford, P., 1935, p. 8). Moreover, a much longer time would be required for the completion of an essay-type test than for an objective-type one.

3.6 Administration of the Achievement Test Items

Pupils were informed that the results of the test were for research purposes, and that these would not affect their actual Arabic class grades.

Directions:

Pupils were given the following directions for the achievement test:

1. There are 12 multiple choice questions containing 100 items and you have 45 minutes to complete the test.

2. For each item select the response that best completes the statement or answer to the question and then put a mark in front of the item or fill the blank.

3. Since your score will be the number of items answered correctly, be sure to attempt all the items. A value of "1" will be given to any correct answer and a value of "0" will be given to any incorrect answer i.e. the maximum score for any pupil, in any given test, would be 100, while the minimum score would be 0.

3.7 Weakness in A.G.

Students start to learn A.G. officially in the fourth grade of the elementary school and concentrate on the verbal and nominal sentences. Following that, they go to the second stage which is the intermediate level,

where they start to take an intensive curriculum in A.G.. If the student cannot comprehend the A.G. from the previous curriculum during the first month, he will not understand the topics which follow, and this cycle in the monthly curriculum continues until the end of the annual study period.

With the increasing intensity of the A.G. curriculum (see Appendix C.9) some students see the A.G. subject as incomprehensible, resembling hieroglyphics, thus resulting in the student not acquiring the required A.G., considering it vague and worthless to spend much time on it when it is only worth five marks out of the fifty given in total to all Arabic subjects.

From the investigator's experience with students of both sexes, before the experiment took place, he found most of the students' knowledge very weak in A.G.. Most of their answers to the investigator's questions were guesses. In one instance, the investigator asked all the students to give him a verbal sentence. It was only at the fifth attempt that one of the students answered correctly.

3.8 Why does this weakness occur?

As we have seen in this intensive curriculum, there is a shortage of grammar lessons and in the tests few of the marks are reserved for A.G.. In addition to this

increasingly demanding curriculum, all that the circumstances helped to create in the end was a large gap in the minds of the students, where there should have been A.G.. All of this was known to the Arabic Language teacher and even with this knowledge of this weakness within this area, he was unable to do anything because he was bound by the monthly curriculum during the year's study. Since the curriculum came from the Centralised Educational Department, he found himself being pursued by the Arabic Supervisor and the Head of the Arabic Department in the school, as well as the Headmaster. He was therefore compelled to keep pace with the monthly curriculum without looking at the students' achievements.

3.9 SAAD Characteristics

1. This authoring system contains the following:

    a. Menu Screen.
    b. Text Screen.
    c. Multiple Choice.
    d. Questions and Answers.
    e. True or False.
    f. Matching of Two Lists.
    g. Ranking a List.
    h. Fill in the Blank.
    i. Select from a List.

j. Identification Screen.

k. Audio Questions.

l. Basic Program.

m. Z-80 Program.

2. This Program enables the user to animate the graphics within a text screen or even in the exercise. Also, he can use the graphics for simulation purposes.

3. SAAD provides an abundance of colouring in the text and graphics; the user can select the foreground screen colour, background, and border screen colour.

4. SAAD provides an abundance of musical tones to respond to various situations, as a reinforcement, such as when a student answers correctly or incorrectly.

5. SAAD enables the teacher to be in control of the texts and programs, so that he can specify the paragraph appearance during the presentation of the lesson. In addition, SAAD provides an opportunity for the teacher to specify the exercise paragraph links, i.e. he can promote the student to a more advanced exercise in the case of correct answers, or link him to the appropriate explanation paragraph in the case of incorrect answers.

3.10 The Technique used in Producing the Arabic Grammar Package (A.G.V.S.S.)

There are a number of considerations which require to be taken into account when producing a neat and efficient A.G. language package, namely:

1. Colours are available for use, as well as facilities for highlighting, and should be used.

2. The screen should not be filled with a lot of sentences and colours at once, but in gradual sequence in order to keep the concentration of the learner on the one particular aspect which this screen has been designed for. In other words, the balance of the screen is essential.

3. There are many methods for moving or skipping to the next screen or next sentence after the present screen has been read. The most commonly used methods are:

a. Displaying "Press space bar to continue".
b. Setting a timer for not more than 10 seconds.

c. Combining both methods so that if the Space Bar has not been pressed after 10 seconds the timer takes over.

4. There are also many methods to move back to the previous screen or the previous sentence, should the learner want to check what he may not have understood. The most commonly used methods are:

a. Pressing "ESC".
b. Pressing one of the function keys. In this package "F4" has been kept for this purpose.

3.11 The Arabic Grammar "Verbal Sentence" Software (A.G.V.S.S.)

Main Menu in the A.G.V.S.S.

The software which has been developed by the investigator and the Alalamyyah Company is divided into seven units and takes around fifty hours for those learning to complete. Usually, after every unit, there is a general exercise reviewing the student's progress, and, depending upon the marks scored in the exercise, the student is automatically given remedial work where appropriate. These seven units come in the main menu as follows:

1. General Review.
2. Matching Colour and Grammatical Function.
3. The Verbal Sentence.
4. The fiʕl.
5. The fa:ʕil.
6. The mafʕu:l bihi.
7. General Exercises.

1. General Review

This program is divided into two parts. The first is an explanation which contains ten basic screens, which gives the student a reminder of what he has been taught in the previous years of the basics of A.G.. For instance, it teaches him how to recognize verbs, nouns, prepositions, interrogatives, demonstratives and pronouns.

The second is the exercise which contains random questions relating to the categories mentioned above.

2. Matching Colour and Grammatical Function

This program consists of four educational games, which teach the learner the matching of a colour with a grammatical category. Whilst the games have the same point their instructional levels are different. The games are as follows:

a. The Kuwait Towers.

b. My Favourite Verbal Sentence.

c. The Colourful Ducks.

d. The Verbal Car.

3. The Verbal Sentence

This program gives the learner an introduction to the verbal sentence, and enables him to recognize the difference between this and the nominal sentence. It is then divided into two parts. The first part is an explanation containing 12 basic screens. The second part is an exercise testing the student's comprehension of this program, consisting of 12 random questions.

4. The fiʔl

This section comes with four sub-titles: Introduction, Aspects of the Verb, Types of Verb and General Exercises. The student has the option of selecting one of these subtitles by pressing its number. The Introduction acts as a reminder for the learner about the three previous programs he has been through. Aspects of the Verb is further sub-divided into two parts: the first demonstrates the following aspects; the ma:Di:, the muDa:riʔ and the amr; the second tests the student's knowledge of these aspects. Types of Verb, again, is sub-divided into two parts: the first

demonstrates the two categories, each consisting of two descriptions, one from each of which can be applied to any verb, i.e. a) SaHi:H and mu¿tall and b) la:zim and muta¿addi; the second again tests the student's knowledge of these categories.

5. The fa:¿il

The subject of fa:¿il is divided into four subtitles which are; mufrad, muthanna, jam¿ and General Exercises. The first and second subtitles are divided into explanation and exercises, which teach the student the feminine and masculine of the singular and dual fa:¿il. The third subtitle is divided into two parts: the first demonstrates the three types - jam¿ mudhakkhar sa:lim, jam¿ mu'annath sa:lim and jam¿ al-taksi:r; the second consists of exercises.

This section consists of 250 basic screens including The General Exercise.

6. The maf¿u:l bihi

This section, the last program in this package, is classified precisely as that of the subject program, except that there is a General Review subtitle, acting as a reminder for the previous sections. (Appendix G describes the layout of these units)

3.12 Organization of the Experiment

The schools for this experiment were chosen by the Ministry of Education in the same governmental district to obtain the same socio-economic features. The selected classes (for more details see Chapter One) from the two schools were chosen by the school headmasters.

The investigator had to obtain permission from the Ministry of Education addressed to the school's headmaster, to allow the experiment to be held in their schools. Some headmasters declined, since they did not want their school schedule to be interrupted. Before going to the schools, the investigator had to submit a proposal to the Ministry of Education explaining the nature of the experiment and giving assurance that there were no political or commercial issues involved in the experiment.(see Appendix C.5,6 respectively)

Since the experiment relied upon MSX Computers, of a total value of approximately KD 21.000,

the investigator had to address a letter to the owner of the MSX Computer Company asking him to supply the schools with 64 sets. Unfortunately, the owner of the company found this too expensive and he offered only 25 sets. The investigator then turned to many education and science institutes in Kuwait, asking for their

support; unfortunately none of them would oblige unless the investigator agreed to switch to their computers. Only one science institute ,KFAS, supplied the experiment with 5 sets and therefore they were used.

3.13 The Duration of the Experiment

The experiment started in the middle of November 1986 and ended on the last day of the school year, May 1987. The investigator divided the experiment into two periods as follows:

1. The first period was between the middle of November 1986 and the Spring holiday on 15th January 1987. This was for reasons of preparation: to introduce the students to the use of computers; organize a new schedule with the two school headmasters to avoid any clashes in class periods (see Appendix C-3); to reserve and organize a room for the computer sets in each school; to discuss the subject of the verbal sentence curriculum and the pre-test and the post-test with the four teachers who were to participate in the experiment, two principal teachers and two Arabic language supervisors; to organize an open visit for the educational and science institutions in the State of Kuwait.

2. The second period was between 28th February 1987 (when the computer sets arrived at the two schools) and 20th May 1987. The first two weeks were spent in introducing the students to the use of the keyboard by teaching them typing and testing their typing speeds.

3.14 Organizing the School Visits

In the second period, the work was divided between the two schools (see Appendix C.1) on five workdays. This had been organized with the headmasters and the principal teachers, taking six periods in each school from the physical education, art and free activity classes without affecting the actual Arabic classes.

3.15 The Problems Encountered during the Experiment in Kuwait

There were two kinds of problem encountered during this study:

a. Economic.
b. Educational.

a. Since this experiment required an ideal computer lab in the two Kuwaiti intermediate schools , the financial issue had to be taken into consideration, as the cost was likely to amount to more than KD20,000.

b. This was the first time that anybody had conducted a computer experiment in the field of education in Kuwait. Educational technology in Kuwaiti schools has not yet reached the point of using microcomputers in Language Learning.

"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its successes, than to take the lead in the introduction of a new order of things". (Machiavelli, "The Prince VI")

CHAPTER 4

4.0 Data Analysis and Results

4.1 Introduction

The purpose of this chapter is to describe and summarise the analysis of the data which has been gathered from this experiment. To analyse the collected data a statistical method has to be used to test the experiment hypotheses. In brief, the usual procedure for testing a statistical hypothesis is the following: a hypothesis, known as the null hypothesis, is proposed about a population; a non-random sample is obtained from the population, and a numerical quantity, known as a statistic, is calculated from the sample data. The rejection of the null hypothesis means acceptance of the alternative, depending upon the value of the statistic: "an alternative hypothesis and rejection of the null hypothesis means automatic acceptance of the alternative hypothesis". (Hayslett, H.T. 1985, p. 4)

Statistics has been described as the science of making decisions in the face of uncertainty, that is, making the best decision on the basis of incomplete information. In order to make a decision about a population and a sample of this population, they must be identified and are defined as the "totality of all cases about which conclusions are desired is called the

population, while the observations actually included in the study are the sample". (Abdul Jabbar, 1983, p. 21) (See tables 1a-1c). The overall analyses were conducted using the SPSSX and the MINI-TAB computer programs.(see Appendix D). All the research hypotheses were tested at or beyond the .05 level. Additional analyses were taken into account to examine the simple effects only if the significant effects occurred at the .05 level or better.

The main research question of this experiment was: Does the use of the microcomputer, and the sex of the pupil, affect the pupils' achievement in the learning of the verbal sentence in Arabic Grammar ?

In this study, the four classes of pupils in the two intermediate schools can be considered as a sample from the population of all pupils in the State of Kuwait.

The sample that is actually included in the experiment is a chosen sample(6), whereas the selection is usually by random process from the population (see above Chapter 3 p. 74) Consequently, the control group and the experimental group were shown by the pre-test to be of different capacities in knowledge.(See below Tables 5-8 pp. 117-123)

(6)This is a common finding in educational survey work where the sample of participants cannot be guaranteed to be random because of the need for cooperation with the educational boards and schools' staff members.

This means that in order to prove statistically the significance of the classes' results in their improvement, it is necessary to use an analysis covariance approach in which the improvement score is corrected on the basis of the pre-test results (See below p. 148 and Glossary). Moreover, the population to which the results can be applied, or for which the results are in fact extrapolated, is smaller than may perhaps be desired under ideal circumstances; the population is, in fact, that of the school from which the selection was made, rather than a wider population.

In much educational research, a specific sample will normally be drawn at random or chosen from a given society (population). In order to measure a pupil's responses, one of many statistical measurement devices should be applied, such as achievement tests (pre and post tests) or a questionnaire.

The sample is subject to an experimental period, usually more than a month. Then the same or an equivalent measurement device will be used. Afterwards, a great deal of useful data, which becomes available from the experimental outcome, can be compared between the responses to the pre and post tests to find out the significant statistical differences. It is well known that there are two main tasks for the statistician. The first is to describe the items (descriptive statistics). The other is to reach

certain inferences (inferential statistics). (Abdul Jabbar, T. 1983. p. 20)

Table 1.(a) (SEX)

Value Label	Value	Frequency	%	Valid %	Cum. %
Male	1	57	46	46	46.0
Female	2	67	54	54	100.0
Total		124	100.0	100.0	

Valid Cases: 124 Missing Cases: 0

Table 1.(b) (Group)

Value Label	Value	Frequency	%	Valid %	Cum. %
Control	1	64	51.6	51.6	51.6
Experimental	2	60	48.4	48.4	100.0
Total		124	100.0	100.0	

Valid Cases: 124 Missing Cases: 0

Table 1.(c) (Class)

Value Label	Sex	Value	Frequency	%	Valid %	Cum. %
3/3	1	1	26	21.0	21.0	21.0
3/4	2	2	34	27.4	27.4	48.4
3/6	2	3	33	26.6	26.6	75.0
3/1	1	4	31	25.0	25.0	100.0
Total			124	100.0	100.0	

Valid Cases: 124 Missing Cases: 0

4.2 The Design of the Experiment

All educational experimentation is concerned with variable relations. In the simplest type of experiment, two variables only are involved; an independent variable and a dependent variable. For example, an experiment may be initiated to compare two different methods of teaching Arabic Grammar, designated groups one and two. Each method may be applied to different groups of experimental subjects. (See table 1.d) Following a period of instruction, performance may be measured using an achievement test. "The essence of the idea of an experiment lies in the simple fact that the investigator selects the values or categories of the treatment variable, the distribution method (knowing the sampling distribution of a statistic is very important for hypothesis testing, since from it one can calculate the probability of obtaining an observed sample value if a particular hypothesis is true), the nature of a statistical hypothesis, and the frequency of their occurrence." (Ferguson, G., 1981, p. 221) This enables the investigator to study an indefinitely large number of relations which are not amenable to study by observational or correlational methods, and may not in fact have any existence in nature at all prior to the experiment.

Table 1.(d)

GROUPS

ONE	TWO
3	1
4	2

CLASSES

1	2	3	4

SEX

MALE	FEMALE
1	2
4	3

4.3 Sampling and Estimation

The sample for the present investigation consisted of seventh grade Kuwaiti students enrolled at two intermediate schools; Al Moghairah Ben Nofal and Al Romaithiah, Kuwait. A total of 124 students, aged between 12-13 years of age, both male and female, were selected and assigned to one of two treatment groups (see above, Chapter 3).

According to the prevalent educational system in Kuwait, boys are segregated from girls. Thus, it is safe to assume that, by and large, the sex variable may

well appear in this study. In addition, microcomputers have never been used in the Kuwaiti intermediate schools. These students (the sample) had no knowledge of the operation of microcomputers at all, except two or three of them who had used them for playing computer games.

The Estimation

The investigator prepared parallel, immediate and delayed tests (See Chapter 3 and Appendix C.4) The construction of the achievement test items was done with the help of the Department of Arabic Studies and the Language Centre at Glasgow University. The Arabic language instructors and specialists in the Ministry of Education in Kuwait University inspected them respectively for content validity, readability and meaningfulness.

Both group one and group two had the pre-test after the instruction was presented. The retention test was administered for all treatment groups (Table 2) almost four months later.

Table 2

BOYS

1	4
Pre-Test	Pre-Test
Post-Test	Post-Test

GIRLS

1	4
Pre-Test	Pre-Test
Post-Test	Post-Test

4.4 The Measurement Evaluation

In the previous Chapter the achievement tests have been discussed in detail. It is easy to understand the hypotheses that the investigator tried to prove in his experimental work. However, it is very difficult to grasp the mass of unordered outcome data. Therefore, a statistical measuring evaluation (Statistical Tests, S.T.) must be used to order the data, classify them to form a frequency distribution (see Neave, H.R., 1978, pp. 41-47) and display the outcome results graphically (histogram).

These S.T. (i.e. T-Tests, F-Tests, U-Tests, Q-Tests etc) may serve to test the significance level of the variable being observed.

4.5 Which S.T. should be applied and why?

In order to present the ideas involved in testing a statistical hypothesis, one should explain, in general, that the hypothesis being tested is called the null hypothesis (i.e. it asserts that there is no difference between the two tested means), and is denoted as HO.

The hypothesis that the experimenter is willing to accept if he does not accept the null hypothesis is called the alternative hypothesis (i.e. it asserts that there is a difference between the two tested means) and is denoted as H1.

The data shown in Tables 5-8, pp. 117-123 (each table represents a class of the sample) are the scores that 124 pupils obtained on the two achievement tests. It is difficult to tell, without lengthy scrutiny, just how these scores are distributed. It is clear that the smallest score is 15 and the largest score is 100; it is also clear that there are few scores below 20 and above 90 (See Tables 3 & 4). However, it is much less easy to tell whether there are many scores between 20 and 90. Presentation of these data in a histogram is needed, so that the main features of the distribution of the achievement tests scores may be seen at a glance. (See Fig. 2-5, pp.118-124)

Table 3

Frequency of Pupils obtaining Total Scores of between 0 and 100 on each of the Two Achievement Tests.

Total Scores	Pre-Test Frequency	Classes				Post-Test Frequency	Classes			
		1	2	3	4		1	2	3	4
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15	2				2					
16	3	2			1					
17	3	2			1					
18										
19										
20										
21	1				1					
22	1				1					
23	1	1								
24	1	1								
25	2				2					
26	1				1					
27	2			1	1					
28										
29	2		1		1	1				1
30	2				2	1				1
31	1	1								
32	1		1							
33	3		1		2	2				2
34	4		1		3					
35	3	3				2				2
36	1	1				2				2
37	2		1	1						
38	2	1	1			1				1
39	4	1	1	1	1	1				1
40						1			1	
41	2	1		1						
42	2			2		2				2
43	5		2	1	2	1			1	

Total Scores	Pre-Test Frequency	Classes				Post-Test Frequency	Classes			
		1	2	3	4		1	2	3	4
44						1			1	
45	2	1		1		3			1	2
46	3				3					
47	1		1			1				1
48	3		1	2		1				1
49	1			1						
50	2	1			1					
51	1			1		2			2	
52	2	1		1						
53										
54	1				1	1				1
55	1		1			1			1	
56	1			1		2	1			1
57	1				1	3	1		1	1
58						3		2	1	
59	1				1					
60	1	1				2				2
61	3		1	2		1		1		
62										
63						2		2		
64	2	1		1		4		2	2	
65						4	1		1	2
66	3		3							
67	3		1	2						
68	2			2						
69	2		1	1		4	1		2	1
70						1				1
71	3		1	2		4		1	1	2
72	3		2	1		2	1		1	
73	1			1		3			3	
74	2	1	1			2	2			
75	1		1			3	1		1	1
76	3	1	1	1		1			1	
77						5	1	2	1	1
78	1			1		3			3	
79	3	1	1		1	1	1			
80	4		3	1		3	2		1	
81	1				1					
82	2	1	1			2		1	1	
83	3	1	1	1						
84	2	1	1			1			1	
85	2	1		1		2	1		1	
86	1			1		3	2		1	
87	2	1	1			1		1		
88	1		1			4	1	2	1	
89						2		2		
90						6	4	2		
91	1			1		5	2	2	1	
92						1		1		
93	1				1					
94						2		1	1	
95						5	1	3	1	

Total Scores	Pre-Test Frequency	Classes 1	2	3	4	Post-Test Frequency	Classes 1	2	3	4
96						5	3	2		
97						2		1		1
98						1		1		
99										
100						5		5		
	Total=124					Total=124				

Class	Sex	Group	N.	Class Label
1	1	2	26	3/3
2	2	2	34	3/4
3	2	1	33	3/6
4	1	1	31	3/1

Scoring of the Test Items:

A value of 1 was given to any correct answer and a value of 0 was given to any incorrect answer , i.e. the maximum score for any pupil, in any given test, would be 100, while the minimum score would be 0.

Table 4

Frequency of Pupils' Differences in Scores between pre- and post tests, in their Achievements

Total Scores	Frequency	Classes				Notes
		1	2	3	4	
-17	1			1		
-9	1			1		
-5	1			1		
-4	1				1	
-3	1			1		
-2	1				1	
-1	2			1	1	
1	1				1	
2	2			2		
3	3			2	1	
4	5	1		2	2	
5	5		1	2	2	
6	2			2		
7	3			3		
8	2	2				
9	6			3	3	
10	1		1			
11	3		1	1	1	
12	6	1	2	1	2	
13	4		2		2	
14	5	2		1	2	
15	4	2		1	1	
16	1			1		
17	4	1	1	1	1	
18	4	1	3			
19	2		1			
20	6	1	1	2	2	
21	4		3	1		
22	3	1	1	1		
24	3		1		2	
25	4		3		1	
26	1		1			
28	2		2			
29	4	1	3			
30	3	1	1	1		
31	2				2	
34	3	1	1		1	
35	1				1	
36	2	1		1		
37	1		1			
38	1	1				
40	1	1				
41	1	1				

Total Scores	Frequency	Classes				Notes
		1	2	3	4	
44	1	1				
45	1	1				
46	1	1				
49	1		1			
50	1		1			
55	1		1			
56	2	2				
58	1	1				
69	1	1				
74	1	1				

TOTAL=124

4.6 Administration of the Arabic Grammar Achievement Test

The selection of appropriate teaching and learning methods and their effectiveness in pupils' results is always one of the main problems encountered by any researcher dealing with classroom situations. In many educational studies, however, a pupil's achievement has been considered by many educators as one of the most appropriate criteria for assessing teacher effectiveness. (See Saadeh, 1970, pp. 73-91 & Power and Sadler, 1976, pp. 77-88; Stones and Morris, 1972 and Evans, 1962)

In this study, a pupil's achievements were taken as a basic and most important product variable for measuring the effectiveness of using microcomputers in Kuwaiti intermediate schools.

A pupil's achievement is defined, in this study, as the gain in knowledge from studying Arabic Grammar either through the microcomputer or through traditional methods (see the tables of specifications in Chapter Three and Tables 4a and 4b) during the period February-May 1987.

Table 4.(a)

Computing the Male Achievement Tests "CELL MEANS" by the ANOVA PROGRAMME

PRE-TEST				
Total Population = 57		Mean = 43.89		
Class	1 50.00 (26)	2 00.00 (0)	3 00.00 (0)	4 38.77 (31)
Group	1 38.77 (31)	2 50.00 (26)	00.00	00.00
POST-TEST				
Total Population = 57		Mean = 66.21		
Class	1 81.85 (26)	2 00.00 (0)	3 00.00 (0)	4 53.10 (31)
Group	1 53.10 (31)	2 81.85 (26)	00.00	00.00

Table 4.(b)

Computing the Female Achievement Tests "CELL MEANS" by the ANOVA PROGRAMME

PRE-TEST				
Total Population = 67		Mean = 61.06		
Class	1 00.00 (0)	2 61.18 (34)	3 60.94 (33)	4 00.00 (0)
Group	1 60.94 (33)	2 61.18 (34)	00.00	00.00
POST-TEST				
Total Population = 67		Mean = 77.57		
Class	1 00.00 (0)	2 85.26 (34)	3 69.64 (33)	4 00.00 (0)
Group	1 69.64 (33)	2 85.26 (34)	00.00	00.00

4.7 Administration of the Achievement Scales as a Pre-Test

Since each chosen selected class in this project, experimental and traditional, was considered as a representative sample for the same grade level in the whole school, a pre-test was essential to collect the necessary data concerning pupils' initial level of achievement in the Arabic Grammar area.

Pupils in the two selected intermediate schools were given achievement pre-tests in the presence of the investigator and the head of the Arabic Department of each school.

Pupils were given the same instructions for the pre-test. The instructions were as follows:-

1. Write your full name, School name and your class number, i.e. 3/1, 3/3, 3/4, or 3/6, at the top of the test sheet.

2. There are a hundred questions (to be answered by filling a blank or by choosing the correct answer either from a matching or a multiple choice exercise) and you have 45 minutes to complete the test.

3. Since your score will be the number of questions answered correctly, be sure to attempt all the questions.

4.8 Administration of the Achievement Scales as Post-Test

The achievement post-test in Arabic Grammar was administered to pupils after the completion of the experiment in the middle of May 1987, for the two selected schools.

The 124 pupils were informed that the purpose behind this test was to establish the amount of knowledge they achieved from studying the specific subject topics. Since the achievement post-test was similar to the achievement pre-test, pupils were, therefore, given the same instructions as in the pre-test.

4.9 Scoring of the test items

In both the achievement tests a value of 1 was given to any correct answer and a value of 0 was given to any incorrect answer, i.e. the maximum score for any pupil in any test would be 100, while the minimum score would be 0 (for more details see Table 3, p.107).

4.10 Analysis of Pupil Achievements in Arabic Grammar

a) Measuring pupils' gain in knowledge during the experiment in Arabic Grammar.

b) Measuring the significance of the difference between the achievement of girls and boys in Arabic Grammar.

c) Measuring the significance of the difference between the achievement of "group one" and "group two" pupils in Arabic Grammar.

4.11 Measuring Pupils' Gain in Knowledge during the Experimental Period in the Arabic Grammar Area

This part is divided into two Sections; the first section is directed towards the measurement of the gain in pupils' cognitive knowledge after the experiment in teaching A.G. had been conducted, during a four months' period between February and May 1987. To this end, pupils' scores were collected through the administration of the pre-test in February and the post-test in the following May 1987. The difference between the two scores was calculated for each pupil. (See Tables 5-8 & Figs 2-5, pp. 117-124)

The Results of the Achievement Tests

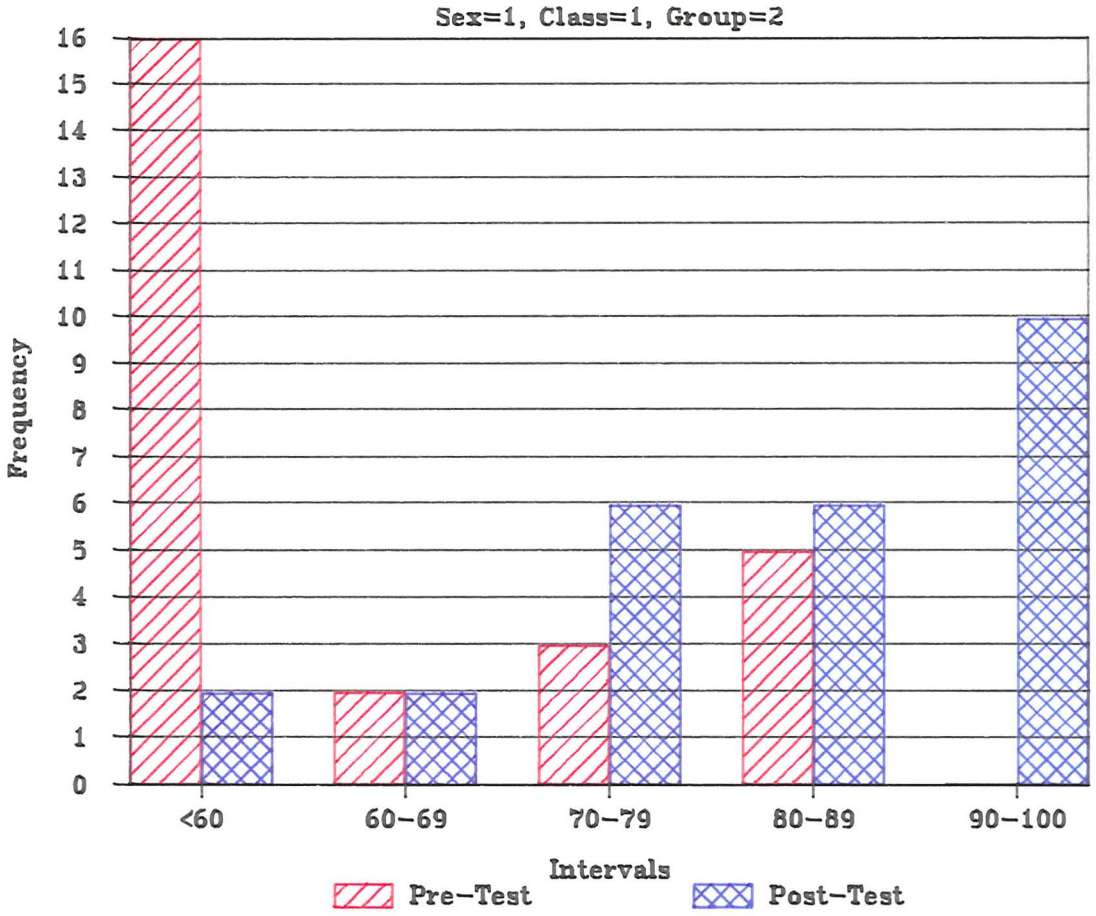
Sex=1, Class=1, Group=2

Table 5

N	SEX	CLASS	GROUP	PRE-TEST	POST-TEST	DIFF.
1	1	1	2	87	95	8
2				85	90	5
3				84	88	4
4				31	90	69
5				83	91	8
6				82	96	14
7				79	96	17
8				76	96	20
9				74	86	12
10				60	74	14
11				64	86	22
12				23	79	56
13				35	80	45
14				17	75	58
15				16	57	41
16				36	80	44
17				39	85	46
18				38	56	18
19				45	74	29
20				17	91	74
21				41	77	36
22				52	90	38
23				50	90	40
24				35	69	34
25				16	72	56
26				35	65	30

TOTAL = 838

Figure 2, ACHIEVEMENT TEST RESULTS



The Results of the Achievement Tests

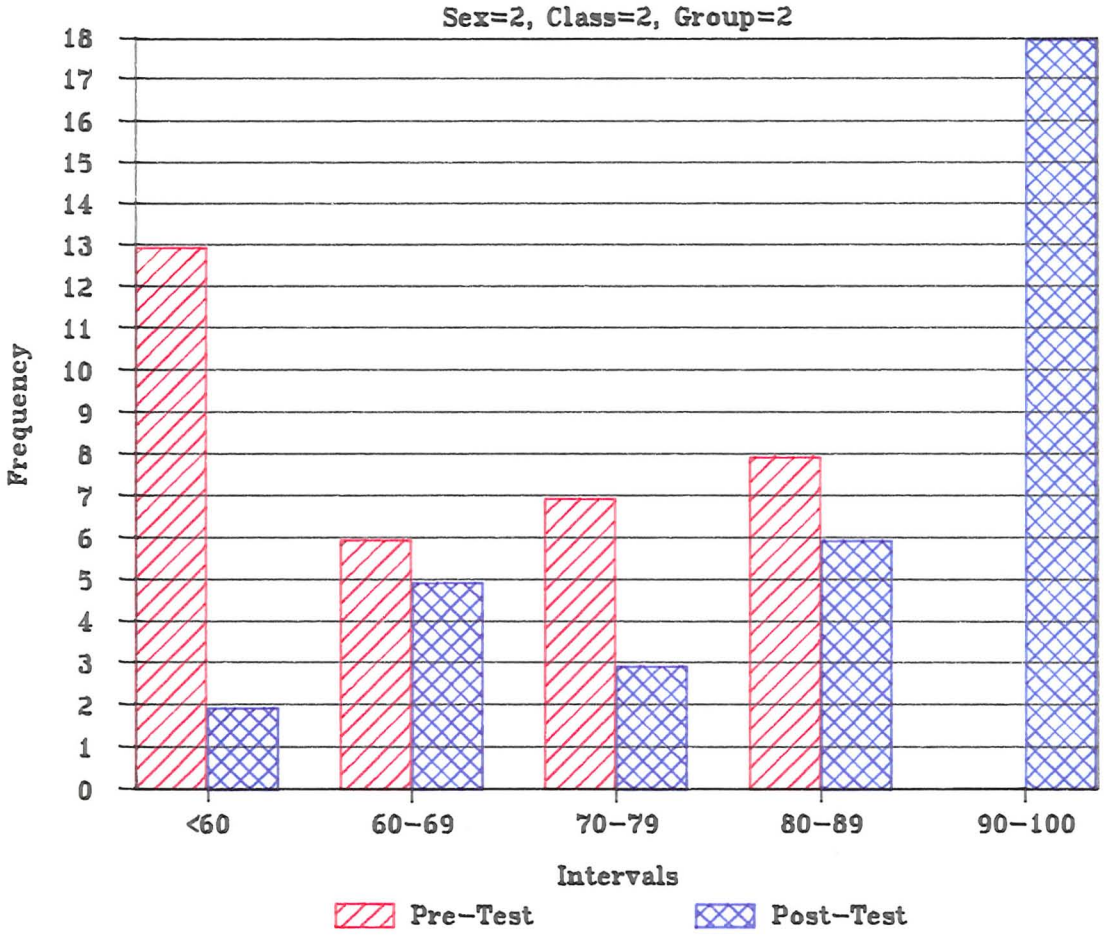
Sex=2, Class=2, Group=2

Table 6

N	SEX	CLASS	GROUP	PRE-TEST	POST-TEST	DIFF.
1	2	2	2	39	64	25
2				33	88	55
3				55	77	22
4				43	92	49
5				29	58	29
6				66	96	30
7				80	100	20
8				72	100	28
9				88	100	12
10				37	63	26
11				66	95	29
12				74	89	15
13				83	96	13
14				80	98	18
15				80	95	15
16				87	100	13
17				84	94	10
18				66	91	25
19				47	64	17
20				82	100	18
21				67	88	21
22				79	90	11
23				76	97	21
24				72	91	19
25				61	95	34
26				34	58	24
27				43	71	28
28				75	87	12
29				69	90	21
30				38	63	25
31				32	82	50
32				48	77	29
33				71	89	18
34				24	61	37

TOTAL = 819

Figure 3, ACHIEVEMENT TEST RESULTS



The Results of the Achievement Tests

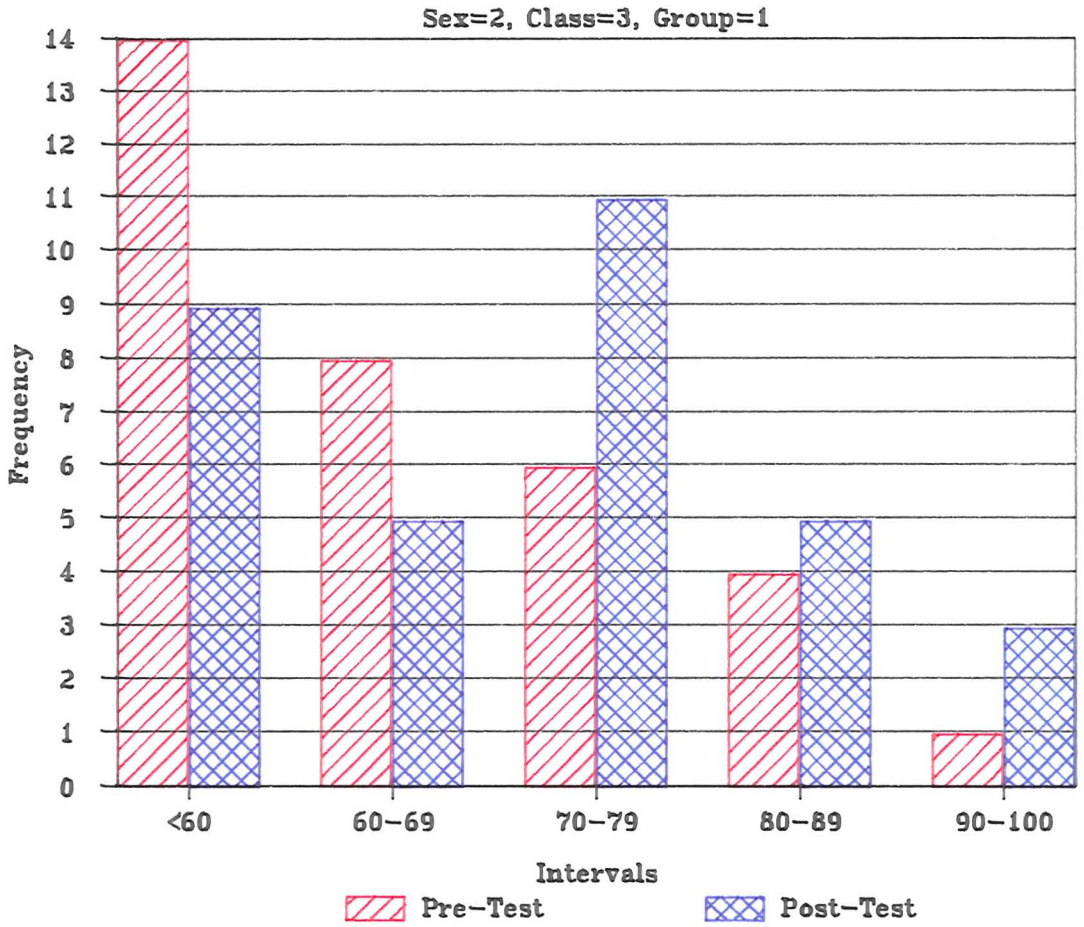
Sex=2, Class=3, Group=1

Table 7

N	SEX	CLASS	GROUP	PRE-TEST	POST-TEST	DIFF.
1	2	3	1	78	85	7
2				91	95	4
3				48	64	16
4				71	82	11
5				45	40	-5
6				83	88	5
7				56	76	20
8				61	64	3
9				71	78	7
10				42	78	36
11				86	91	5
12				43	58	15
13				51	65	14
14				49	71	22
15				64	55	-9
16				85	94	9
17				52	73	21
18				68	77	9
19				37	57	20
20				67	69	2
21				41	43	2
22				72	78	6
23				61	73	12
24				80	84	4
25				27	44	17
26				73	80	7
27				39	69	30
28				48	45	-3
29				76	75	-1
30				67	73	6
31				69	72	3
32				68	51	-17
33				42	51	9

TOTAL = 287

Figure 4, ACHIEVEMENT TEST RESULTS



The Results of the Achievement Tests

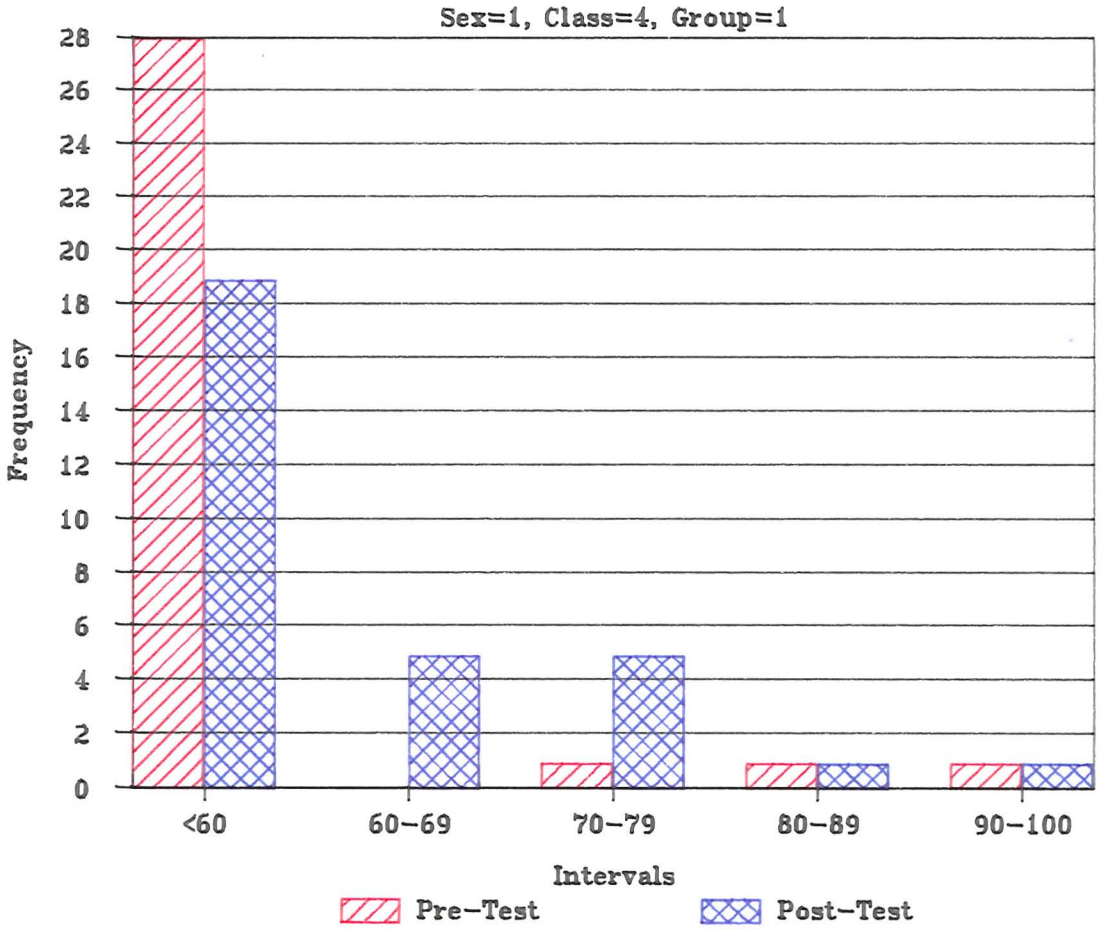
Sex=1, Class=4, Group=1

Table 8

N	SEX	CLASS	GROUP	PRE-TEST	POST-TEST	DIFF.
1	1	4	1	26	35	9
2				43	60	17
3				81	86	5
4				33	45	12
5				39	70	31
6				79	75	-4
7				21	45	24
8				22	56	34
9				15	35	20
10				15	30	15
11				54	65	11
12				57	71	14
13				50	54	4
14				17	29	12
15				43	42	-1
16				46	60	14
17				30	65	35
18				93	97	4
19				34	39	5
20				33	42	9
21				25	69	44
22				27	36	9
23				34	33	-1
24				34	47	13
25				59	57	-2
26				25	38	13
27				30	33	30
28				46	77	31
29				16	36	20
30				46	71	25
31				29	48	19

TOTAL = 471

Figure 5, ACHIEVEMENT TEST RESULTS



As the pre-test scores on the achievement test differed only slightly from zero values, indicating little previous knowledge and understanding of the topic to be taught during the experimental period, as well as showing that there was little or no variance among the pre-test scores, a "residual mean gain" calculation was found to be of no advantage over the "raw gain" calculations undertaken in this part. Thus the "raw gain" calculations are the only ones reported in Tables 9-17.

To test the significance of the difference between the two values, the differences between pupils' two scores (i.e. pre-test and post-test) were subjected to a T-test for related groups. The T-test is seen by Bruning and Kintz (1968, p. 28) as one of the most commonly used techniques, which is applied to test the significance of the difference between the means of two groups. This is because the T-test is the most likely of all tests to reject the null hypothesis when the H0 is false when the necessary assumptions are valid. Similarly, the F-test used in the Analysis of Variance and the Analysis of Covariance has the greatest power to detect a false null hypothesis.

In this part, the T-test for related groups was computed, using the following formula:

$$T = \frac{X - Y}{\sqrt{\frac{ED^2 - (ED)^2/N}{N(N-1)}}}$$

Where:

X = the mean value of the post test scores;

Y = the mean value of the pre-test scores;

N = Number of pupils;

ED^2 = the sum of the difference in score between each "X" and "Y" pair squared.

Table 9

Summary Statistics of Both Male And Female Achievement Tests (N=124)

Achievement Tests	Mean Score	Standard Deviation			
Pre-Test	53.169	21.880			
Post-Test	72.347	19.444			

Table 10

Summary Statistics of Male Pupils' Achievement Tests

(N=57)

Achievement Tests	Mean Score	Standard Deviation			
Pre-Test	43.895	22.472			
Post-Test	66.211	20.997			

Table 11

Summary Statistics of Female Pupils' Achievement Tests

(N=67)

Achievement Tests	Mean Score	Standard Deviation			
Pre-Test	61.060	18.062			
Post-Test	77.567	16.441			

Table 12

Summary Statistics of "Group 2" Achievement Tests

(N=26)

Achievement Tests	Mean Score	Standard Deviation	F.D.S.	T Value	Prob.
Pre-Test	50.000	24.559	25	8.058	≤0.0001
Post-Test	81.846	11.540			

Table 13

Summary Statistics of "Group 2" Achievement Tests

(N=34)

Achievement Tests	Mean Score	Standard Deviation	F.D.S.	T Value	Prob.
Pre-Test	61.176	19.661	33	12.794	≤0.0001
Post-Test	85.265	14.035			

Table 14

Summary Statistics of "Group 1" Achievement Tests

(N=31)

Achievement Tests	Mean Score	Standard Deviation	F.D.S.	T Value	Prob.
Pre-Test	38.77	19.5	30	5.322	≤0.0001
Post-Test	53.10	15.10	30		

Table 15

Summary Statistics of "Group 1" Achievement Tests

(N=33)

Achievement Tests	Mean Score	Standard Deviation	F.D.S.	T Value	Prob.
Pre-Test	60.94	16.60	32	7.560	≤0.0001
Post-Test	69.64	17.90	32		

Table 16

Summary Statistics of "Group 1" Male And Female Achievement Tests (N=64)

Achievement Tests	Mean Score	Standard Deviation			
Pre-Test	50.203	21.099			
Post-Test	61.625	18.385			

Table 17

Summary Statistics of "Group 2" Male And Female Achievement Tests (N=60)

Achievement Tests	Mean Score	Standard Deviation			
Pre-Test	56.333	22.427			
Post-Test	83.783	13.020			

The results of the T-test analysis are represented in Tables 18-21 for each of the samples. From the results of these T-analyses, it is obvious that a significant gain in the knowledge of grammar of the observed pupils has occurred in the studied area. The T-values which represent the significance of the mean difference between the observed pupils pre- and post-

achievement scores were found to be highly significant ($P \leq 0.001$). (See Table 18-21, pp.131-134)

4.12 Measuring the Significance of the Difference between the Achievement of Groups

The second section of this part is addressed to finding out if the gains in Arabic Grammar achievement, based on the raw scores of the post test, of (a) Male pupils, are similar to those of the Female pupils in the studied area, and if the gains of (b) "Group one" pupils (i.e. those who were taught by traditional method) are similar to those of "Group Two" pupils (i.e. those who were taught by the computer) in A.G.

In other words, did either the sex of the observed pupils or the two different methods of teaching which were adopted by the two groups, where group one used traditional methods and group two used computers, produce any differential effects on the pupils cognitive achievement in the studied area?

Table 18

Class 1 3/3 N=26

$$T = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{(ED)^2 - (ED)^2/N}{N(N-1)}}}$$

$$T = \frac{81.85 - 50.00}{\sqrt{\frac{37163-(838)^2/26}{26 \times 25}}} = \frac{31.85}{\sqrt{\frac{37163-702244/26}{650}}}$$

$$= \frac{31.85}{\sqrt{\frac{37163-27009.384}{650}}} = \frac{31.85}{\sqrt{\frac{10153.616}{650}}}$$

$$= \frac{31.85}{3.9523343}$$

$$T = 8.058$$

Table 19

Class 2 3/4 N=34

$$T = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{(ED)^2 - (ED)^2/N}{N(N-1)}}}$$

$$T = \frac{85.26 - 61.18}{\sqrt{\frac{23705-(819)^2/34}{34 \times 33}}} = \frac{24.08}{\sqrt{\frac{23705-670761/34}{1122}}}$$

$$= \frac{24.08}{\sqrt{\frac{23705-19728.264}{1122}}} = \frac{24.08}{\sqrt{\frac{3976.736}{1122}}}$$

$$= \frac{24.08}{1.882}$$

$$\underline{T = 12.794}$$

Table 20

Class 3 3/6 N=33

$$T = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{(ED)^2 - (ED)^2/N}{N(N-1)}}}$$

$$T = \frac{69.64 - 60.94}{\sqrt{\frac{5317-(287)^2/33}{33 \times 32}}} = \frac{8.7}{\sqrt{\frac{5317-82369/33}{1056}}}$$

$$= \frac{8.7}{\sqrt{\frac{5317-2496.0303}{1056}}} = \frac{8.7}{\sqrt{\frac{2820.9697}{1056}}}$$

$$= \frac{8.7}{1.6344334}$$

$$\underline{T = 5.322}$$

Table 21

Class 4 3/1 N=31

$$T = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{(ED)^2 - (ED)^2/N}{N(N-1)}}}$$

$$T = \frac{53.16 - 38.77}{\sqrt{\frac{9251-(427)^2/31}{31 \times 30}}} = \frac{14.39}{\sqrt{\frac{9251-182329/31}{930}}}$$

$$= \frac{14.39}{\sqrt{\frac{9251-5881.5806}{930}}} = \frac{14.39}{\sqrt{\frac{3369.4194}{930}}}$$

$$= \frac{14.39}{1.9034262}$$

$$\underline{\underline{T = 7.560}}$$

4.13 Statement of Hypotheses

Each of the above questions is stated in a form of a null hypothesis followed by the alternative form, as follows:

1 : H0 There are no significant differences between the achievements of male pupils and those of female pupils in Arabic Grammar.

H1 There are significant differences between the achievements of male pupils and those of female pupils in A.G.

2 : H0 There are no significant differences between the improvements of the "Group one" pupils and of the "Group two" pupils in A.G.

H1 There are significant differences between the improvements of the "Group one" pupils and of the "Group two" pupils in A.G.

To test the above hypotheses, the data resulting from the raw scores of the observed pupils' post-achievement tests, in Arabic Grammar, were subjected to an independent T-analysis, using the following formula:

$$T = \frac{X - Y}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

where:

X = the mean value of sample one;

Y = the mean value of sample two;

S_1 = the standard deviation of sample one;

S_2 = the standard deviation of sample two;

N_1 = the number of pupils in sample one;

N_2 = the number of pupils in sample two.

The results of the T-analyses, which were carried out to find whether the gain in knowledge of the male (N=57) and female (N=67) groups differed significantly from each other in the studied area, suggested that the observed female pupils achieved significantly better results in Arabic Grammar (T=0.01 , P 0.05) than the male pupils (See Table 22 & Fig 5). Therefore the first null hypothesis was rejected in the studied area.

Moreover, the T-test which was carried out to assess the significance of the differences in the achievement between "group one" and "group two" pupils (See Table 23 & Fig 6) indicated that the only significant difference was found between the achievement of the two groups (T = 0.01). Thus the null hypothesis which stated the CALL method would have no effect on pupils' achievement was rejected at the 0.01 level of significance.(see Appendix D.1)

Table 22

Summary Statistics of Male and Female Pupils' Post-Test Raw Score used in the T-Test Analyses (N=124)

Sample	No.	Mean Score	Std. Dev.
Male	57	53.142	14.566
Female	67	61.825	11.024

Table 23

Summary Statistics of "Group 1" and "Group 2" Pupils' Post-Test Raw Score used in the T-Test Analyses (N=124)

Sample	No.	Mean Score	Std. Dev.
Group 1	64	51.012	21.011
Group 2	60	82.309	13.236

4.14 Analysis of Data in the Comparison of the Two Methods

The data were collected using four classes of intermediate-level school pupils; the classes were classified according to the factors Sex and Method, giving four combinations:

(Male, Experimental),	(Female, Experimental),
(Female, Traditional),	(Male, Traditional).

Each pupil was assessed before and after the use of the teaching method, yielding a pre-test score and a post-test score. The data are summarized in Table 24.

Graphical displays of the pre-scores are presented in Figs. 6-9.

The first question which should be considered is whether or not the four classes were comparable in ability as measured by their pre-test scores.

4.15 Comparability of Classes prior to Experiment

A statistical technique of One-Way Analysis of Variance was used, in order to test the hypothesis that the mean pre-test scores for each of the four classes were equal.

Table 24

Sample Size (n), Sample Mean (x) and Sample Standard Deviation (s)

(a) Pre-Test Score

	Experimental	Traditional
Male	n=26 x=50 s=24.6	n=31 x=38.8 s=19.5
Female	n=34 x=61.2 s=19.7	n=33 x=60.9 s=16.6

(b) Post-Test Score

	Experimental	Traditional
Male	n=26 x=81.9 s=11.5	n=31 x=53.1 s=15.1
Female	n=34 x=85.3 s=14.0	n=33 x=69.6 s=17.9

(c) Improvement (Post-Pre)

	Experimental	Traditional
Male	n=26 x=31.8 s=19.4	n=31 x=14.3 s=11.9
Female	n=34 x=24.1 s=10.9	n=33 x=8.7 s=10.7

Figure 6

Pre-Score Histograms

Histogram of pre-test score 1 N=26

Midpoint	Count		
20	5	*****	
30	1	*	
40	7	*******	
50	3	***	CLASS 1
60	2	**	
70	1	*	
80	5	*****	
90	2	**	

Histogram of pre-test score 2 N=34

Midpoint	Count		
20	1	*	
30	4	****	
40	5	*****	
50	2	**	CLASS 2
60	2	**	
70	9	*********	
80	9	*********	
90	2	**	

Figure 7

Pre-Score Histograms

Histogram of pre-test score 3 N=33

Midpoint	Count		
30	1	*	
40	6	******	
50	6	******	CLASS 3
60	4	****	
70	9	*********	
80	4	****	
90	3	***	

Histogram of pre-test score 4 N=31

Midpoint	Count		
20	6	******	
30	12	************	
40	3	***	
50	5	*****	CLASS 4
60	2	**	
70	0		
80	2	**	
90	1	*	

Figure 8

Histograms of Improvements in Score

Histogram of improvements 1 N=26

Midpoint	Count		
0	1	*	
10	6	******	
20	4	****	
30	3	***	CLASS 1
40	5	*****	
50	2	**	
60	4	****	
70	1	*	

Histogram of improvements 2 N=34

Midpoint	Count		
10	4	****	
15	5	*****	
20	9	*********	
25	5	*****	
30	6	******	CLASS 2
35	2	**	
40	0		
45	0		
50	2	**	
55	1	*	

Figure 9

Histograms of Improvements in Score

Histogram of improvements 3 N=33

Midpoint	Count		
-15	1	*	
-10	1	*	
-5	2	**	
0	3	***	
5	11	**********	
10	5	*****	CLASS 3
15	4	****	
20	4	****	
25	0		
30	1	*	
35	1	*	

Histogram of improvements 4 N=31

Midpoint	Count		
-5	1	*	
0	3	***	
5	5	*****	
10	6	******	
15	6	*******	CLASS 4
20	3	***	
25	2	**	
30	2	**	
35	2	**	
40	0		
45	1	*	

Let M_i denote the population mean pre-test score for the ith class (see Glossary). The following hypotheses are considered:

H0: $M_1 = M_2 = M_3 = M_4$

H1: There is a difference between the means.

The appropriate test-statistic is :

$$TS = \frac{\{\sum_{i=1}^{K} n_i(\bar{x}_i-\bar{x}_G)^2\} / (K-1)}{S_p^2 / (N-K)}$$

where:

K = No. of population means.

$\bar{x}_i$ = sample mean of the i^{th} class (i=1,2,3,4)

$\bar{x}_G$ = pooled sample mean for all classes.

S_p^2 = pooled sample variance for all classes.

N = total sample size.

So:

$$N = n_1 + n_2 + \ldots\ldots n_K$$

$$\bar{x}_G = 1/N \sum_{i=1}^{K} n_i\bar{x}_i$$

$$S_p^2 = 1/(N-K) \{\sum_{i=1}^{K} (n_i-1)S_i^2\}$$

where S_i^2, the sample variance of the i^{th} class, is given by :

$$S_i^2 = 1/(n_i-1) \sum_{j=1}^{n_i} (x_{ij}-\bar{x}_i)^2$$

where x_{ij} denotes the j^{th} observation collected from the i^{th} class ($j=1,\ldots,n_i$; $i=1,\ldots,K$)

4.16 Assumptions

(1) All observations are statistically independent.

(2) The sample data for each class follows a Normal Distribution.

(3) The population variances of the classes are equal.

These assumptions were considered to be appropriate in this context because:

(1) The observations were collected from different pupils.

(2) Probability plots, constructed for each set of sample data, appeared to be approximately linear.

(3) Bartlett's test of the homogeneity of population variances was found to be non-significant.

The observed value of the test-statistic was 9.04 which is greater than the critical value of 2.68, obtained from tables of the F(3,120) probability distribution at the 95th percentile, ($P < 0.0001$). "As (P) becomes smaller and smaller and creeps beyond the very small significance levels so the difference becomes more and more apparent." (Castle, W.M., 1977, p. 134) Therefore, there is statistical significance to suggest that the population means are unequal, i.e. the four classes are not comparable with respect to their pre-test ability (see Appendix D-2). In order to locate the source of the difference(s) between means, we calculate the interval estimates.

4.17 Schette Intervals for Multiple Comparisons

These are obtained by using the formula:

$$\bar{x}_i - \bar{x}_j \pm \sqrt{\{(K-1)F(K-1,N-K,0.95)S_p^2(1/n_i + 1/n_j)\}}$$

$(i \neq j)$

Where F(K-1, N-K;.95) denotes the 95th percentile of the F(K-1, N-K) probability distribution. These intervals have an overall confidence of 0.95 and are given by the following:

M_1-M_2	11.18 + 14.78	Contain 0.
M_1-M_3	10.94 + 14.87	
M_1-M_4	11.23 + 15.08	
M_2-M_3	0.14 + 13.86	
M_2-M_4	22.41 + 14.09	Do not Contain 0.
M_3-M_4	22.17 + 14.19	

So, it follows that class 4 has a significantly lower average pre-test score than classes 2 and 3.

This finding may create a problem, when comparing the improvements achieved by the methods, because any significant differences discovered might have been due to the fact that the classes were not of comparable ability prior to the experiment. However, we shall see that in order to analyse the effects of the teaching methods, the pre-test score must be taken into account.

We now examine whether or not each class shows evidence of a statistically significant improvement.

4.18 Analysis of the Improvement in Score

The effectiveness of a teaching method was measured by calculating the improvement in score for each child, i.e.

Improvement = Post test - Pre test.

Each class was considered separately using the one sample t-test to examine the hypothesis that the mean improvement is zero.

Let δ_i denote the population mean improvement for the i^{th} class (i=1,2,3,4). We consider the hypotheses:

$$H0: \quad \delta_i = 0 \ *$$

$$H1: \quad \delta_i \neq 0 \ *$$

The test statistic is

$$TS = \frac{\bar{d}_i}{Sd^{(i)}/\sqrt{n_i}}$$

Here d_i denotes the sample mean improvement for the i^{th} class, and $Sd^{(i)}$ denotes the sample standard deviation of the improvements for the i^{th} class. The results of these tests are seen in Table 25.

Table 25

	Sample size	Test Statistic	P-Value
Class 1	26	8.36	<0.00005
Class 2	34	12.81	<0.00005
Class 3	33	4.69	<0.00005
Class 4	31	6.70	<0.00005

It can be seen from the table that each class shows evidence of a statistically significant improvement in the mean score. It should be noted that the assumptions required for the one-sample test are that (i) the observations are independent and (ii) they follow a normal distribution. Both of these assumptions are reasonable here, because the observations were recorded on different children and the appropriate probability plots were approximately linear.

A comparison of the mean improvements of the four classes should now be considered.

4.19 Comparison of Class Performance

The natural approach to this question would be to analyse the differences between the pre-test score and post-test score. However, this approach is appropriate only when these differences are uncorrelated with the pre-test scores. Therefore, before we can proceed, we must consider scatterplots of the difference between the post- and pre-test scores versus pre-test score for each

class. These are presented in Figs. 10-13. (see pp. xxx-xxx) It can be seen that for each class there is evidence of a negative correlation, which is particularly strong in Class 1. This reflects the fact that those pupils whose pre-test scores are lower tend to show a greater improvement. Clearly the pupils whose pre-test score is high have little room for improvement, since the maximum score is 100. Hence, in order to compare the performances of the classes, we must take into account the problem presented by the significant differences between the classes prior to the experiment, as shown in their pre-test scores.

The statistical technique used to perform the analysis is called the Analysis of Covariance. By this approach, the investigator dealt with the dependence of improvement on the pre-test score by assuming that, for each class, the mean improvement depends linearly on the pre-test score.

We consider the following model for data:

$$M: \quad \delta_i = \alpha_i + \beta_i t_{ij} \qquad (i=1,.,4;j=1,..n_i)$$

Under model M, all observations have the same variances and the samples are assumed to follow normal probability distributions.

Scatterplots of Difference between Post-test Score and Pre-Test Score versus Pre-Test Score

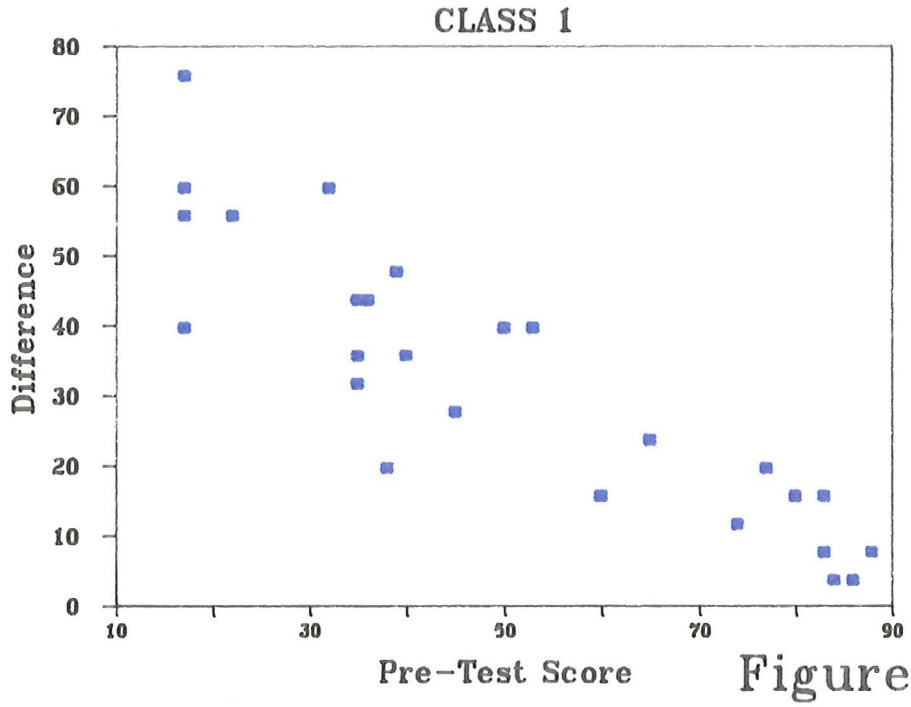


Figure 10

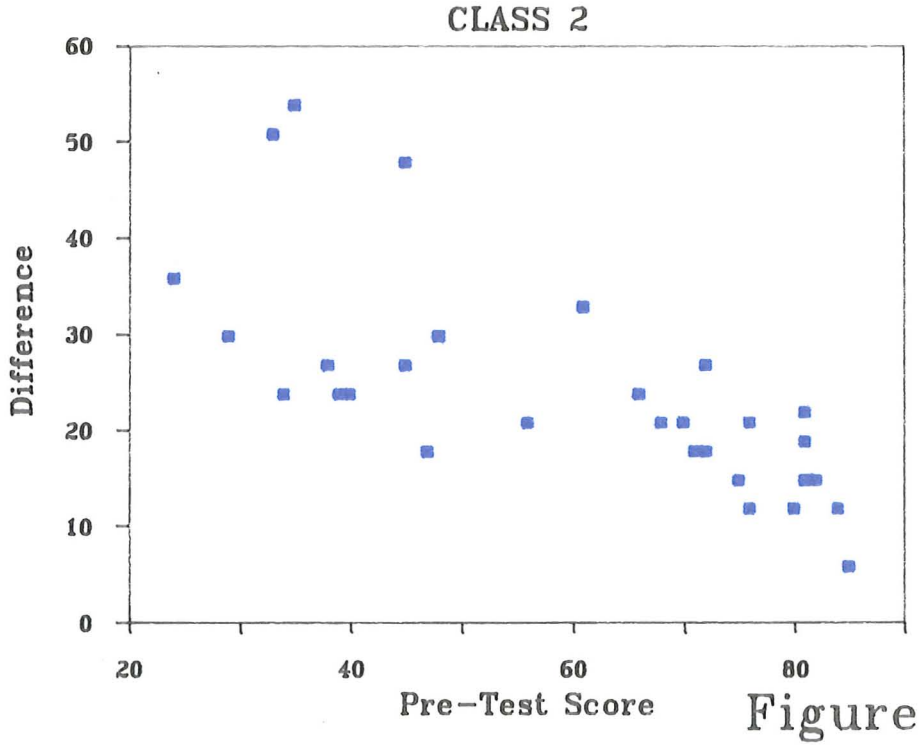


Figure 11

Scatterplots of Difference between Post-test Score and Pre-Test Score versus Pre-Test Score

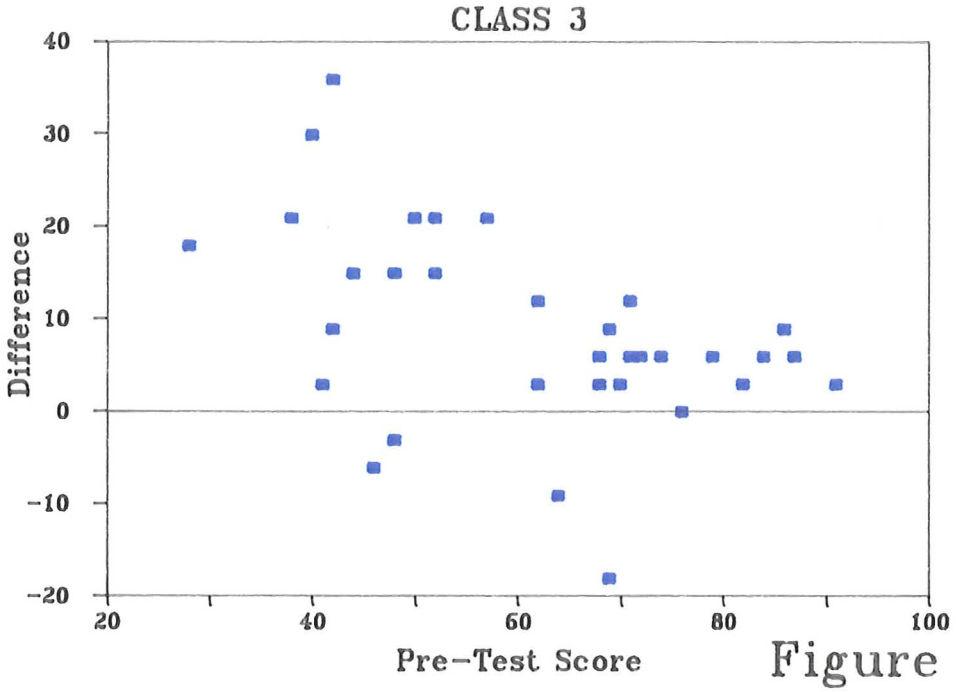


Figure 12

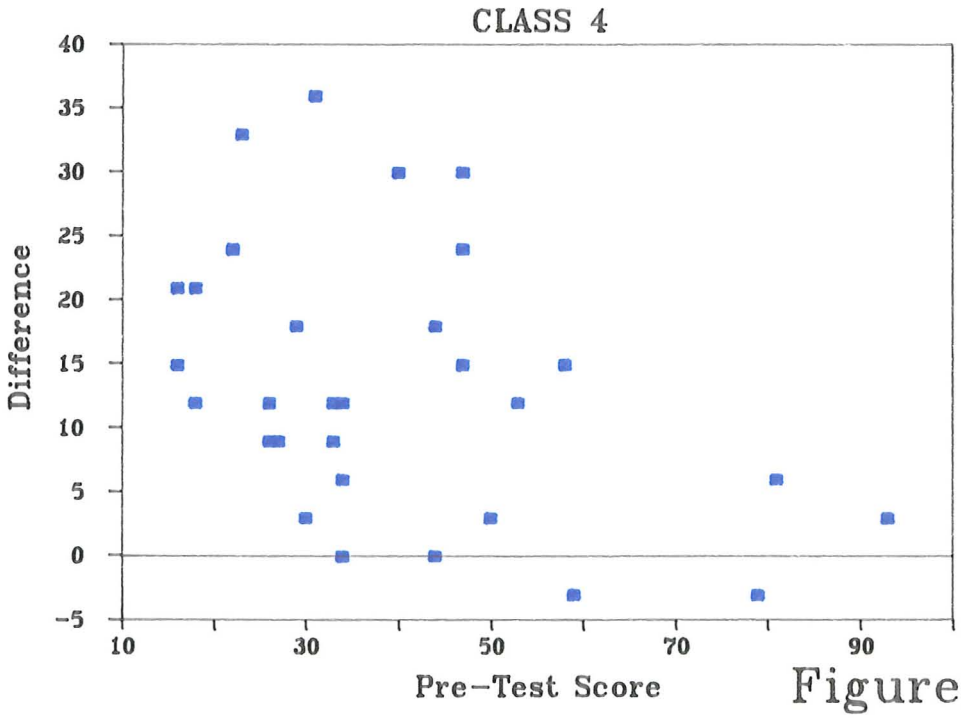


Figure 13

Model M allows a different regression line for each class; however, it was preferable to find the simplest model that best describes the data. The following three models were considered:

$$H_\Phi : \delta i = \alpha + \beta t_{ij}$$

$$H_s : \left.\begin{array}{l} \delta_1 = \delta_4 = \alpha_1 + \beta_1 t_{ij} \\ \delta_2 = \delta_3 = \alpha_2 + \beta_2 t_{ij} \end{array}\right\} \text{Sex Difference}$$

$$H_m : \left.\begin{array}{l} \delta_1 = \delta_2 = \alpha_1 + \beta_1 t_{ij} \\ \delta_3 = \delta_4 = \alpha_2 + \beta_2 t_{ij} \end{array}\right\} \text{Method Difference}$$

These were interpreted thus:

H_Φ : This means that the improvement is linearly related to pre-test score and that there is no difference between each of the four classes.

H_s : This means that the improvement is linearly related to pre-test score but now the relationship for males is <u>different</u> from that of females.

H_m : This is similar to Hs, but here it is assumed that the <u>difference</u> is between the teaching methods.

The model H_m, means that in terms of the relationship between the improvement score and the pre-test score, any difference between the classes is due to the teaching method alone i.e. there is no difference between the

sexes. The fact that this model is found to be statistically non-significant implies that there is no statistically significant difference between the sexes in terms of the relationship between the improvement score and pre-score.

Each of the models H_ϕ, H_s, and H_m were now tested against the general model M. All of these models are examples of the Normal Linear Model. The testing procedure for comparing the two models H1 and H2 is to:

(i) Estimate the unknown parameters.

(ii) Calculate the dimension of the model,i.e. the number of unknown parameters.

(iii) Calculate the residual sum of squares from the fitted model. This measures the amount of variability in the data which is left "unexplained" by the model. The results are presented in Table 26.

Table 26

Model	Estimated Relationship	Dimension	Residual Sum of Squares
H_Φ	$\delta_1=\delta_2=\delta_3=\delta_4$ $=38.6-0.37t$	2	22767.6
H_s	$\delta_1=\delta_4=37.9-0.35t$ $\delta_2=\delta_3=39.8-0.38t$	4	22750.5
H_m	$\delta_1=\delta_2=59.2-0.56t$ $\delta_3=\delta_4=25.3-0.28t$	4	10910.6
M	$\delta_1=66.9-0.70t$ $\delta_2=48.6-0.40t$ $\delta_3=26.6-0.29t$ $\delta_4=24.5-0.26t$	8	10246.2

t denotes the Pre-test score

δ_i is the mean improvement for the i^{th} class (see glossary)

The procedure for testing model H1 against model H2 is to calculate the test statistic:

$$TS = \frac{(r_1-r_2) \,/\, (\dim H_2 - \dim H_1)}{r_2 \,/\, (N - \dim H_2)}$$

This is called an "F ratio".

Here, r1 = residual sum of squares under H1.

Model H1 is rejected and model H2 is adopted if

$$TS > F(\dim H2 - \dim H1,\ n - \dim H2;\ 1-\alpha)$$

for a test with a significance level α. [Using a significance level α]. The results of a test using a significance level of 0.05 are presented in Table 27.

Table 27

Test	F-ratio	df	Critical Value	Result
H_Φ vs M	23.6	(6,116)	2.19	Reject H_Φ
H_s vs M	35.4	(4,116)	2.46	Reject H_s
H_m vs M	1.88	(4,116)	2.46	Don't Reject H_m

From this sequence of tests, it is found that model Hm cannot be rejected. This means that an alternative model is adopted where the mean improvement depends linearly on the pre-test score, i.e. it decreases as the pre-test score increases. However, the straight line representing the relationship is different for the two teaching methods. It is now of interest to estimate the mean difference in improvement between the two methods. This is given by the following formula. A 95% confidence interval for the difference of mean

improvement using the experimental method minus the mean improvement using the traditional method, i.e.

$$(\alpha_1+\beta_{1t}) - (\alpha_2+\beta_{2t})$$

is given by:

$$(\hat{\alpha}_1-\hat{\alpha}_2) + (\hat{\beta}_1-\hat{\beta}_2)t \pm t(N-4;\ .975) \times S$$

$$S=\sqrt{[(r/(N-4)(1/n_1+1/n_2+(t-\bar{t}_1)^2/S_{tt}^{(1)}+(t-\bar{t}_2)^2/S_{tt}^{(2)}]}$$

Here $\hat{\alpha}_1$, $\hat{\alpha}_2$, $\hat{\beta}_1$, $\hat{\beta}_2$, denote the estimates of α_1, α_2, β_1, β_2.

t denotes the pre-test score.

$t(N-4;\ .975)$ denotes the .975 percentile of the $t(N-4)$ probability distribution.

n_1 is the number of pupils taught by the experimental method.

n_2 is the number of pupils taught by the traditional method.

$\bar{t}_1$ is the average pre-test score for pupils taught by the experimental method.

$\bar{t}_2$ is the average pre-test score for pupils taught by the traditional method.

$S_{tt}^{(1)} = (n_1-1)$ times the sample variance of pre-test scores for the experimental method.

$S_{tt}^{(2)} = (n_2-1)$ time the sample variance of pre-test scores for the traditional method.

For a given pre-test score, a 95% confidence interval for the difference in mean improvement under the experimental method - mean improvement under the traditional method, i.e. the average superiority of the experimental method, is given by:

$$33.93-0.2877t \pm 18.8793 \times \sqrt{(0.03229 + (t-56.33)^2/29675.33 + (t-50.2)^2/28046.36)}$$

Some examples are presented in Table 28. For example, given a pre-test score of 40, this enables us to be 95% confident that the mean superiority of the experimental method compared with traditional method lies between 18 and 26.

Table 28

Pre-Test	Estimated Mean Superiority of Exper. Method	95% Confidence Interval
20	28.2	(22,34)
30	25.3	(20,30)
40	22.4	(18,26)
50	19.5	(16,23)
60	16.7	(13,20)
70	13.8	(10,18)
80	10.9	(5,16)

It appears that over most of the range of 0-100, on average, the experimental method leads to greater improvement in score than the traditional method.

CHAPTER 5

CONCLUSION

Summarising The Experiment and the Significance of its Findings

This study was based upon an empirical examination of learning in Kuwaiti Seventh-Grade Intermediate Schools. A constructed series of tests was applied to a representative sample of pupils, whose cooperation and seriousness greatly facilitated the completion of the initial gathering of data. Moreover, this study constituted the first study of Kuwaiti education grounded upon detailed A.G. classroom observations. It also represented the first attempt to obtain accurate data concerning pupils' learning of A.G. by means of computers. It further, incidentally, threw light on the sex variable. The data obtained from the various experiments have subsequently been subjected to statistical analyses. The various findings have been examined and interpreted in the light of empirical studies and theoretical developments elsewhere. Since the observations of this study are based on a representative sample of Kuwaiti intermediate schools, the results of these observations provide a factual foundation for further analysis of present and future practice in the teaching of A.G., by which the

achievement of pupils in F.A. may be better predicted. Moreover, it is hoped that this information will help educationalists, teachers and researchers to isolate possible problems and strengths in the teaching of A.G. within Kuwaiti and other intermediate schools in the future.

In this study two groups of pupils of F.A. were selected, non-randomly, from two schools (one male and one female). When the achievements of the pupils taught according to two different methods were compared, a distinct tendency towards better achievement was noticed in pupils taught by microcomputers. The results of this study appear to favour the introduction of teaching A.G. to pupils in a manner different from the traditional method.

Of the 124 pupils who participated in this experiment it was clear that those who used the microcomputers showed a greater enthusiasm for learning A.G. than those who were taught by the traditional methods. In fact, many were reluctant to leave the microcomputers during official breaks or when obliged to attend classes in other subjects. They appeared to appreciate the opportunity to engage in individual self-instruction , as opposed to forming part of a taught group.

"It seems that the traditional methods of teaching Arabic have created more serious untreatable learning problems than the nature of the AL [F.A.] itself. The exclusive use of the G-TM(7), as in traditional Arabic textbooks, actually inhibits production of speech because students are trained to think [if not to recite] in terms of paradigms. Also, the dangers of presenting Arabic grammar as an object in itself (in its decontextualised form) or as a decoding system, postpones the development of the learners' ability to communicate in Arabic and divorces language learning from the essential interpersonal nature." (Jadwat, Y. Ayoob, (1978), p. 361)

Conclusion from the Statistical Analysis

a) There was evidence of statistically significant differences in the mean pre-test score between the classes.

b) There was evidence of a statistically significant correlation between the improvement score and the pre-test score.

Hence in order to compare the classes it is necessary to perform an **analysis of covariance.** This analysis makes a correction for the fact that the control and experimental groups have different average

(7)G-TM : Grammar Translation Method

pre-test scores; it also incorporates the correlation between pre-test score and improvement score.

An adequate model was found to explain the data; this model may be interpreted as saying that there is no mean difference between boys and girls in terms of the relationship between improvement and pre-test score. However there is a mean difference between the teaching methods.

In order to explore this difference, interval estimates (see Chapter 4, p. 145) were calculated for the mean differences in improvement score between the control and experimental groups while controlling for the pre-test score. For the wide range of pre-test score values considered, these intervals demonstrated that on average, the improvement shown by the experimental group is greater than that of the control group.

It has to be stated that the population for which the results can be examined was smaller than might be ideally desired for indications that they might be applied over a wider range. It was also through force of circumstances, non-randomly selected. Thus, it may prove to be the case that these results are particular for the two schools in which the experiment was carried out. However, it must be pointed out that this is common in educational survey work, where samples of

participants cannot be guaranteed to be random because some limitation has to be placed on the way in which they are selected. In such circumstances most people would accept that it is reasonable to extrapolate to a wider interpretation.

Concerning the question dealing with the effect of the two teaching methods on students' performance, it was found in general that these methods differentially affected student performance. It was concluded that where the experimental method had been adopted the learning was superior to that from the traditional method. (see Table 27 p. 154) These results may be interpreted holistically by discussing the significant effect of the use of microcomputers. First, the significant difference in achievement might be due to the fact that the experimental group was more motivated than the other. The experimental group was motivated toward learning A.G. since they believed that their performance would in turn reflect on their intelligence since they were using microcomputers, and on their reputation, since they had been chosen for the experiment ; this might increase anxiety and might influence them in their concentration on learning A.G. Fleming (1970, pp. 69-200) concluded that "excessive novelty produces anxiety which could cause subjects to escape from the situation either physically or perceptually." Second, the experimental group had a good chance to interact with microcomputers

continuously. Nelson, G.E. and others, (1976, pp. 28-37) stated in their article : Two New Strategies for Computer-Assisted Language Instruction (CAL1); that "The unique property of the computer as a medium for education is its ability to interact with the student." Third, the experimental group had individual attention at console from microcomputers. Finally, the flexibility; which can include allowing students to choose among several headings of explanations and exercises, which is unlikely to be achieved with books and worksheets, gave the experimental group ample time to absorb the presented lesson.

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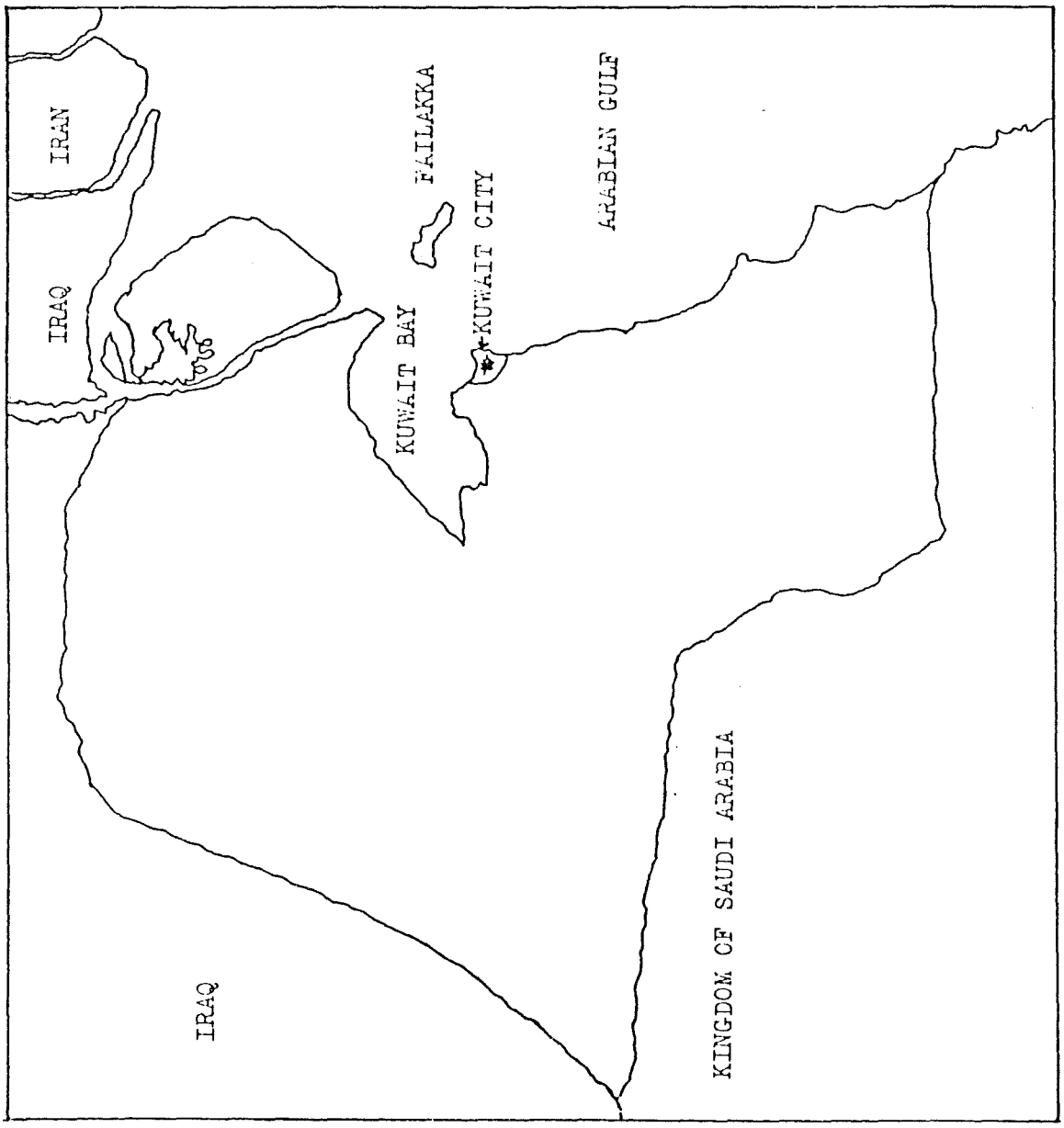
APPENDIX A

APPENDIX A - 1


IRAN
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FAILAKKA
KUWAIT CITY
KUWAIT BAY
ARABIAN GULF
IRAQ
KINGDOM OF SAUDI ARABIA

APPENDIX B

al Alamiah العالمية

AL ALAMIAH ARABIC SOFTWARE

بسم الله الرحمن الرحيم
تعهد بالمحافظة على السرية

التاريخ : ١٩٨٦/١١/١٩

حفاظا على حقوق الشركة العالمية للالكترونات "التي أبدت استعدادها
لإطلاعي على طرق العمل لديها لمساعدتي في إنهاء بحثي".

أتعهد أنا نوري يوسف الوتار بالآتي :

أولا : بالمحافظة على أسرار العمل أو أية معلومات سرية أخرى وصلت إل
علمي سواء كانت هذه المعلومات مملوكة ملكية خاصة للعالمي
للالكترونات أو أنها مؤتمنة عليها من طرف ثالث بعقود.

ثانيا : لأغراض هذا التعهد يعتبر أسرار متعلقة بالعمل أية أسرار تجاري
أو معلومات أو عمليات أو أفكار غير معروفة بشكل عام في مجا
الصناعة والتي تعطي العالمية للالكترونات ميزة تنافسية وهذ
تشمل بشكل خاص وعلى سبيل المثال ما يلي :-

أ - كل المعلومات ذات الصلة بالبرامج الموجودة حاليا لد
العالمية للالكترونات أو تلك التي تحت التطوير.

ب - كل المعلومات ذات الصلة بأنظمة التشغيل التي طورته
العالمية للالكترونات أو تلك التي تحت التطوير لديها.

ج - كل المعلومات ذات الصلة بلغات البرمجة التي طورته
العالمية للالكترونات أو هي بصدد تطويرها أو طورتها أطراف
أخرى ذات صلة تعاقدية معها.

د - الأفكار والمشاريع التي خططت الشركة لعملها مستقبلا.

ثالثا : ألتزم باعتبار أية معلومات حالية أو مستقبلية تتعلق بعمل
العالمية للالكترونات وطرق أدائها سرية ولا أقوم باستعمالها أو
منازعتها فيها حتى تتم إفادتي من قبلها خطيا بغير ذلك.

رابعا : أتعهد بأن أسلم للعالمية للالكترونات بعد انتهاء تدربي جميع
الأوراق والسجلات والوثائق التي استلمتها منها لأغراض البحث أو
تم استخدامها لوضع معلومات خاصة بالعالمية لغرض التحكم فيها
من قبلي لمقتضيات البحث وأتعهد بعدم استنساخها أو الإحتفاظ بأي
نسخ منها تحت حيازتي بعد انتهاء العلاقة.

خامسا : يغطي هذا الإتفاق كافة أسرار العمل العائدة للعالمية للالكترونا
والتي أطلعت عليها أثناء قيامي بالبحث أو بسببه.

المقر بما فيه

نوري يوسف الوتا

[redacted]

briya, P. O. Box 8196 Salmiah, Kuwait Cable : INTELLECT Tel. 5319781/3. Tlx. 46973 AASOFT KT. Fax:5331886

APPENDIX C

APPENDIX C-1

The Distribution of Subject Periods
According to the Number of Classes

Islamic Education	3 Periods (1&2)* 2 Periods (3&4)** 3 X 9= 27 2 X 8=16 TOTAL=43
Arabic Language	6 Periods for the Fourth Grade TOTAL=6 X 17= 102
English Language	5 Periods (1&2) 6 Periods (3&4) 5 X 9= 45 6 X 8= 48 TOTAL=93
Mathematics	4 Periods for the Fourth Grade TOTAL=4 X 17= 68 2 Periods for the Fourth Grade TOTAL=2 X 17=34
Science	3 Periods for the Fourth Grade TOTAL=3 X 17=51
Physical Education	2 Periods 2 X 17= 34
Art	2 Periods 2 X 17= 34
Music	1 Period 1 X 17= 17
Free Activity	2 Periods 2 X 17= 34

*(1&2) First & Second Grades
**(3&4) Third & Fourth Grades

APPENDIX C-2

The Distribution of the Arabic Language Curriculum

SUBJECT	1st Year	2nd Year	3rd Year	4th Year
Reading	2	2	2	2
Poetry	1	1	1	1
Grammar	1	1	1	1
Composition	1	1	1	1
Dictation & Handwriting	1	1	1	1

APPENDIX C-3

The Schedule in the Two Schools

	1	2	3	4	5	6
Saturday		B	B			
Sunday				G	G	
Monday		G	G			
Tuesday				B	B	
Wednesday	B	B			G	G

B = Boys G = Girls

APPENDIX C-4

اختبار تحريبى لتجربة استخدام الحاسب الآلى فى تدريس
قواعد اللغة العربية المرحلة المتوسطة (اختبار بعدى)
(اشراف / نورى يوسف الوتار)

****

اسم المدرسة : .....

اسم الطالب : ..... الصف : (/)

==========

السؤال الأول :

أ) أجب عما يأتى :- هات جملة اسمية :

.....

هات جملة فعلية :

.....

ب) اختر الجملة الفعلية فقط فى الجمل التالية :

١ - يتعلم الاولاد السباحة فى الصيف .
٢ - النهار يطول ايام الصيف .
٣ - يصوم المسلمون شهر رمضان.
٤ - يقف العصفور فوق الشجرة .
٥ - الماء يتحول الى بخار بالحرارة .

ح) اجعل الجمل الاسمية التالية جملا فعلية ثم بين الفاعل فى كل منها ؟

١ - الانهار تتكون من مياه الامطار

الفاعل فى الجملة الفعلية هو : .....

٢ - محمد كتب الدرس :

الفاعل فى الجملة الفعلية هو : .....

٣ - الزهور تتفتح فى الربيع

الفاعل فى الجملة الفعلية هو : .....

(٢)

السؤال الثاني :

أ) اختر الاجابة الصحيحة فيما يلـــي :

١ ـ لن ينام المريض .

(ينام) اعرابها :

* فعل مضارع مرفوع بالضمة .
* فعل مضارع منصوب بالفتحة .
* فعل مضارع مجزوم بالسكون .

٢ ـ لتعرف ان الله مع المخلصين .

(تعرف) اعرابها :

* فعل مضارع منصوب بالفتحة
* فعل مضارع مرفوع بالفتحة .
* فعل مضارع مجزوم بالسكون .

٣ ـ حبا الله الطبيعة جمالا .

(حبا) اعرابها :

* فعل مضارع منصوب بالفتحة .
* فعل ماض مبنى على الفتح
* فعل مضارع مرفوع بالضمة المقدرة .

٤ـ لم يأكل الطفل طعامه

(يأكل) اعرابها :

* فعل مضارع مرفوع بالضمة .
* فعل مضارع مجزوم بالسكون .
* فعل مضارع منصوب بالفتحة .

ب) يخلص بعض الناس فى أعمالهم .

أدخل (لن) مرة و (لا) مرة أخرى على الجملة السابقة ثم اضبط الفعل المضار

١ ـ بعض الناس فى اعمالهم .

٢ ـ بعض الناس فى اعمالهم .

جـ) اختر لكل فعل مما يأتى فاعلا يناسبه من السطر الثانى ثم اضبط آخره :

يغرد ، أورقت ، يصهل ، امتلأت ، تشقشق .

الحصان ، البلبل ، الكراسات ، العصافير ، الاشجار .

١ ـ

٢ ـ

٣ ـ

٤ ـ

٥ ـ

السؤال الثالث :

أ) صحح الخطأ الموجود بين القوسين فى الجمل الآتية :

١ - فاز (الولدين) بالجائزة الاولى والثانية .
فاز ..... بالجائزة الاولى والثانية .

٢ - ترحب (البنت) بصديقاتهن .
ترحب ..... بصديقاتهن .

٣ - فرحت (الفائزة) بنجاحهما .
فرحت ..... بنجاحهما .

٤ - يودع (المسافر) اصدقاءهم .
يودع ..... اصدقاءهم .

٥ - يساعد (التلميذ) مدرسهم .
يساعد ..... مدرسهم .

ب) حدد نوع الفاعل فى الجمل التالية :

١ - يحج المسلمون الى بيت الله .
نوع الفاعل هو : .....

٢ - ينقل الذباب الامراض الخطيرة
نوع الفاعل هو : .....

٣ - يذهب التلميذ الى المدرسة مبكرا
نوع الفاعل هو : .....

٤ - نالت المتسابقتان جائزتين كبيرتين
نوع الفاعل هو : .....

٥ - تعطف الامهات على أبنائها
نوع الفاعل هو : .....

السؤال الرابع :

أ) املأ الفراغات التالية بمفعول به مناسبا :-

١ - يزرع الفلاح ..... الطيبة (الثمارَ - الثمارُ - الثمارِ)

٢ - يفهم التلميذ ..... (دروسِه - دروسَه - دروسُه)

٣ - كافات الناظرة ..... المتفوقات (التلميذاتِ - التلميذاتُ - التلميذاتَ)

٤ - قدم اللاعبون ..... لزميلهم (هديةً - هديةٍ - هديةٌ)

٥ - يتعلم الاولاد ..... في الصف (السباحةِ - السباحةَ - السباحةُ)

٦ - دمّر الابطال ..... في المعركة (السفنُ - السفنِ - السفنَ)

٧ - يؤدي المعلمون ..... باخلاص (واجبُهم - واجبِهم - واجبَهم)

٨ - سيهزم العرب ..... (المعتدون - المعتدين - المعتديانَ)

٩ - شجع الجمهور ..... الفائزين (الفريقان - الفريقين - الفريق)

١٠- يقرأ المسلمون ..... الكريم (القرآنَ - القرآنِ - القرآنُ)

السؤال الخامس :

أ) يحترم المواطنون قانون بلادهم .

مانوع الجملة السابقة ؟

اخرج الفعل : .....

مانوع الفعل : .....

اخرج الفاعل : .....

مانوع الفاعل : .....

ماعلامة رفعه : .....

مامفرد المواطنون: .....

مامثنى المواطنون: .....

ماجمع المؤنث السالم من "المواطنون" : .....

أخرج المفعول به : .....

السؤال السادس :

" سافر احمد الى القاهرة وسافر صديقان من اصدقائه معه ، جهز الاصدقاء الحقائب وودع الاهل المسافرين وغادروا البلاد . وقد زار الاصدقاء حديقة الحيوان ورأوا اسدين يرقدان في قفصهما ويتجمع الزائرون عند اقفاص القرود يشاهدونها تقفز بخفة فضحك الاولاد وسعدت البنات "

- اقرأ القطعة السابقة ثم أخرج منها مايلى :-

١ - جملة فعلية : .....

٢ - جملة فعلية على أن يكون فعلها مضارعا وفاعلها جمع مذكر سالما .

.....

٣ - فاعلا جمع تكسير : .....

٤ - فاعلا جمع مؤنث سالما : .....

٥ - فاعلا مثنى : .....

٦ - فاعلا مفردا مذكرا : .....

٧ - اخرج من القطعة مفعولا به جمع تكسير : .....

٨ - مفعولا به مفرد مؤنث : .....

٩ - مفعولا به جمع مذكر سالما : .....

١٠- مفعولا به مثنى : .....

السؤال السابع : أ) بين نوع الافعال الآتية من حيث الصحة والاعتلال :

الفعل	صحيح / معتل	نوعه
يزرع	.....	.....
يلقي	.....	.....
يبدو	.....	.....
قال	.....	.....
سأل	.....	.....
اهتم	.....	.....
وهب		

ب) اختر الاجابة الصحيحة بوضع خط تحت الاجابة التى بين القوسين :

١ - يقنع المسلم بالقليل (متعدى - لازم)

٢ - يجعل الله الارض مسجدا (متعدى - لازم)

٣ - لايهمل المجتهد فى دروسه (متعدى - لازم)

٤ - يسجد المؤمن خاشعا (متعدى - لازم)

٥ - رأيت الحديقة مزهرة (متعدى - لازم)

السؤال الثامن :

سأل رجل صديقـــه :
أراك فرحا ، تغدو مبتسما وتمسى مبتسما ، والمكاره من حولك كثيرة تمـــض القلب وتمزّقـــه .
قال الصديـــق :
ولماذا أحزن ؟ ان المكباره قسمان : قسم فيه حيلة فالاحتيال دواؤه ، وقســـم لاحيلة فيه فالصبر شفاؤه .

أخرج من القطعة السابقـــة :

١ ـ فعلا صحيحا سالمـــا : .....

٢ ـ فعلا صحيحا مهموزا : .....

٣ ـ فعلا صحيحا مضعفا : .....

٤ ـ فعلا معتلا ناقصـــا : .....

٥ ـ فعلا معتلا أجوفـــا : .....

==========

السؤال التاسـع :

وجد الولد ساعة فى الســـاحة .
مانوع الجملة السابقة ؟
أخرج الفعـــل : .....

أخرج الفاعل : .....

الفعل " وجد " : * فعل ماضى مبنى على الفتح .
* فعل مضارع مرفـــــــوع .
* فعل أمر مجـــــــــزوم .

هل أحد حروفه الاصلية حرف علـــة ؟

ماهـــو : .....

اذن هل هو فعل صحيح او فعل معتل ؟

هو فعل : .....

اين حرف العلة فى الفعل ؟ * وسطه * اخره * أوله .

" وجد " فعل معتـــــل ؟ * اجوف * مثال * ناقص .

السؤال العاشـــــر :

ضـــع دائرة حول المطلـــوب فقـــــط :-

١ - رأيت الفدائـى اكثر النـاس تضحية .
(ضع دائرة حول المفعول به)

٢ - لايجهل المواطنون حقوقهم المشروعة فى وطنهم .
(ضع دائرة حول الفاعل)

٣ - قـال تعالـــى :
" اليوم اكملت لكم دينكم ، وأتممت عليكم نعمتي ورضيت لكم الاسلام دينا "
(ضع دائرة حول الافعال فقط)

٤ - قل الحق وتمســك به .
(ضع دائرة حول الفعل اللازم)

٥ - يقف العصفور على الشجرة ثم يطير .
(ضع دائرة حول فعل معتل اجوف)

٦ - حروف العلة (ا ، ب ، ت ، و ، ق ، هـ ، ى)
(ضع دائرة حول حروف العلة فقط)

٧ - ظن البحار البحر هائجـا .
(ضع دائرة حول المفعول به)

٨ - يهتم الاسلام بالمرأة .
(ضع دائر حول الفعل الصحيح المضعف)

****

APPENDIX C-5

بسم الله الرحمن الرحيم

WAIT UNIVERSITY
LLEGE OF EDUCATION
Office of the Dean

جامعة الكويت
كلية التربية
مكتب العميد

ox 5969
. 840612 – 841181 Ext. 2000

ص.ب ٥٩٦٩
تليفون ٨٤٠٦١٢ – ٨٤١١٨١/٢٠٠٠

تاريخ : ٢٢ / ١٠ / ١٩٨٦ رقم : ١٧٨

السيده / وكيل وزارة التربية المساعد لشئون التعليم العام المحترمة

تحية طيبة وبعـــد ،

يرجى التكرم باتخاذ اللازم نحو تسهيل مهمة معيد البعثة السيد / نوري يوسف الوتار – بشأن تطبيق تجربة عملية على مدرستين بنيـــن وبنـات – وذلك باستخدام مجموعتين في كل مدرسة الأول بالطريقة التقليدية والثانية بطريقة الحاسب الآلـــي .

وتفضلوا بقبول فائق التقدير والاحترام ،،،

[redacted]

[redacted]

بسم الله الرحمن الرحيم

٧٥/٣٠/٠٥٠٤/٨٦/٨٠٠٠

وزارة التربية

رقم الاشارة نوت / ط ل ل /

التاريخ

~~منطقه حولى التعليميه~~

السيد المحترم / ناظر مدرسه المغيره بن نوفل المتوسطه بنين

بعد التحيه ،،

يقوم معيد البعثه نورى الوتار - جامعه الكويت

لاجراء بحث ميدانى بعنوان استخدام الحاسب الالى فى تدرس قواعد اللغه العربيه

فى مدرستكم على عينه طلبه ~~وطالبات~~ .

يرجاء التكرم بالاشراف على اجراءات البحث فى المدرسه وتسهيل

مهمه الباحث عند الزيارة .

مع خالص التحيه ،،

[redacted]

بـادل بد الله الصـالح
مراقب الخدمات التعليمية
منطقـة حـولي التعليميـة

نسخه / لمراقب الخدمات التعليميه .

" / للملـــف .

APPENDIX C-9

Distribution of the Arabic Grammar Curriculum In the Intermediate School

1st Year of Intermediate School

Month	Arabic Grammar	Notes
September & October		
November	mubtada' and khabar Singular Dual Plural	
December & January	fa:ʔil Singular Dual Plural mafʔu:l bihi Zarf zama:n Zarf maka:n	
February	majru:r Dama:'ir munfaSilah Dama:'ir khiTa:b	
March	Dama:'ir takallum Dama:'ir gha:bah istifha:m and jawa:b	
April	nafy	
May	Practice	

2nd Year of Intermediate School

Month	Arabic Grammar	Notes
September & October		
November	¿ala:ma:t tarqi:m ka:na wa akhawa:tuha: aSbaHa amsa: aDHa: ba:ta za:la Sa:ra laysa ma: za:la da:ma inna wa akhawa:tuha: anna ka-anna layta la¿alla la:kinna	
December	na:'ib fa:¿il fi¿l SaHi:H fi¿l mu¿tall	
December & January	na¿t maf¿u:l li-ajlihi maf¿u:l muTlaq (all)	
February	muDa:f ilayhi Ha:l ¿aTf	
March	raf¿ fi¿l muDa:ri¿ naSb fi¿l muDa:ri¿ an lan kay la:m ta¿li:l idhan jazm fi¿l muDa:ri¿ lam lamma: la:m amr la:m na:hiyyah	

2nd Year of Intermediate School

Month	Arabic Grammar	Notes
April	af¿a:l khamsah	
May	Practice	

3rd Year of Intermediate School

Month	Arabic Grammar
September & October	
November	SaHi:H mu¿tall fi¿l muDa:ri¿ raf¿ & naSb SaHi:H & mu¿tall after: an lan kay Hatta: la:m ta¿li:l fa:' sababiyyah
December	jazm fi¿l muDa:ri¿ SaHi:H & mu¿tall after: lam lamma: la:m amr la:m na:hiyyah jazm fi¿l muDa:ri¿ SaHi:H & mu¿tall after adawa:t sharT
December & January	an man ma: mahma: ayy mata Practice on amr (several kinds)
February	fi¿l la:zim fi¿l muta¿addi: Fi¿l muta¿addi: with two maf¿u:l bihi 1) as with Zanna kha:la za¿ama

3rd Year of Intermediate School

Month	Arabic Grammar
February (cont'd)	Hasiba alfa: wajada ʿalima ra'a: 2) as with aʿTa: - kasa: fataHa - albasa
March	khabar 1) mufrad 2) jumlah 3) shibh jumlah putting khabar before mubtada' ka:na wa-akhawa:tuha: (meaning & function)
April	ka:na wa-akhawa:tuha: The types of khabar that they have putting the khabar before the ism inna wa-akhawa:tuha: (meaning & function) The types of khabar that they have putting the khabar before the ism
May	Comparison between ka:na wa-akhawa:tuha and inna wa-akhawa:tuha:

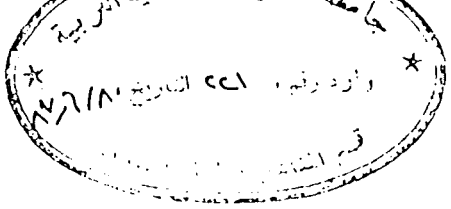
APPENDIX D

APPENDIX D

بسم الله الرحمن الرحيم

WAIT UNIVERSITY
OLLEGE OF EDUCATION
Department of Curriculum
and Instruction
uwait, P. O. Box No. 13281
Tel. No. 840207 – 840639

جامعة الكويت
كلية التربية
قسم المناهج وطرق التدريس
الكويت – ص.ب ١٣٢٨١ كيفان
تليفون : ٨٤٠٦٣٩ – ٨٤٠٢٠٧



رقم :

تاريخ : ١٩٨٧/٦/٧ م

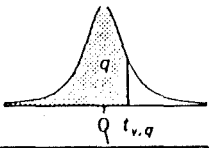
حضرة رئيس مركز الحاسب الآلي بجامعة الكويت المحترم

تحية طيبة وبعد ،

أرجو مساعدة معيد عضو البعثة : الأستاذ / نوري يوسف الوتار لاستخراج الاحصائيات على نظام " SPSSX " .

ولكم جزيل الشكـــــــر ،،،

3·1 the Student t distribution



ν \ q	0.600	0.700	0.750	0.800	0.850	0.900	0.925	0.950	0.975	0.990	0.995	0.999	.9995
1	0.325	0.727	1.000	1.376	1.963	3.078	4.165	6.314	12.71	31.82	63.66	318.3	636.6
2	0.289	0.617	0.816	1.061	1.386	1.886	2.282	2.920	4.303	6.965	9.925	22.33	31.60
3	0.277	0.584	0.765	0.978	1.250	1.638	1.924	2.353	3.182	4.541	5.841	10.21	12.92
4	0.271	0.569	0.741	0.941	1.190	1.533	1.778	2.132	2.776	3.747	4.604	7.173	8.610
5	0.267	0.559	0.727	0.920	1.156	1.476	1.699	2.015	2.571	3.365	4.032	5.893	6.869
6	0.265	0.553	0.718	0.906	1.134	1.440	1.650	1.943	2.447	3.143	3.707	5.208	5.959
7	0.263	0.549	0.711	0.896	1.119	1.415	1.617	1.895	2.365	2.998	3.499	4.785	5.408
8	0.262	0.546	0.706	0.889	1.108	1.397	1.592	1.860	2.306	2.896	3.355	4.501	5.041
9	0.261	0.543	0.703	0.883	1.100	1.383	1.574	1.833	2.262	2.821	3.250	4.297	4.781
10	0.260	0.542	0.700	0.879	1.093	1.372	1.559	1.812	2.228	2.764	3.169	4.144	4.587
11	0.260	0.540	0.697	0.876	1.088	1.363	1.548	1.796	2.201	2.718	3.106	4.025	4.437
12	0.259	0.539	0.695	0.873	1.083	1.356	1.538	1.782	2.179	2.681	3.055	3.930	4.318
13	0.259	0.538	0.694	0.870	1.079	1.350	1.530	1.771	2.160	2.650	3.012	3.852	4.221
14	0.258	0.537	0.692	0.868	1.076	1.345	1.523	1.761	2.145	2.624	2.977	3.787	4.140
15	0.258	0.536	0.691	0.866	1.074	1.341	1.517	1.753	2.131	2.602	2.947	3.733	4.073
16	0.258	0.535	0.690	0.865	1.071	1.337	1.512	1.746	2.120	2.583	2.921	3.686	4.015
17	0.257	0.534	0.689	0.863	1.069	1.333	1.508	1.740	2.110	2.567	2.898	3.646	3.965
18	0.257	0.534	0.688	0.862	1.067	1.330	1.504	1.734	2.101	2.552	2.878	3.610	3.922
19	0.257	0.533	0.688	0.861	1.066	1.328	1.500	1.729	2.093	2.539	2.861	3.579	3.883
20	0.257	0.533	0.687	0.860	1.064	1.325	1.497	1.725	2.086	2.528	2.845	3.552	3.850
21	0.257	0.532	0.686	0.859	1.063	1.323	1.494	1.721	2.080	2.518	2.831	3.527	3.819
22	0.256	0.532	0.686	0.858	1.061	1.321	1.492	1.717	2.074	2.508	2.819	3.505	3.792
23	0.256	0.532	0.685	0.858	1.060	1.319	1.489	1.714	2.069	2.500	2.807	3.485	3.768
24	0.256	0.531	0.685	0.857	1.059	1.318	1.487	1.711	2.064	2.492	2.797	3.467	3.745
25	0.256	0.531	0.684	0.856	1.058	1.316	1.485	1.708	2.060	2.485	2.787	3.450	3.725
26	0.256	0.531	0.684	0.856	1.058	1.315	1.483	1.706	2.056	2.479	2.779	3.435	3.707
27	0.256	0.531	0.684	0.855	1.057	1.314	1.482	1.703	2.052	2.473	2.771	3.421	3.690
28	0.256	0.530	0.683	0.855	1.056	1.313	1.480	1.701	2.048	2.467	2.763	3.408	3.674
29	0.256	0.530	0.683	0.854	1.055	1.311	1.479	1.699	2.045	2.462	2.756	3.396	3.659
30	0.256	0.530	0.683	0.854	1.055	1.310	1.477	1.697	2.042	2.457	2.750	3.385	3.646
31	0.256	0.530	0.682	0.853	1.054	1.309	1.476	1.696	2.040	2.453	2.744	3.375	3.633
32	0.255	0.530	0.682	0.853	1.054	1.309	1.475	1.694	2.037	2.449	2.738	3.365	3.622
33	0.255	0.530	0.682	0.853	1.053	1.308	1.474	1.692	2.035	2.445	2.733	3.356	3.611
34	0.255	0.529	0.682	0.852	1.052	1.307	1.473	1.691	2.032	2.441	2.728	3.348	3.601
35	0.255	0.529	0.682	0.852	1.052	1.306	1.472	1.690	2.030	2.438	2.724	3.340	3.591
36	0.255	0.529	0.681	0.852	1.052	1.306	1.471	1.688	2.028	2.434	2.719	3.333	3.582
37	0.255	0.529	0.681	0.851	1.051	1.305	1.470	1.687	2.026	2.431	2.715	3.326	3.574
38	0.255	0.529	0.681	0.851	1.051	1.304	1.469	1.686	2.024	2.429	2.712	3.319	3.566
39	0.255	0.529	0.681	0.851	1.050	1.304	1.468	1.685	2.023	2.426	2.708	3.313	3.558
40	0.255	0.529	0.681	0.851	1.050	1.303	1.468	1.684	2.021	2.423	2.704	3.307	3.551
45	0.255	0.528	0.680	0.850	1.049	1.301	1.465	1.679	2.014	2.412	2.690	3.281	3.520
50	0.255	0.528	0.679	0.849	1.047	1.299	1.462	1.676	2.009	2.403	2.678	3.261	3.496
60	0.254	0.527	0.679	0.848	1.045	1.296	1.458	1.671	2.000	2.390	2.660	3.232	3.460
70	0.254	0.527	0.678	0.847	1.044	1.294	1.456	1.667	1.994	2.381	2.648	3.211	3.435
80	0.254	0.526	0.678	0.846	1.043	1.292	1.453	1.664	1.990	2.374	2.639	3.195	3.416
90	0.254	0.526	0.677	0.846	1.042	1.291	1.452	1.662	1.987	2.368	2.632	3.183	3.402
100	0.254	0.526	0.677	0.845	1.042	1.290	1.451	1.660	1.984	2.364	2.626	3.174	3.390
120	0.254	0.526	0.677	0.845	1.041	1.289	1.449	1.658	1.980	2.358	2.617	3.160	3.373
150	0.254	0.526	0.676	0.844	1.040	1.287	1.447	1.655	1.976	2.351	2.609	3.145	3.357
∞	0.253	0.524	0.674	0.842	1.036	1.282	1.440	1.645	1.960	2.326	2.576	3.090	3.291

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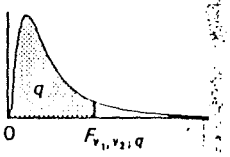


ν_2	q	ν_1 1	2	3	4	5	6	7	8	9	10	12	15	20	30	50	∞
1	.9	39.9	49.5	53.6	55.8	57.2	58.2	58.9	59.4	59.9	60.2	60.7	61.2	61.7	62.3	62.7	63.3
	.95	161	200	216	225	230	234	237	239	241	242	244	246	248	250	252	254
	.975	648	800	864	900	922	937	948	957	963	969	977	985	993	1001	1008	1018
	.990	4052	5000	5403	5625	5764	5859	5928	5981	6022	6056	6106	6157	6209	6261	6303	6366
	.995	1621	2000	2161	2250	2306	2344	2371	2393	2409	2422	2443	2463	2484	2504	2521	2546
	.999	4053	5000	5404	5625	5764	5859	5929	5981	6023	6056	6107	6158	6209	6261	6303	6366
		For ν_2 = 1: values for q = 0·995 should be multiplied by 10 values for q = 0·999 should be multiplied by 100															
2	.9	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38	9.39	9.41	9.42	9.44	9.46	9.47	9.49
	.95	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.5	19.5	19.5
	.975	38.5	39.0	39.2	39.2	39.3	39.3	39.4	39.4	39.4	39.4	39.4	39.4	39.4	39.5	39.5	39.5
	.990	98.5	99.0	99.2	99.2	99.3	99.3	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5
	.995	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199
	.999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999
3	.9	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24	5.23	5.22	5.20	5.18	5.17	5.15	5.13
	.95	10.1	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.62	8.58	8.53
	.975	17.4	16.0	15.4	15.1	14.9	14.7	14.6	14.5	14.5	14.4	14.3	14.3	14.2	14.1	14.0	13.9
	.990	34.1	30.8	29.5	28.7	28.2	27.9	27.7	27.5	27.3	27.2	27.1	26.9	26.7	26.5	26.4	26.1
	.995	55.6	49.8	47.5	46.2	45.4	44.8	44.4	44.1	43.9	43.7	43.4	43.1	42.8	42.5	42.2	41.8
	.999	167	149	141	137	135	133	132	131	130	129	128	127	126	125	125	123
4	.9	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94	3.92	3.90	3.87	3.84	3.82	3.80	3.76
	.95	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.75	5.70	5.63
	.975	12.2	10.6	9.98	9.60	9.36	9.20	9.07	8.98	8.90	8.84	8.75	8.66	8.56	8.46	8.38	8.26
	.990	21.2	18.0	16.7	16.0	15.5	15.2	15.0	14.8	14.7	14.5	14.4	14.2	14.0	13.8	13.7	13.5
	.995	31.3	26.3	24.3	23.2	22.5	22.0	21.6	21.4	21.1	21.0	20.7	20.4	20.2	19.9	19.7	19.3
	.999	74.1	61.2	56.2	53.4	51.7	50.5	49.7	49.0	48.5	48.1	47.4	46.8	46.1	45.4	44.9	44.1
5	.9	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32	3.30	3.27	3.24	3.21	3.17	3.15	3.10
	.95	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.50	4.44	4.36
	.975	10.0	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68	6.62	6.52	6.43	6.33	6.23	6.14	6.02
	.990	16.3	13.3	12.1	11.4	11.0	10.7	10.5	10.3	10.2	10.1	9.89	9.72	9.55	9.38	9.24	9.02
	.995	22.8	18.3	16.5	15.6	14.9	14.5	14.2	14.0	13.8	13.6	13.4	13.1	12.9	12.7	12.5	12.1
	.999	47.2	37.1	33.2	31.1	29.8	28.8	28.2	27.6	27.2	26.9	26.4	25.9	25.4	24.9	24.4	23.8
6	.9	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96	2.94	2.90	2.87	2.84	2.80	2.77	2.72
	.95	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.81	3.75	3.67
	.975	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52	5.46	5.37	5.27	5.17	5.07	4.98	4.85
	.990	13.7	10.9	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.72	7.56	7.40	7.23	7.09	6.88
	.995	18.6	14.5	12.9	12.0	11.5	11.1	10.8	10.6	10.4	10.3	10.0	9.81	9.59	9.36	9.17	8.88
	.999	35.5	27.0	23.7	21.9	20.8	20.0	19.5	19.0	18.7	18.4	18.0	17.6	17.1	16.7	16.3	15.7
7	.9	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72	2.70	2.67	2.63	2.59	2.56	2.52	2.47
	.95	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.38	3.32	3.23
	.975	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82	4.76	4.67	4.57	4.47	4.36	4.28	4.14
	.990	12.2	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.47	6.31	6.16	5.99	5.86	5.65
	.995	16.2	12.4	10.9	10.1	9.52	9.16	8.89	8.68	8.51	8.38	8.18	7.97	7.75	7.53	7.35	7.08
	.999	29.2	21.7	18.8	17.2	16.2	15.5	15.0	14.6	14.3	14.1	13.7	13.3	12.9	12.5	12.2	11.7
8	.9	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56	2.54	2.50	2.46	2.42	2.38	2.35	2.29
	.95	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.08	3.02	2.93
	.975	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36	4.30	4.20	4.10	4.00	3.89	3.81	3.67
	.990	11.3	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.67	5.52	5.36	5.20	5.07	4.86
	.995	14.7	11.0	9.60	8.81	8.30	7.95	7.69	7.50	7.34	7.21	7.01	6.81	6.61	6.40	6.22	5.95
	.999	25.4	18.5	15.8	14.4	13.5	12.9	12.4	12.0	11.8	11.5	11.2	10.8	10.5	10.1	9.80	9.33

ν_2	q	ν_1 1	2	3	4	5	6	7	8	9	10	12	15	20	30	50	∞
9	.9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44	2.42	2.38	2.34	2.30	2.25	2.22	2.16
	.95	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.86	2.80	2.71
	.975	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03	3.96	3.87	3.77	3.67	3.56	3.47	3.33
	.990	10.6	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.11	4.96	4.81	4.65	4.52	4.31
	.995	13.6	10.1	8.72	7.96	7.47	7.13	6.88	6.69	6.54	6.42	6.23	6.03	5.83	5.62	5.45	5.19
	.999	22.9	16.4	13.9	12.6	11.7	11.1	10.7	10.4	10.1	9.89	9.57	9.24	8.90	8.55	8.26	7.81
10	.9	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35	2.32	2.28	2.24	2.20	2.16	2.12	2.06
	.95	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.70	2.64	2.54
	.975	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78	3.72	3.62	3.52	3.42	3.31	3.22	3.08
	.990	10.0	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.71	4.56	4.41	4.25	4.12	3.91
	.995	12.8	9.43	8.08	7.34	6.87	6.54	6.30	6.12	5.97	5.85	5.66	5.47	5.27	5.07	4.90	4.64
	.999	21.0	14.9	12.6	11.3	10.5	9.93	9.52	9.20	8.96	8.75	8.45	8.13	7.80	7.47	7.19	6.76
11	.9	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27	2.25	2.21	2.17	2.12	2.08	2.04	1.97
	.95	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.57	2.51	2.40
	.975	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59	3.53	3.43	3.33	3.23	3.12	3.03	2.88
	.990	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.40	4.25	4.10	3.94	3.81	3.60
	.995	12.2	8.91	7.60	6.88	6.42	6.10	5.86	5.68	5.54	5.42	5.24	5.05	4.86	4.65	4.49	4.23
	.999	19.7	13.8	11.6	10.3	9.58	9.05	8.66	8.35	8.12	7.92	7.63	7.32	7.01	6.68	6.42	6.00
12	.9	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21	2.19	2.15	2.10	2.06	2.01	1.97	1.90
	.95	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.47	2.40	2.30
	.975	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44	3.37	3.28	3.18	3.07	2.96	2.87	2.72
	.990	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.16	4.01	3.86	3.70	3.57	3.36
	.995	11.8	8.51	7.23	6.52	6.07	5.76	5.52	5.35	5.20	5.09	4.91	4.72	4.53	4.33	4.17	3.90
	.999	18.6	13.0	10.8	9.63	8.89	8.38	8.00	7.71	7.48	7.29	7.00	6.71	6.40	6.09	5.83	5.42
13	.9	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14	2.10	2.05	2.01	1.96	1.92	1.85
	.95	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.38	2.31	2.21
	.975	6.41	4.97	4.35	4.00	3.77	3.60	3.48	3.39	3.31	3.25	3.15	3.05	2.95	2.84	2.74	2.60
	.990	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.96	3.82	3.66	3.51	3.38	3.17
	.995	11.4	8.19	6.93	6.23	5.79	5.48	5.25	5.08	4.94	4.82	4.64	4.46	4.27	4.07	3.91	3.65
	.999	17.8	12.3	10.2	9.07	8.35	7.86	7.49	7.21	6.98	6.80	6.52	6.23	5.93	5.63	5.37	4.97
14	.9	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10	2.05	2.01	1.96	1.91	1.87	1.80
	.95	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.31	2.24	2.13
	.975	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.21	3.15	3.05	2.95	2.84	2.73	2.64	2.49
	.990	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.80	3.66	3.51	3.35	3.22	3.00
	.995	11.1	7.92	6.68	6.00	5.56	5.26	5.03	4.86	4.72	4.60	4.43	4.25	4.06	3.86	3.70	3.44
	.999	17.1	11.8	9.73	8.62	7.92	7.44	7.08	6.80	6.58	6.40	6.13	5.85	5.56	5.25	5.00	4.60
15	.9	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06	2.02	1.97	1.92	1.87	1.83	1.76
	.95	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.25	2.18	2.07
	.975	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12	3.06	2.96	2.86	2.76	2.64	2.55	2.40
	.990	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.67	3.52	3.37	3.21	3.08	2.87
	.995	10.8	7.70	6.48	5.80	5.37	5.07	4.85	4.67	4.54	4.42	4.25	4.07	3.88	3.69	3.52	3.26
	.999	16.6	11.3	9.34	8.25	7.57	7.09	6.74	6.47	6.26	6.08	5.81	5.54	5.25	4.95	4.70	4.31
16	.9	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06	2.03	1.99	1.94	1.89	1.84	1.79	1.72
	.95	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.19	2.12	2.01
	.975	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	3.05	2.99	2.89	2.79	2.68	2.57	2.47	2.32
	.990	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.55	3.41	3.26	3.10	2.97	2.75
	.995	10.6	7.51	6.30	5.64	5.21	4.91	4.69	4.52	4.38	4.27	4.10	3.92	3.73	3.54	3.37	3.11
	.999	16.1	11.0	9.01	7.94	7.27	6.80	6.46	6.19	5.98	5.81	5.55	5.27	4.99	4.70	4.45	4.06
17	.9	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03	2.00	1.96	1.91	1.86	1.81	1.76	1.69
	.95	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.15	2.08	1.96
	.975	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98	2.92	2.82	2.72	2.62	2.50	2.41	2.25
	.990	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.46	3.31	3.16	3.00	2.87	2.65
	.995	10.4	7.35	6.16	5.50	5.07	4.78	4.56	4.39	4.25	4.14	3.97	3.79	3.61	3.41	3.25	2.98
	.999	15.7	10.7	8.73	7.68	7.02	6.56	6.22	5.96	5.75	5.58	5.32	5.05	4.78	4.48	4.24	3.85

ν_2	q	ν_1 1	2	3	4	5	6	7	8	9	10	12	15	20	30	50	∞
18	.9	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98	1.93	1.89	1.84	1.78	1.74	1.66
	.95	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.11	2.04	1.92
	.975	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87	2.77	2.67	2.56	2.44	2.35	2.19
	.990	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.37	3.23	3.08	2.92	2.78	2.57
	.995	10.2	7.21	6.03	5.37	4.96	4.66	4.44	4.28	4.14	4.03	3.86	3.68	3.50	3.30	3.14	2.87
	.999	15.4	10.4	8.49	7.46	6.81	6.35	6.02	5.76	5.56	5.39	5.13	4.87	4.59	4.30	4.06	3.67
19	.9	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96	1.91	1.86	1.81	1.76	1.71	1.63
	.95	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.07	2.00	1.88
	.975	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88	2.82	2.72	2.62	2.51	2.39	2.30	2.13
	.990	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.30	3.15	3.00	2.84	2.71	2.49
	.995	10.1	7.09	5.92	5.27	4.85	4.56	4.34	4.18	4.04	3.93	3.76	3.59	3.40	3.21	3.04	2.78
	.999	15.1	10.2	8.28	7.27	6.62	6.18	5.85	5.59	5.39	5.22	4.97	4.70	4.43	4.14	3.90	3.51
20	.9	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94	1.89	1.84	1.79	1.74	1.69	1.61
	.95	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.04	1.97	1.84
	.975	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84	2.77	2.68	2.57	2.46	2.35	2.25	2.09
	.990	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37	3.23	3.09	2.94	2.78	2.64	2.42
	.995	9.94	6.99	5.82	5.17	4.76	4.47	4.26	4.09	3.96	3.85	3.68	3.50	3.32	3.12	2.96	2.69
	.999	14.8	9.95	8.10	7.10	6.46	6.02	5.69	5.44	5.24	5.08	4.82	4.56	4.29	4.00	3.77	3.38
21	.9	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92	1.87	1.83	1.78	1.72	1.67	1.59
	.95	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.01	1.94	1.81
	.975	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80	2.73	2.64	2.53	2.42	2.31	2.21	2.04
	.990	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.17	3.03	2.88	2.72	2.58	2.36
	.995	9.83	6.89	5.73	5.09	4.68	4.39	4.18	4.01	3.88	3.77	3.60	3.43	3.24	3.05	2.88	2.61
	.999	14.6	9.77	7.94	6.95	6.32	5.88	5.56	5.31	5.11	4.95	4.70	4.44	4.17	3.88	3.64	3.26
22	.9	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90	1.86	1.81	1.76	1.70	1.65	1.57
	.95	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	1.98	1.91	1.78
	.975	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76	2.70	2.60	2.50	2.39	2.27	2.17	2.00
	.990	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.12	2.98	2.83	2.67	2.53	2.31
	.995	9.73	6.81	5.65	5.02	4.61	4.32	4.11	3.94	3.81	3.70	3.54	3.36	3.18	2.98	2.82	2.55
	.999	14.4	9.61	7.80	6.81	6.19	5.76	5.44	5.19	4.99	4.83	4.58	4.33	4.06	3.78	3.54	3.15
23	.9	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92	1.89	1.84	1.80	1.74	1.69	1.64	1.55
	.95	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	1.96	1.88	1.76
	.975	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73	2.67	2.57	2.47	2.36	2.24	2.14	1.97
	.990	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.07	2.93	2.78	2.62	2.48	2.26
	.995	9.63	6.73	5.58	4.95	4.54	4.26	4.05	3.88	3.75	3.64	3.47	3.30	3.12	2.92	2.76	2.48
	.999	14.2	9.47	7.67	6.70	6.08	5.65	5.33	5.09	4.89	4.73	4.48	4.23	3.96	3.68	3.44	3.05
24	.9	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91	1.88	1.83	1.78	1.73	1.67	1.62	1.53
	.95	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.94	1.86	1.73
	.975	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70	2.64	2.54	2.44	2.33	2.21	2.11	1.94
	.990	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.03	2.89	2.74	2.58	2.44	2.21
	.995	9.55	6.66	5.52	4.89	4.49	4.20	3.99	3.83	3.69	3.59	3.42	3.25	3.06	2.87	2.70	2.43
	.999	14.0	9.34	7.55	6.59	5.98	5.55	5.23	4.99	4.80	4.64	4.39	4.14	3.87	3.59	3.36	2.97
25	.9	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89	1.87	1.82	1.77	1.72	1.66	1.61	1.52
	.95	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.92	1.84	1.71
	.975	5.69	4.29	3.69	3.35	3.13	2.97	2.85	2.75	2.68	2.61	2.51	2.41	2.30	2.18	2.08	1.91
	.990	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13	2.99	2.85	2.70	2.54	2.40	2.17
	.995	9.48	6.60	5.46	4.84	4.43	4.15	3.94	3.78	3.64	3.54	3.37	3.20	3.01	2.82	2.65	2.38
	.999	13.9	9.22	7.45	6.49	5.89	5.46	5.15	4.91	4.71	4.56	4.31	4.06	3.79	3.52	3.28	2.89
30	.9	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82	1.77	1.72	1.67	1.61	1.55	1.46
	.95	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.84	1.76	1.62
	.975	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51	2.41	2.31	2.20	2.07	1.97	1.79
	.990	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84	2.70	2.55	2.39	2.25	2.01
	.995	9.18	6.35	5.24	4.62	4.23	3.95	3.74	3.58	3.45	3.34	3.18	3.01	2.82	2.63	2.46	2.18
	.999	13.3	8.77	7.05	6.12	5.53	5.12	4.82	4.58	4.39	4.24	4.00	3.75	3.49	3.22	2.98	2.59

ν_2	q	ν_1 1	2	3	4	5	6	7	8	9	10	12	15	20	30	50	∞
35	.9	2.85	2.46	2.25	2.11	2.02	1.95	1.90	1.85	1.82	1.79	1.74	1.69	1.63	1.57	1.51	1.41
	.95	4.12	3.27	2.87	2.64	2.49	2.37	2.29	2.22	2.16	2.11	2.04	1.96	1.88	1.79	1.70	1.56
	.975	5.48	4.11	3.52	3.18	2.96	2.80	2.68	2.58	2.50	2.44	2.34	2.23	2.12	2.00	1.89	1.70
	.990	7.42	5.27	4.40	3.91	3.59	3.37	3.20	3.07	2.96	2.88	2.74	2.60	2.44	2.28	2.14	1.89
	.995	8.98	6.19	5.09	4.48	4.09	3.81	3.61	3.45	3.32	3.21	3.05	2.88	2.69	2.50	2.33	2.04
	.999	12.9	8.47	6.79	5.88	5.30	4.89	4.59	4.36	4.18	4.03	3.79	3.55	3.29	3.02	2.78	2.38
40	.9	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76	1.71	1.66	1.61	1.54	1.48	1.38
	.95	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.74	1.66	1.51
	.975	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39	2.29	2.18	2.07	1.94	1.83	1.64
	.990	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.66	2.52	2.37	2.20	2.06	1.80
	.995	8.83	6.07	4.98	4.37	3.99	3.71	3.51	3.35	3.22	3.12	2.95	2.78	2.60	2.40	2.23	1.93
	.999	12.6	8.25	6.59	5.70	5.13	4.73	4.44	4.21	4.02	3.87	3.64	3.40	3.14	2.87	2.64	2.23
45	.9	2.82	2.42	2.21	2.07	1.98	1.91	1.85	1.81	1.77	1.74	1.70	1.64	1.58	1.52	1.46	1.35
	.95	4.06	3.20	2.81	2.58	2.42	2.31	2.22	2.15	2.10	2.05	1.97	1.89	1.81	1.71	1.63	1.47
	.975	5.38	4.01	3.42	3.09	2.86	2.70	2.58	2.49	2.41	2.35	2.25	2.14	2.03	1.90	1.79	1.59
	.990	7.23	5.11	4.25	3.77	3.45	3.23	3.07	2.94	2.83	2.74	2.61	2.46	2.31	2.14	2.00	1.74
	.995	8.71	5.97	4.89	4.29	3.91	3.64	3.43	3.28	3.15	3.04	2.88	2.71	2.53	2.33	2.16	1.85
	.999	12.4	8.09	6.45	5.56	5.00	4.61	4.32	4.09	3.91	3.76	3.53	3.29	3.04	2.76	2.53	2.12
50	.9	2.81	2.41	2.20	2.06	1.97	1.90	1.84	1.80	1.76	1.73	1.68	1.63	1.57	1.50	1.44	1.33
	.95	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.03	1.95	1.87	1.78	1.69	1.60	1.44
	.975	5.34	3.97	3.39	3.05	2.83	2.67	2.55	2.46	2.38	2.32	2.22	2.11	1.99	1.87	1.75	1.55
	.990	7.17	5.06	4.20	3.72	3.41	3.19	3.02	2.89	2.78	2.70	2.56	2.42	2.27	2.10	1.95	1.68
	.995	8.63	5.90	4.83	4.23	3.85	3.58	3.38	3.22	3.09	2.99	2.82	2.65	2.47	2.27	2.10	1.79
	.999	12.2	7.96	6.34	5.46	4.90	4.51	4.22	4.00	3.82	3.67	3.44	3.20	2.95	2.68	2.44	2.03
60	.9	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71	1.66	1.60	1.54	1.48	1.41	1.29
	.95	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.65	1.56	1.39
	.975	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27	2.17	2.06	1.94	1.82	1.70	1.48
	.990	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35	2.20	2.03	1.88	1.60
	.995	8.49	5.79	4.73	4.14	3.76	3.49	3.29	3.13	3.01	2.90	2.74	2.57	2.39	2.19	2.01	1.69
	.999	12.0	7.77	6.17	5.31	4.76	4.37	4.09	3.86	3.69	3.54	3.32	3.08	2.83	2.55	2.32	1.89
80	.9	2.77	2.37	2.15	2.02	1.92	1.85	1.79	1.75	1.71	1.68	1.63	1.57	1.51	1.44	1.38	1.24
	.95	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06	2.00	1.95	1.88	1.79	1.70	1.60	1.51	1.32
	.975	5.22	3.86	3.28	2.95	2.73	2.57	2.45	2.35	2.28	2.21	2.11	2.00	1.88	1.75	1.63	1.40
	.990	6.96	4.88	4.04	3.56	3.26	3.04	2.87	2.74	2.64	2.55	2.42	2.27	2.12	1.94	1.79	1.49
	.995	8.33	5.67	4.61	4.03	3.65	3.39	3.19	3.03	2.91	2.80	2.64	2.47	2.29	2.08	1.90	1.56
	.999	11.7	7.54	5.97	5.12	4.58	4.20	3.92	3.70	3.53	3.39	3.16	2.93	2.68	2.41	2.16	1.72
100	.9	2.76	2.36	2.14	2.00	1.91	1.83	1.78	1.73	1.69	1.66	1.61	1.56	1.49	1.42	1.35	1.21
	.95	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.97	1.93	1.85	1.77	1.68	1.57	1.48	1.28
	.975	5.18	3.83	3.25	2.92	2.70	2.54	2.42	2.32	2.24	2.18	2.08	1.97	1.85	1.71	1.59	1.35
	.990	6.90	4.82	3.98	3.51	3.21	2.99	2.82	2.69	2.59	2.50	2.37	2.22	2.07	1.89	1.74	1.43
	.995	8.24	5.59	4.54	3.96	3.59	3.33	3.13	2.97	2.85	2.74	2.58	2.41	2.23	2.02	1.84	1.49
	.999	11.5	7.41	5.86	5.02	4.48	4.11	3.83	3.61	3.44	3.30	3.07	2.84	2.59	2.32	2.08	1.62
120	.9	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68	1.65	1.60	1.55	1.48	1.41	1.34	1.19
	.95	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.55	1.46	1.25
	.975	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22	2.16	2.05	1.94	1.82	1.69	1.56	1.31
	.990	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19	2.03	1.86	1.70	1.38
	.995	8.18	5.54	4.50	3.92	3.55	3.28	3.09	2.93	2.81	2.71	2.54	2.37	2.19	1.98	1.80	1.43
	.999	11.4	7.32	5.78	4.95	4.42	4.04	3.77	3.55	3.38	3.24	3.02	2.78	2.53	2.26	2.02	1.54
∞	.9	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63	1.60	1.55	1.49	1.42	1.34	1.26	1.00
	.95	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.46	1.35	1.00
	.975	5.02	3.69	3.12	2.79	2.57	2.41	2.29	2.19	2.11	2.05	1.94	1.83	1.71	1.57	1.43	1.00
	.990	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04	1.88	1.70	1.52	1.00
	.995	7.88	5.30	4.28	3.72	3.35	3.09	2.90	2.74	2.62	2.52	2.36	2.19	2.00	1.79	1.59	1.00
	.999	10.8	6.91	5.42	4.62	4.10	3.74	3.47	3.27	3.10	2.96	2.74	2.51	2.27	1.99	1.73	1.00

APPENDIX E

APPENDIX E-1

إلـــــى : السيد محمد الشارخ
مـــــن : نديم الخليلـــي
التاريخ: ٨٦/١٢/١٧
الموضوع: تحليل وقتي وحجم لبرنامج د. نوري (القواعد العربية)

١) كما هو موضح بالمخطط المرفق، فإن برنامج د. نوري مقسم إلى ٧ أقسام رئيسية، وهناك بعض الأقسام الرئيسية مجزئة إلى أقسام فرعية.

٢) كل قسم من هذه الأقسام مقسم إلى [شرح/تمارين] ما عدا التمارين العامة.

٣) عدد صفحات السيناريو المتوقعة لكل قسم مبينة بالمخطط (ش:شرح/ت:تمارين) ومجموعها هو:

١- ش : شرح : ١٠٥ صفحات
٢- ت : تمرين: ١٠٧ صفحة

٤) كل صفحة من صفحات السيناريو التي سوف يقدمها د. نوري، تعادل عند ادخالها لصاد حوالي :-

١- ش : شرح : (من ١ إلى ٢) صفحة
٢- ت : تمرين: (من ٤ إلى ٥) صفحة

٥) أقل حجم متوقع لكل شاشة من هذه الشاشات على صاد هو 1-K وأكبر حجم متوقع هو 3-k .

٦) حجم الرسومات من ٢٠ - ٣٠ - K.

٧) حجم برنامج د. نوري هو: (K - 800 على الأقل).

٨) الوقت الزمنـــي :-

١- مراجعة عامة	
٢- الجملة الفعلية	(٣ أيام)
٣- كلمات ملونة	
٤- الفعل	(٣ أيام)
٥- الفاعل	(٤ أيام)
٦- المفعول به	(٢ يوم)
٧- اختبارات	(١ يوم)
** مراجعة + تعديلات	(١٠ أيام)

المجموع : ٢٣ يوم

ملاحظة : ١) يبدأ العمل بهذا الجدول اعتبارا من تاريخ ١٩٨٦/١٢/١٨.

٢) هناك ثلاث أنواع لتخزين مواد الدروس وهي :-

١- كارتردج (اقتراح د. نوري)
٢- قرص واحد (حجم الدروس < ٧٢٠)
٣- قرصين (حجم الدروس > ٧٢٠)

GRP-SCR #	SIZE	DESCRIPTION	GRP#	X	Y	BG.	مدرسي
5Φ	٥×٤	ولد اتجاهه لليمين	١١٠			١٢	مفصل
ΦΦ	٥×٤	نفس الولد اتجاهه لليمين (سناب)	١١١			١٢	//
Φ1	٥×٤	ولد ينظر للأمام	١١٢			١٢	"
Φ1	٥×٤	نفس الولد ينظر للأمام ولكنه قافز (سناب)	١١٣			١٢	"
Φ2	٣×٣	قضيب مسافة وعليه يد	١٧٠			١٢	"
Φ3	٩×٨	ولد وعليه سحابة بها ولد ويأكل (يفكر)	٢٤٠			١٢	"
Φ4	٩×٨	ولد وعليه سحابة بها ولد يلعب كرة (يفكر)	٢٦٠			١٢	"
Φ5	٤×٥	ولد لليمين - يحمل كأس ماء	١٨٠			١٢	"
Φ5	٤×٥	نفس الولد لليمين يشرب الماء (سناب)	١٨١			١٢	"
Φ6	٧×٨	شجرة عليها قرد	٢٠٠			١٢	"
Φ7	٤×٤	جندي لليمين	٢٠٥			١٢	"
Φ7	٤×٤	جندي لليمين (يتحرك) سناب	٢٠٦			١٢	"
1Φ8	٤×٢	ولد بالاتجاه يمين	٢٢٠			١٢	"
1Φ8	٤×٢	" " يتحرك (سناب	٢٢١			١٢	"
		~~ولد يسبح~~					
1Φ9	٤×٤	ولد يسبح	١٤٢			١٢	العقلية
1Φ9	٤×٤	ولد يسبح (سناب	١٤٥			١٢	
1Φ9	٤×٤	مربع لونه أخضر	١٤٦			١٢	
11Φ	٤×٤	ولد معه تفاحة	١٥٠			١٢	
11Φ	٤×٤	ولد أكل التفاحة (سناب)	١٥١			١٢	
111	٤×٥	جمل عليه المقاعد	١٦٠				
111	٤×٥	" " (سناب)	١٦١				

SCR #	SIZE	DESCRIPTION	GRP#	X	Y	BG.	الدرس
2	٥X٤	رجل	١٠١			١٢	راهبة كاتة
12	٥X٤	قطة	١٠٣			١٢	
12	٥X٤	وردة	١٠٢			١٢	
12	٥X٤	طاولة	١٠٤			١٢	
2	٥X٤	ولد يصيد سلم	١١٠			١٢	
2	٥X٥	: : : أسنان	١١١			١٢	
13	٢X٢	يد	١١٦			١٢	
3	٢X٢	ولد	١١٧			١٢	
3	٢X٢	بنت	١١٥			١٢	
4	٨X٢٢	رسة طبيعة	١٢٠			١٢	
15	٢X٢	كرة					
15	٩X٥	هندي تحل لا اله الا الله					
5	~~٣X٢~~	ولد					
6	٦X٩	حصان	٢٠١			١٢	الفاعل
16	٨X٩	حصان عليه ولد	٢٠٤				
16	٧X٧	ولد حامل لافتة [أنا الفاعل]	٢٠٥				
7	٥X٦	رجل حامل تأسي لأعلى	٢٠٠				
7	٥X٦	: : : لأسفل	٢٠١				
7	٦X٤	سجرة	٢٠٢				
8	٥X٥	حصان	١٢٠				
8	٥X٥	سجرة	١٢١				
8	٥X٥	رجل	١٢٢				
8	٥X٥	كرة	١٢٣				
9	٥X٤	امرأة كورية	٢٠٠				
10	٢X٢	سلم رافع يدين	٢٠١				
10	٢X٢	مدرسة كورية	٢٠٢				
11	٢X٢	سلحفاة ترفع يديها	٢٠٤				

?/1	GRP-SER #	SIZE	DESCRIPTION	GRP#	X	Y	BG.	C
18	121	٢x٢	مدرسة كويتية	٢٤١			١٢	
9	122	٢x٢	كتاب	٢٧٢			١٢	
							F | B	
0	123	٢x٦	صورة المفرد	٩٠٧			١ | ١٠	
1	123	٢x٦	تصغيراى	٩٠٨			١٥ | ١	
2	123	٢x٦	صور ١٥ جمع	٩٠٩			١ | ٢	
3	123	٢x٤	جندي					
4	123	٢x٤	رجل	٩٠١				
5	123	٢x٤	قلم	٩١٥				
6	123	٢x٤	كتاب	٩٠٢				
7	124	٥x٥	رجل واقف	٨٠٣				ولابه
8	124	٥x٥	" ساجد	٨٠٤				
9	125	٤x٥	حصان	٨٠١				
0	125	٤x٥	تفاحة	٨٠٢				
			~~كأس~~					
11	126	٥x٦	رجل يعطي كأس	٨٠٣				
2	127	٤x٦	مدرسة كويتية (مع المعلم)	١١٥			٧ | ١٢	
2	127	٢x٢	ولد	٦٠٢			٦ | ١٢	
3	127	٤x٦	مدرس يحمل عصاة	٩١٠				
4	128	٤x٤	جندي يحمل بندقية (الاتجاه للبيت)	٩١٤				
5	128	٤x٤	جندي (سباب)	٩١٧				

APPENDIX F

APPENDIX F-1

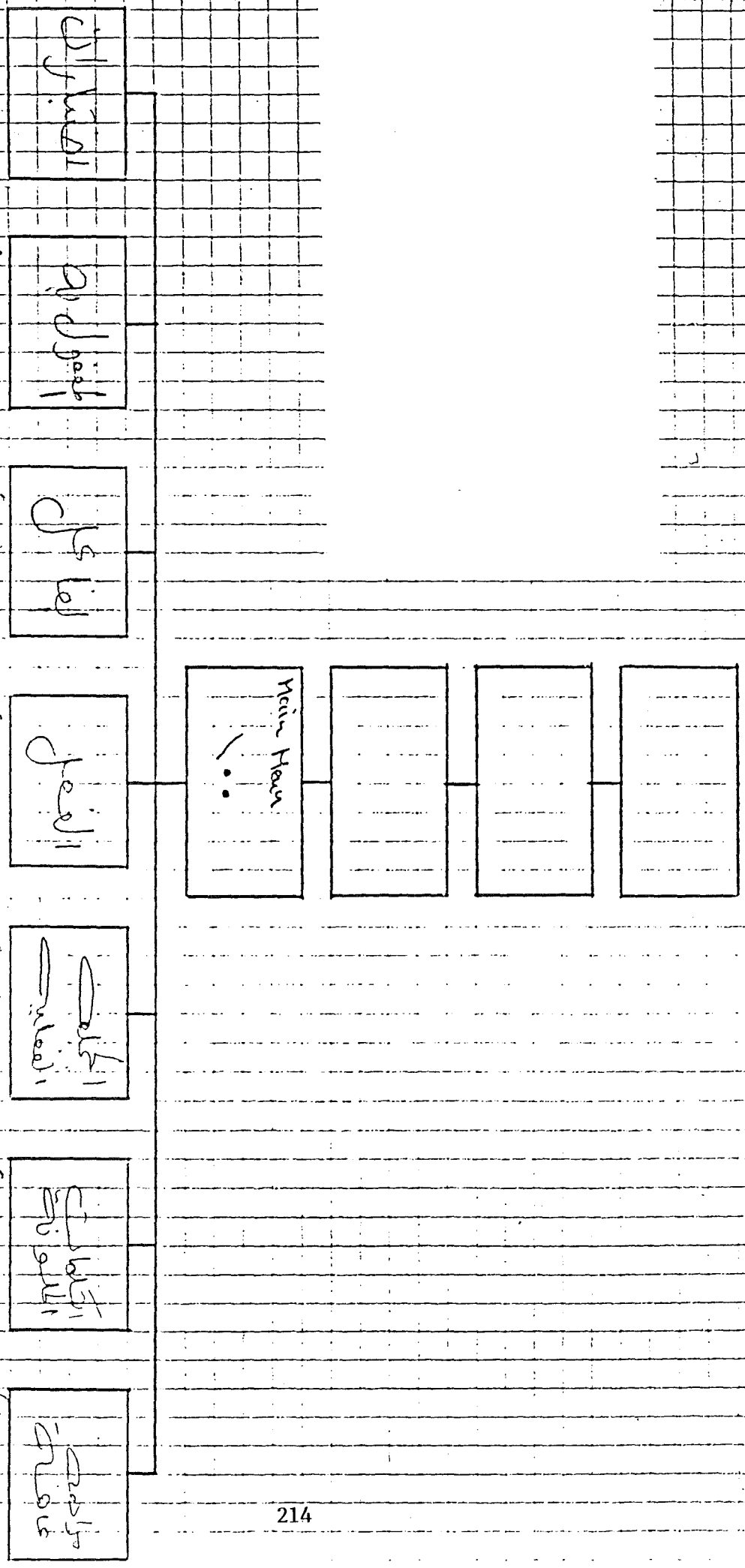
BASIC Language Commands

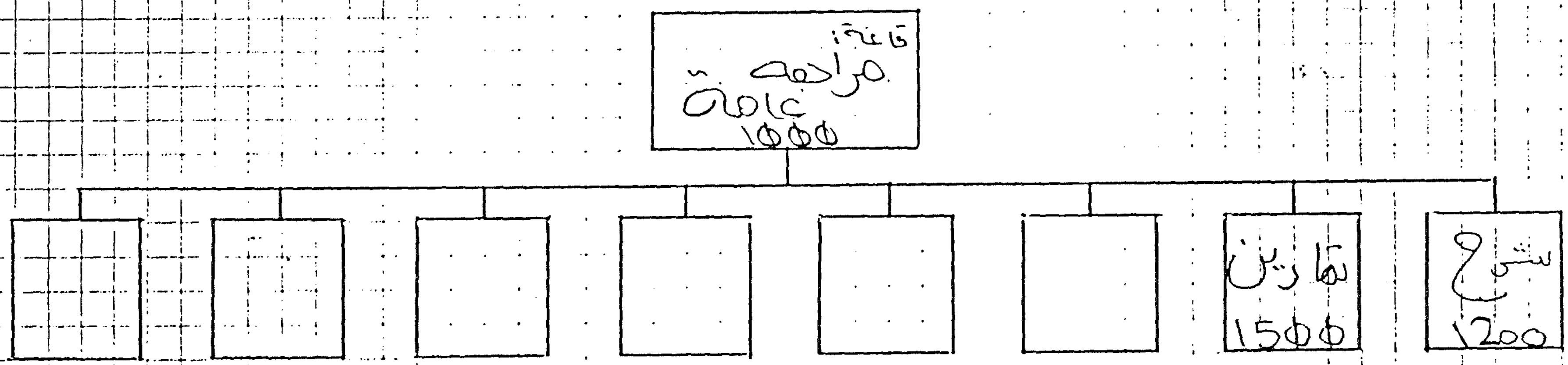
ABS(n)
AND
ASC
ATN(n)
AUTO
BEEP
CDBL(n)
CHR$(x)
CINT(n)
CIRCLE
CLICK
CLS
COLOR
CONT
COS(n)
CSNG(n)
Ctrl/Stop Key
Cursor Controls
DATA
DEF
DELETE
DIM
DIV
DRAW
Else
End
Erase
EXP(n)
FIX(n)
For Next
FRE
Get
Gosub
Goto
Graphs
HEX$
If Go Else
If Then Else
Inkey$
Input
Input$(n)
Instr
INT(n)
Key click
Key List
LEFT$
Len(x$)
Let
Line
List
LList
Load
Locate
LOG(n)
MID$
Motoroff
Motoron
New
Next
OCT$
On Interval
On Error
On Gosub
on sprite
on stopwidth
orxor
paint
play
point
preset
print
print TAB
pset
put
put sprite(n)
Read
Rem
Renam
Return
Right$
RND
RUN
Save
Screen
SGN(n)
SIN(n)
Sound
Sound off
Sound on
Space$
SPC(n)
Sprite$
SQR(n)
Step
Stop
Stop Key
Stop on
STR$
String$
Swap
TAB(n)
TAN(n)
Then
Tone
Troff
Tron
VAL
VAL(n$)

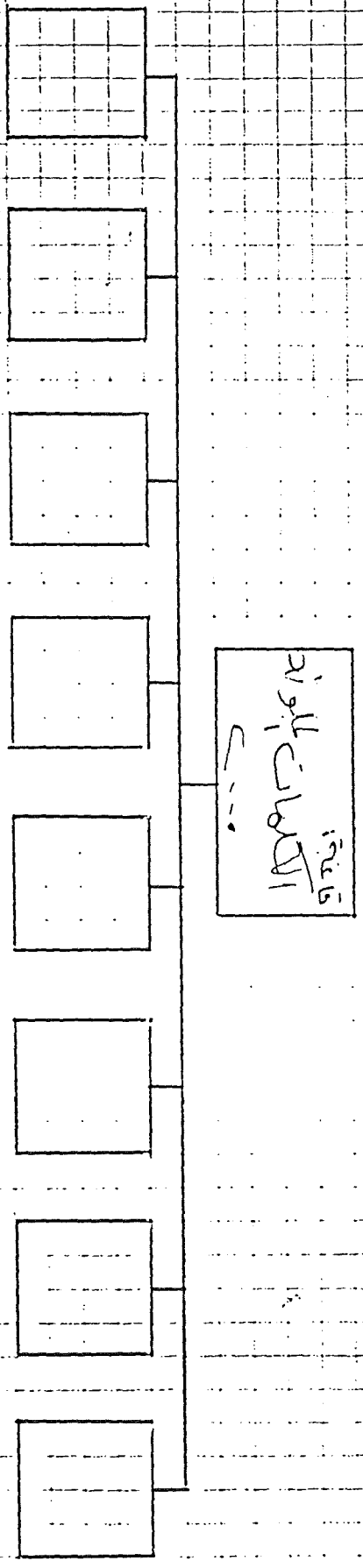
APPENDIX F-2

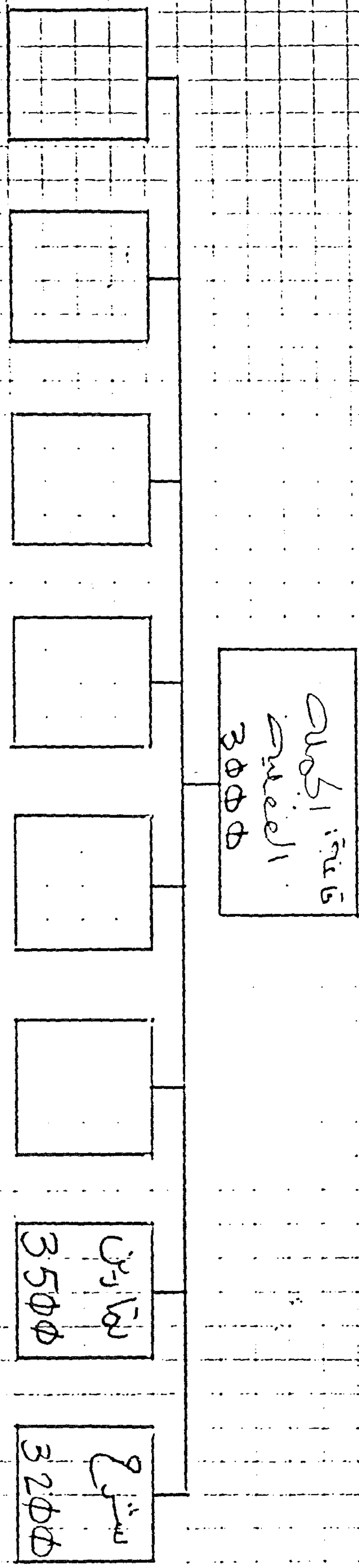
Authoring Language Commands

Accompanied Sound
Additional Text
Branching
Coloring
Coloring of Thirds
Erase Codes
ESC
F1 = Screen Foreground
F2 = Screen Background
F3 = Screen Border
Fill in the Blank
Flashing Cursor
Flashing Text
Function Keys
Graphics
Graphs Animation
Identification Screen
Lesson & Paragraph
Load
Matching of Two Lists
Menu Screen
Multiple Choice
Music
Question & Answers
Ranking a List
Return
Screen sections
Select
Select from a List
Text Screen
The Editor
Title Screen
Transfer (Timer)
True or False
Types of Fonts
Types of Thirds

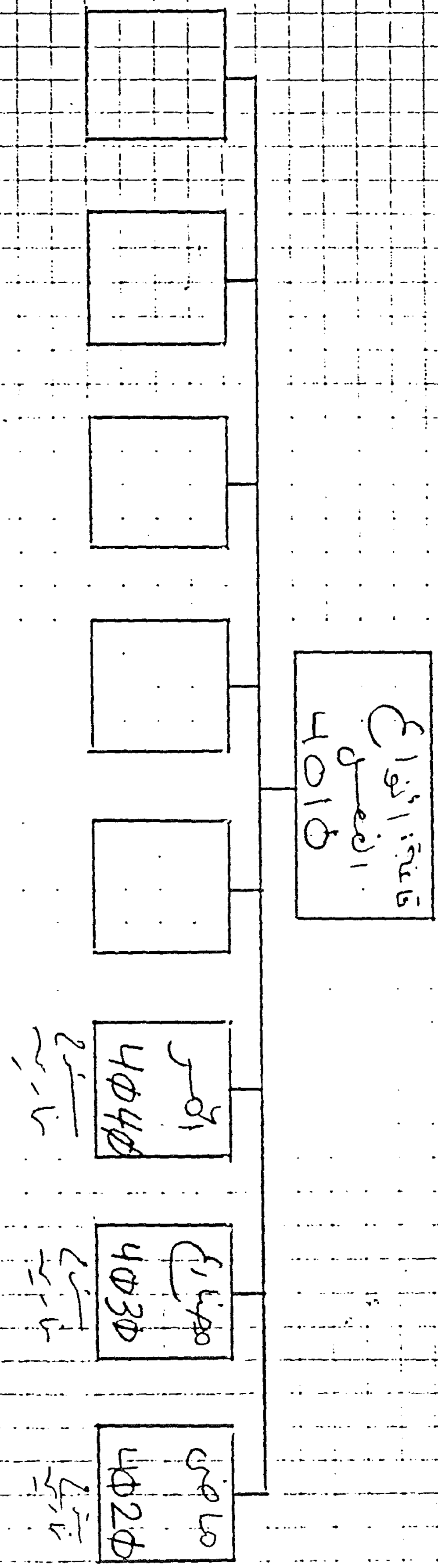

Main Menu

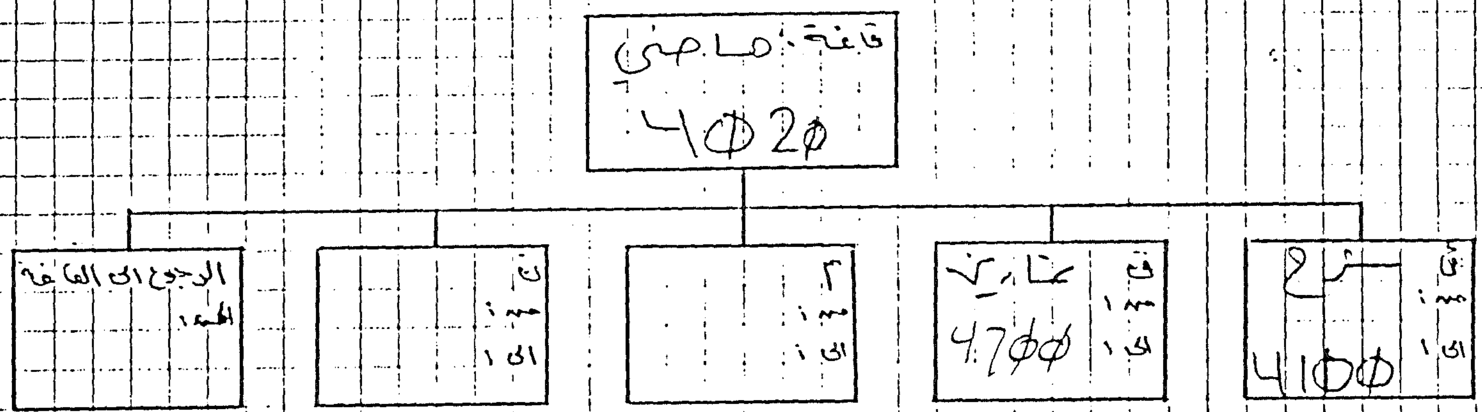

قاعة:
مراجعة عامة
1000
تمارين
1500
شرح
1200

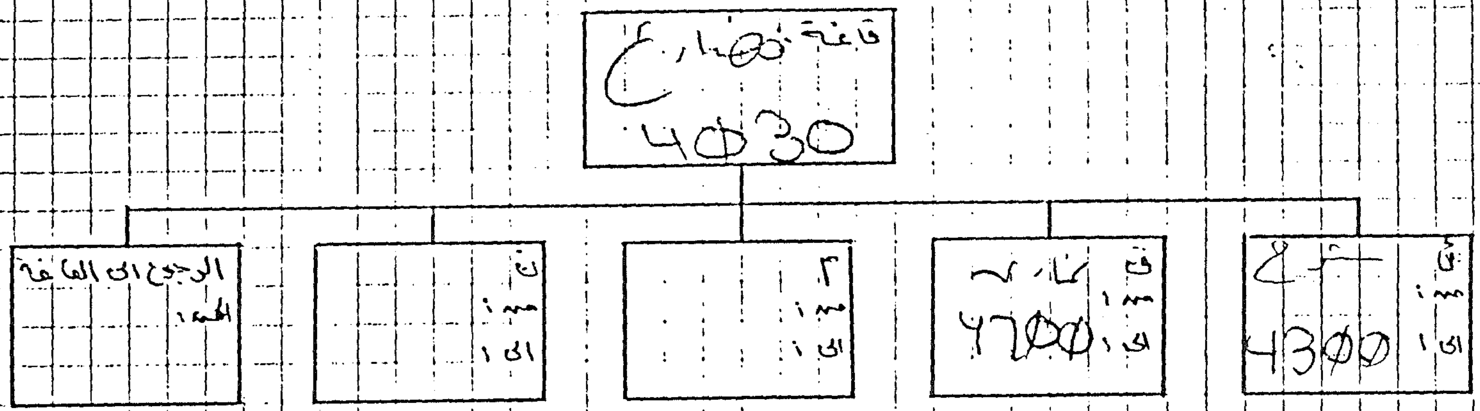

قائمة الكلمات الجديدة


قاعدة الجملة الفعلية
3000
شرح
3200
تمارين
3500

درس ٤٥


قاعدة أنواع الفعل
4010
ماضي
4020
مضارع
4030
أمر
4040


قائمة: ماضي
4020
4700
4100
الرجوع الى القائمة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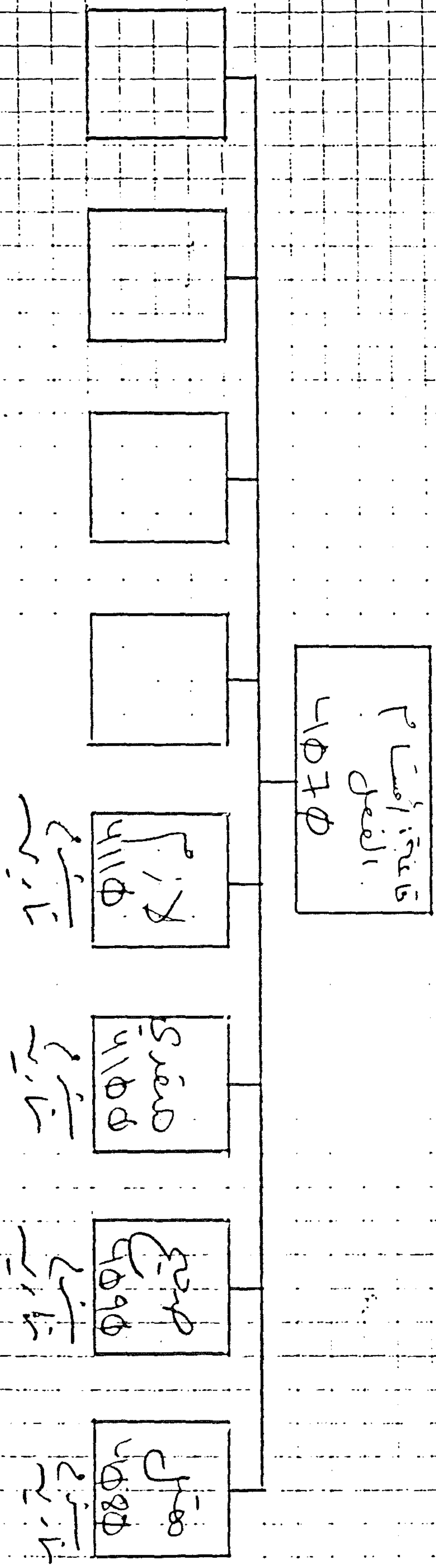

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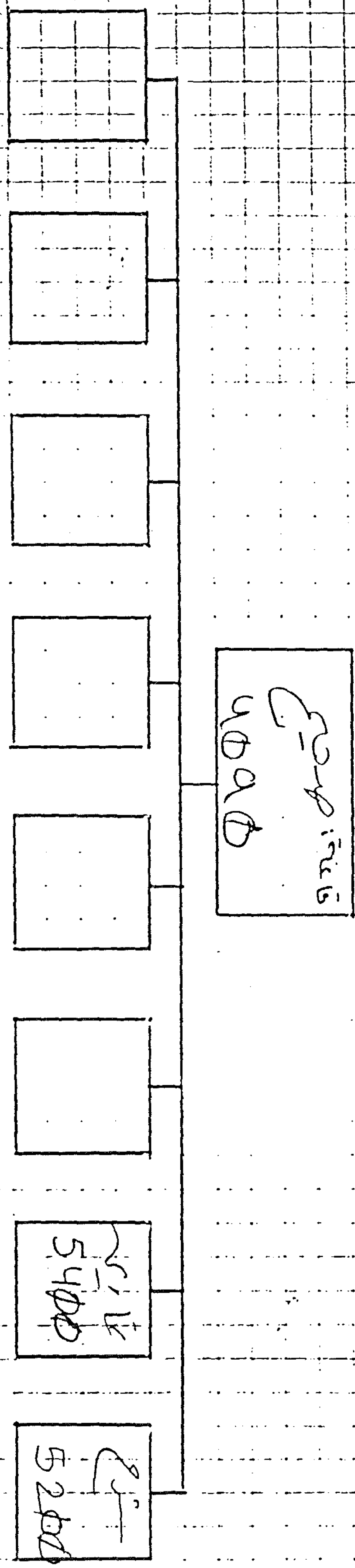

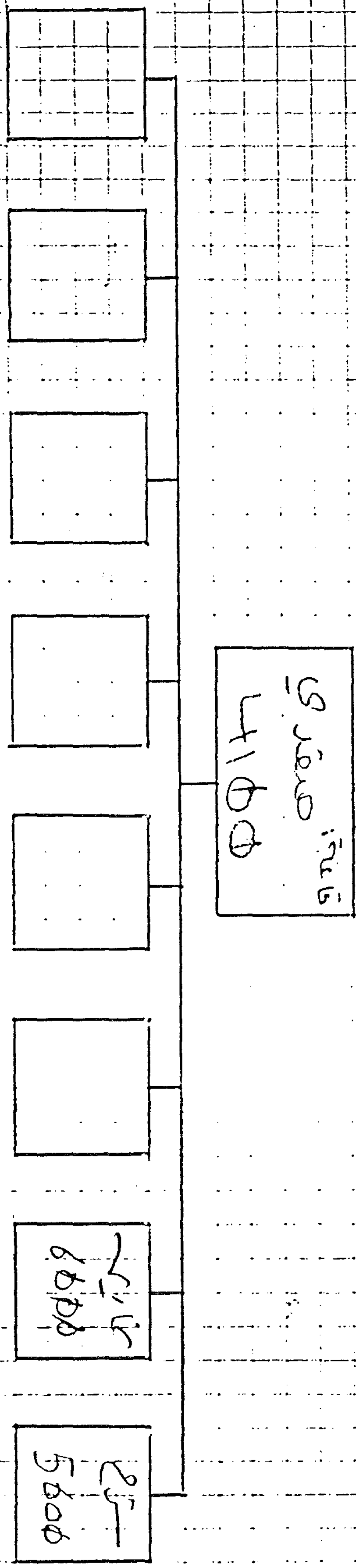
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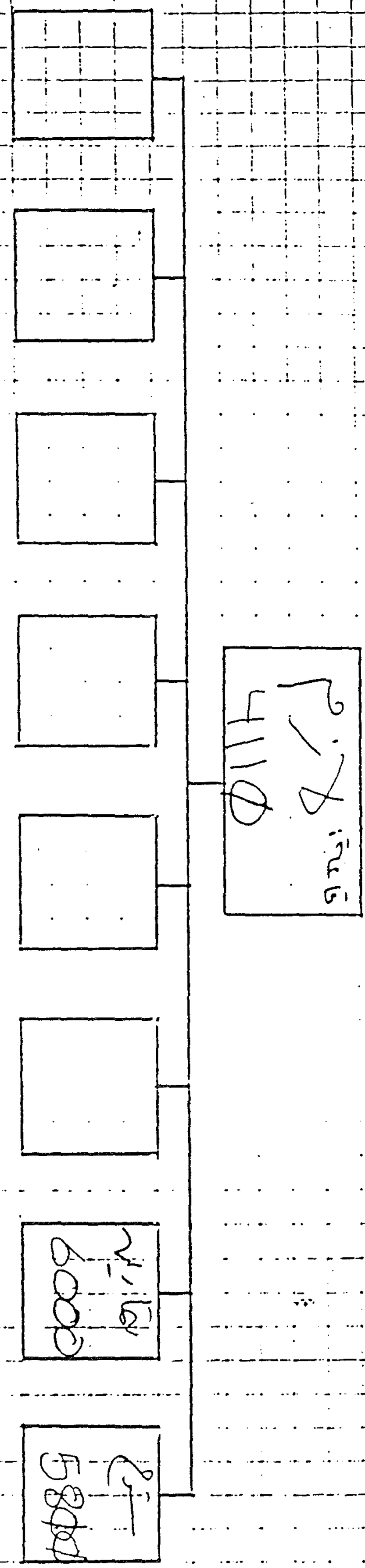

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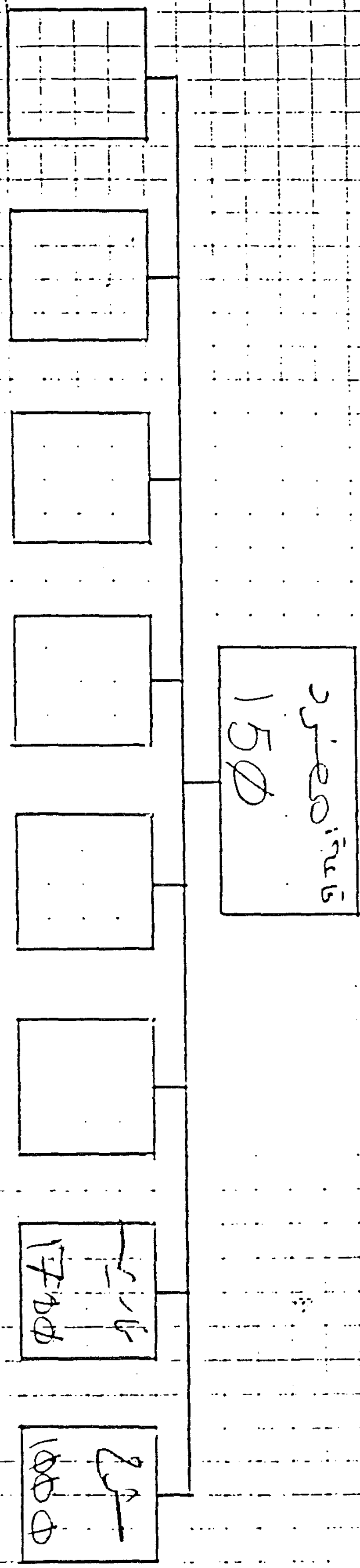

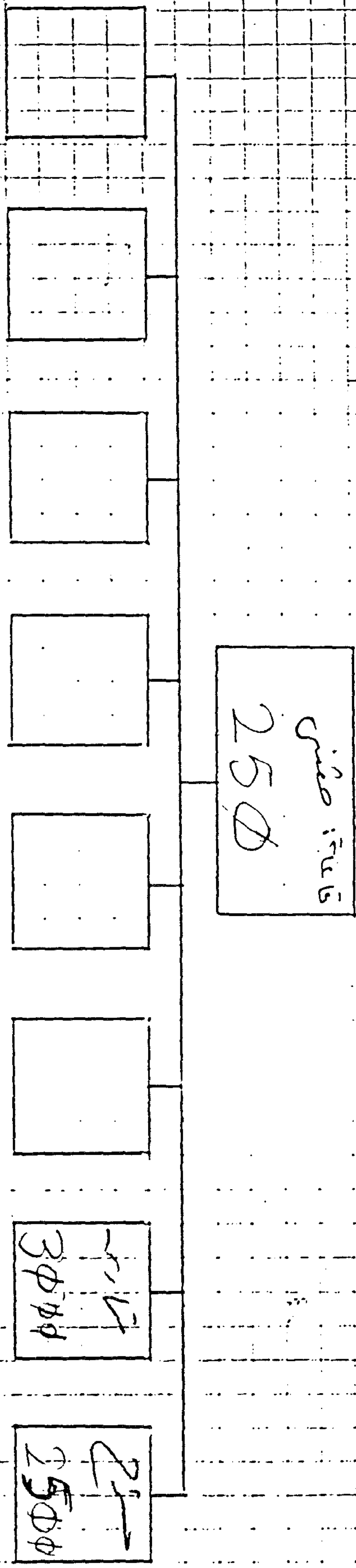
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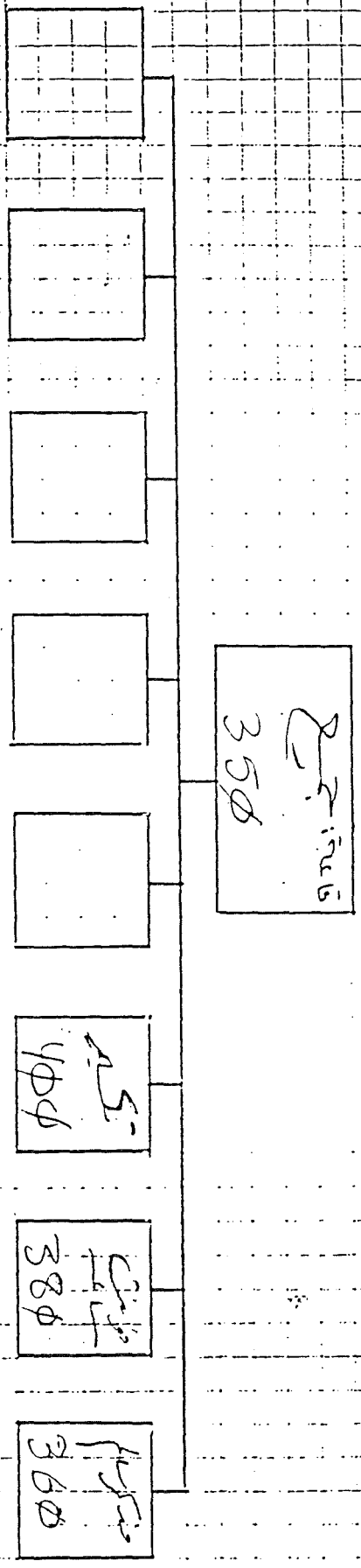
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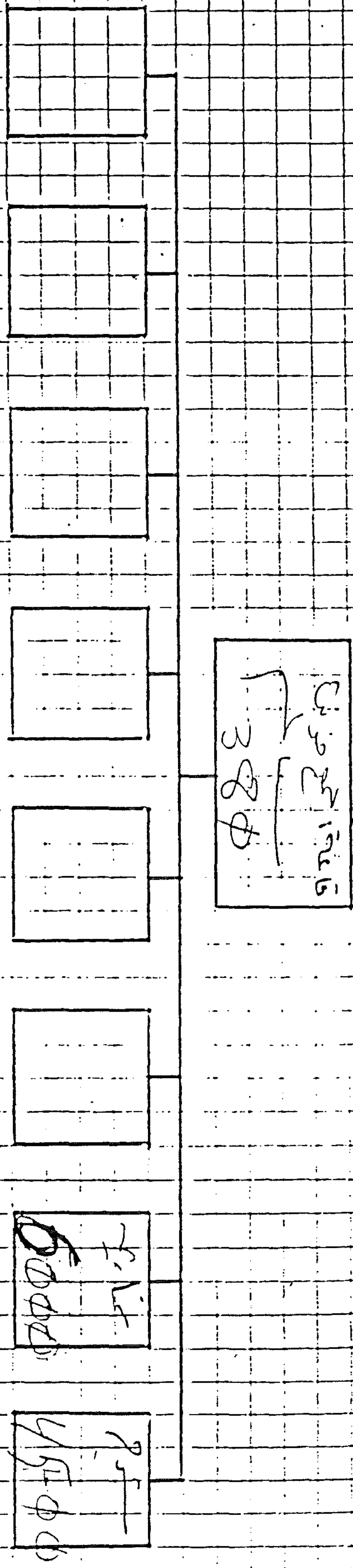

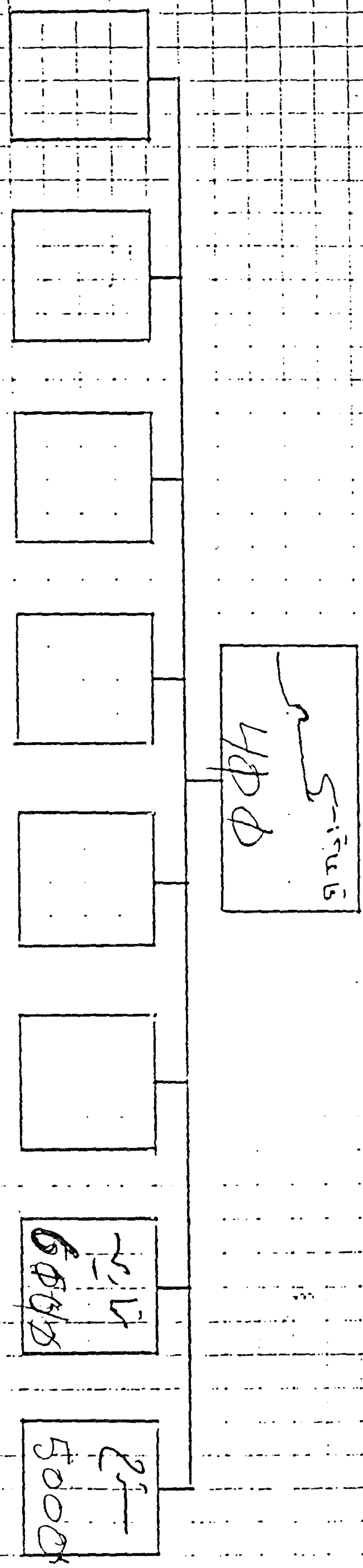

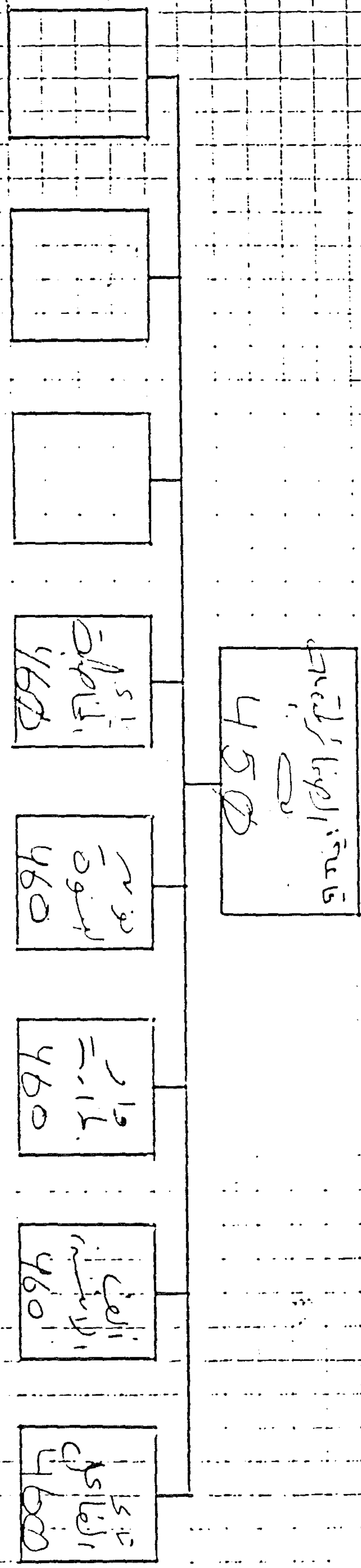
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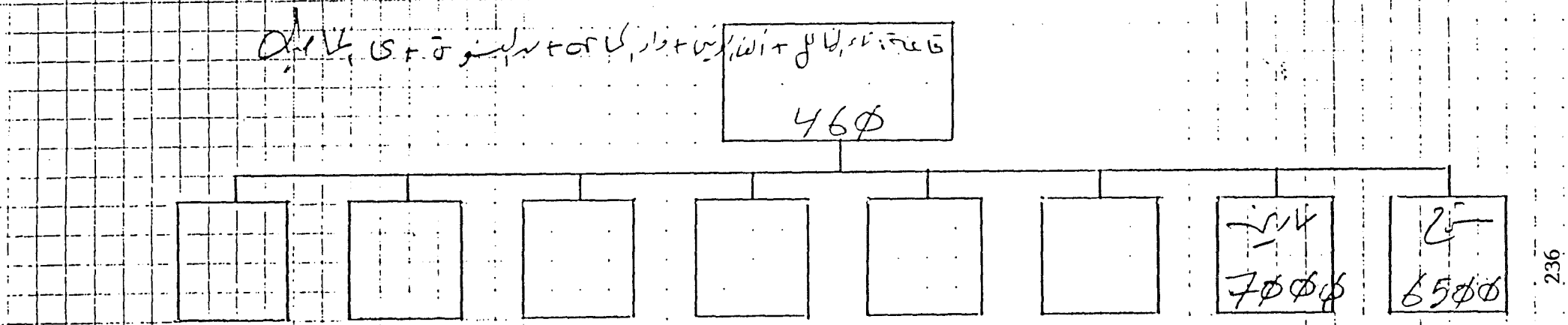
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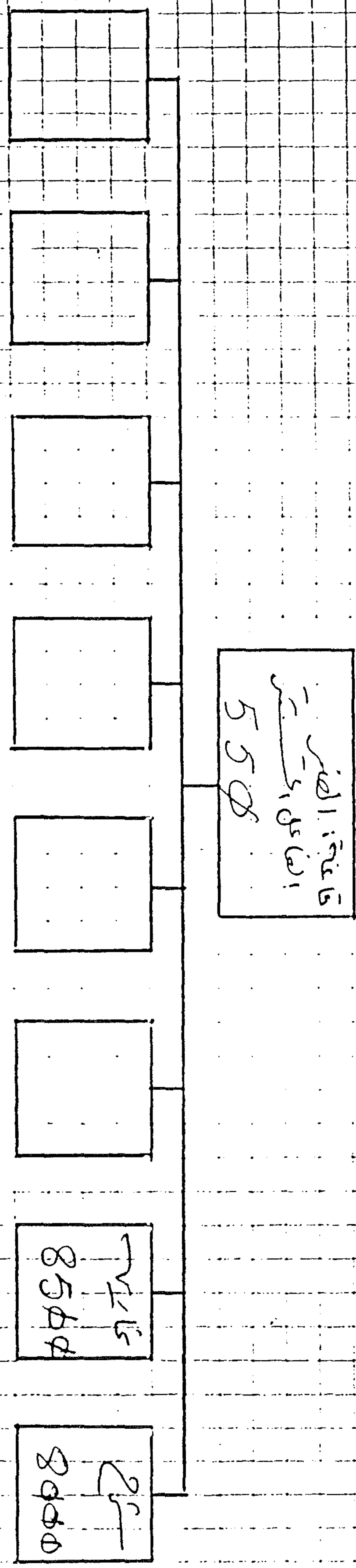
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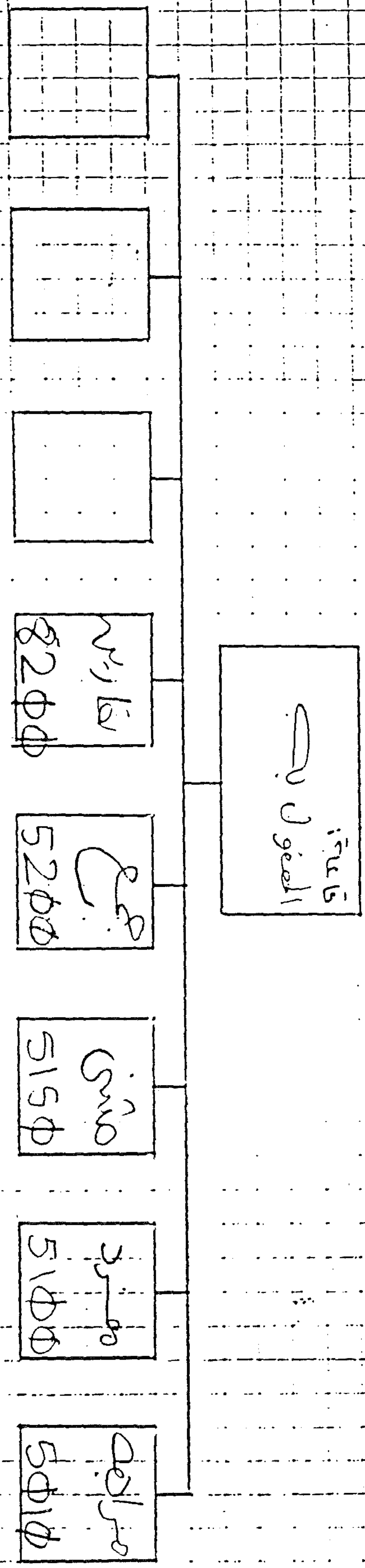
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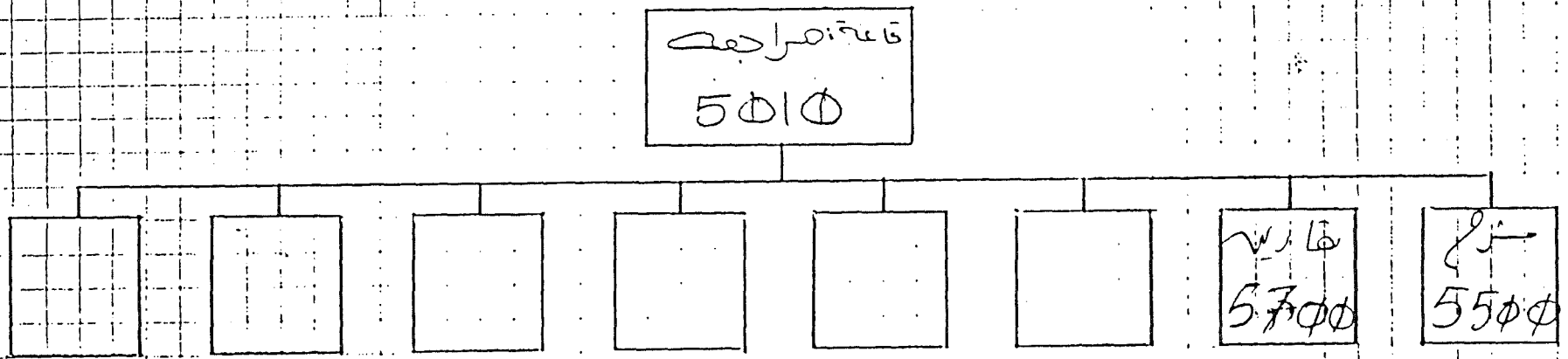
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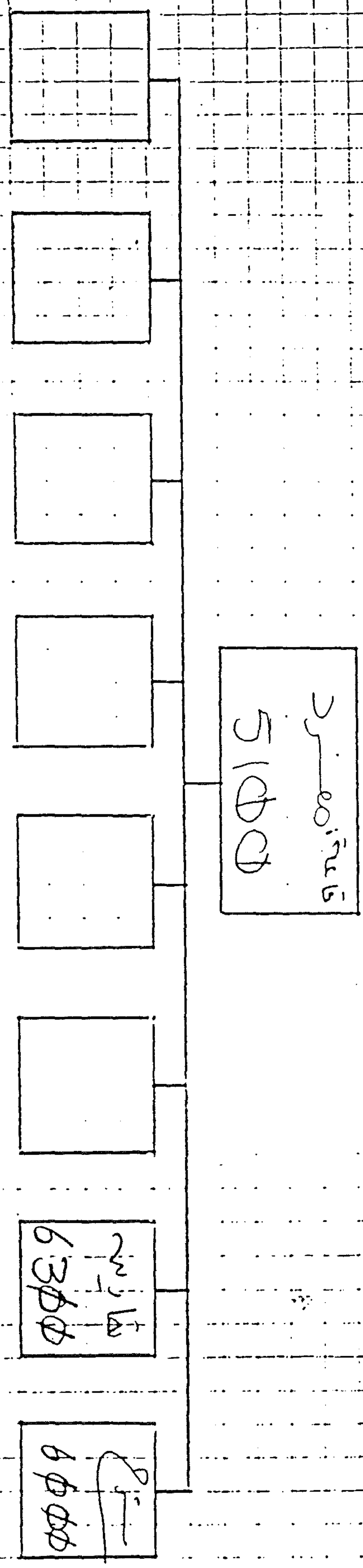
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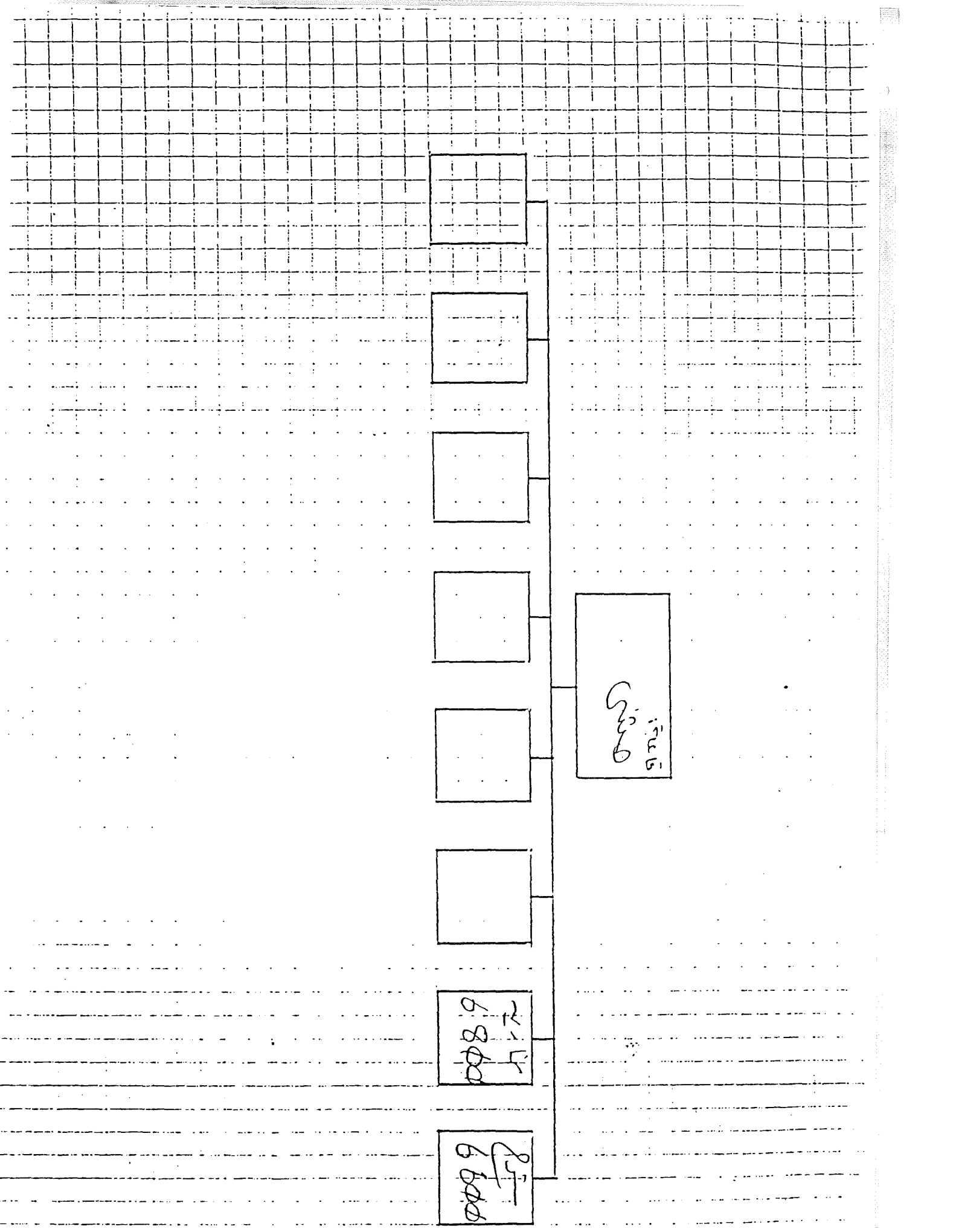

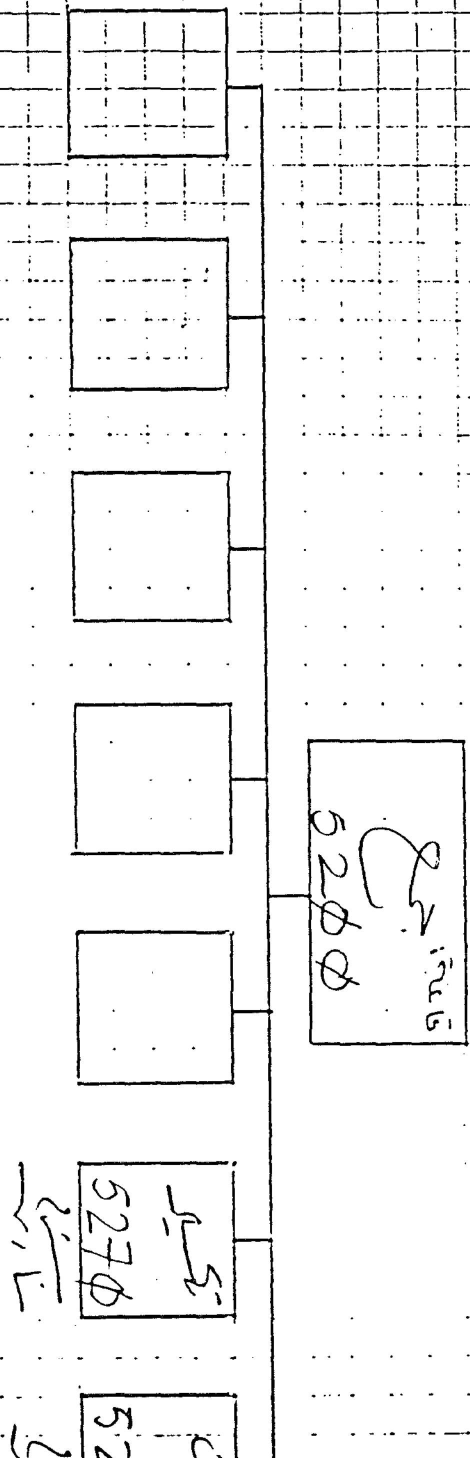
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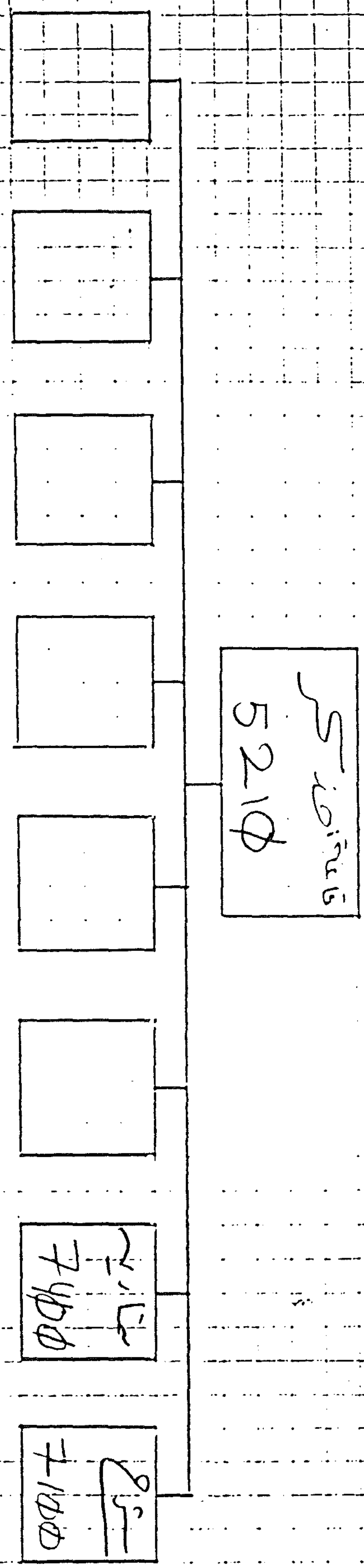
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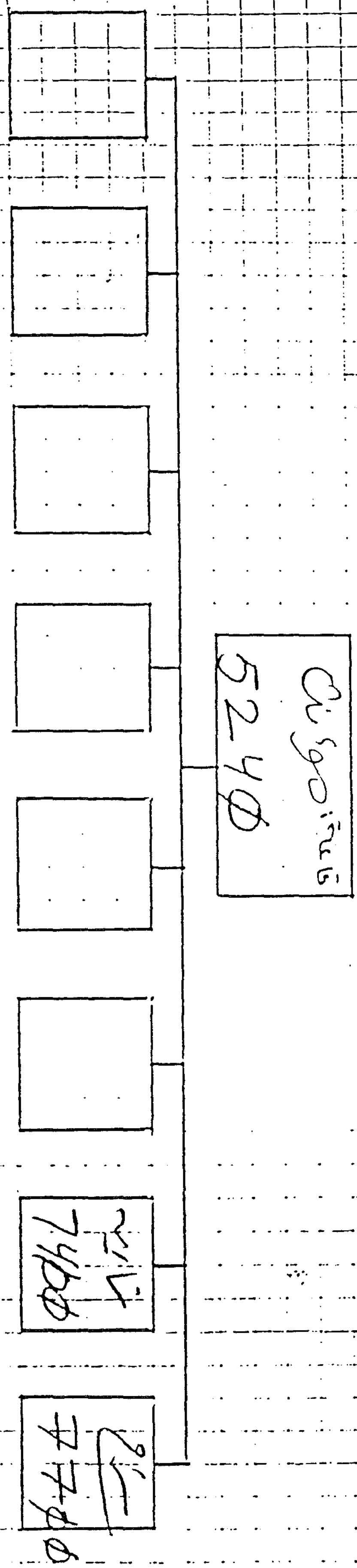
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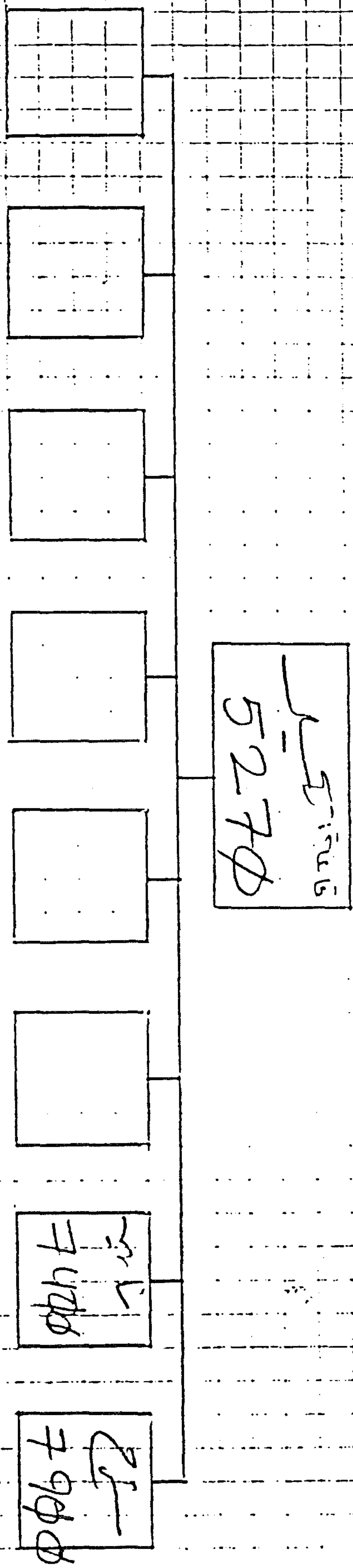
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APPENDIX G

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APPENDIX G HAS NO CONTENT