GRAPHOLOGICAL ORIENTATION IN ENGLISH AND ARABIC
AND ITS IMPLICATIONS FOR TRANSITION TO
ENGLISH MEDIUM EDUCATION

EL TAYEB EL MANSOUR EL HASSAN

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English is introduced belatedly in the school system of most
of the Arab countries after the pupils have acquired satisfactory
mastery of Arabic which is reinforced by its use as the only medium
in general education. However in tertiary technical education the
status of English suddenly changes from a mere school subject of no
active use outside the English class to the main or only medium of
instruction. This immediate transition from Arabic to English as a
medium has called for the introduction of Service English which
tries to bridge the gap between the students' real competence and
the level needed for the pursuit of studies satisfactorily.

Service English courses, however, fail to address adjustment
and adaptation problems arising from the opposing graphological
directionality of Arabic, right-to-left, and English, left-to-right.
Dominant Arabic directional sets tend in many cases to negatively
affect or slow perception and organization of information in English
particularly when non-verbal or semi-verbal forms and formats
affected by orientation are involved. This study attempts to
empirically identify and classify orientation-related problems in
order to suggest ways and strategies for combating them right at the
start of an English medium education following an Arabic one.

In the course of doing so the study, unlike previous
reviewed studies related to orientation attempts to be both applied
and pedagogical. It uses as its main subjects, Arab students at
the start of English medium education in the Sudan and the U.K.
Conversely learners and users of Arabic as a foreign and second
language are investigated to see the graphological influence of
English on Arabic graphology. The implications of graphological
orientation on text organisation are also considered with particular
reference to Arabic texts with English subtexts. The video medium
has been used for data collection and suggested as a possible tool
in solving the attested problems.

KEY WORDS:

Arabic, English, Right-to-left, Left-to-right, Writing

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ACKNOWLEDGEMENTS

LIST OF CONTENTS

N.B. This thesis is accompanied by a
1-hour videotape bearing its title and
constitutes an integral part of it.

CHAPTER ONE

Introduction

The Basic Hypothesis

The present research rests mainly on the simple hypothesis that the opposing linear graphological directionality of Arabic, Right to left (R-L) and English, left-to-Right (L-R) affects the way learners and users of either system perceive, process and organize information presented or originated in the other system. The firstly acquired directionality sets are believed to be in conflict with the new ones.

This is supported by observational evidence of many teachers of either English or Arabic to the speakers of the other. Swales (1975:9) referring to the phenomenon as right-to-left thinking wrote:

> "Some of us have noticed at Khartoum that certain students on entering the Faculty of Science (English medium following Arabic medium secondary school) do not easily catch on to the left-to-right organization of information. For instance students were asked to do the following:
>
> "Draw two small boxes on a line in your textbook. Label them A and B. Draw a line between them and show that A leads to B rather than vice versa.
>
> "A significant minority of the class produced:

> rather than the expected:""

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Swales wondered whether this phenomenon had any serious consequences (in coping with electric circuits, for example) or whether it was bound to disappear when the left-to-right orientation had been pointed out. He ended by asking whether any one had detected a similar problem.

In response to Swales's query Barron (1975/76) reported observing similar behaviour in Iranian students studying geology through the medium of English at a tertiary level in Tabriz, Iran. The likely interpretation of the similar attitude of both Sudanese and Iranian students is that both Arabic and Farsi use the Arabic alphabet and hence the R-L orientation.

Swales and Barron's observations are typical of those made in the context of English as a Foreign Language (TEFL) and English for Specific Purposes (ESP). Although no empirical research has been carried out, to the best of the researcher's knowledge, exclusively in that context the impact of acquired literacy-related skills on the development of directional preferences and attitudes had been fairly well researched using mainly L-R monolingual (eg. Regan and Cropley, 1964) and L-R/R-L bilingual subjects (eg. Metwalli 1974). However these studies and many others (see Chapter Three) were not carried out with clear pedagogical applications in

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mind as this one aims to do.

The Significance of the Study

The study _firstly_ aims to identify, classify and quantify the residual graphological influence of the first or main writing system on the second as attested in the practice of mainly adult users of the second system. _Secondly_ it attempts to assess the impact of such residue in inhibiting or slowing down academic and professional achievement. _Thirdly_, if that was found to be of a significant level, necessary recommendation would be made to counteract the negative aspects of first system graphological interference.

The emphasis of the study, however, as explicitly stated in the title of the study is on the implications of transition to an English medium education, in or outside the Arab world, following an Arabic-medium one. This is the case in most of the Arab countries where English rather than French is the most important language after Arabic. Graphological adaptation problems are thus particularly associated with students in the English zone of the Arab world. In the French zone French, and L-R orientation for that matter, are too deeply established to be seriously dominated by Arabic and R-L orientation. English on the other hand is normally introduced in either region at 11-13 and for 6-8 years as a school subject in general education. Moreover, in many of the Arab countries English is not taught under favourable conditions in regard to motivation, facilities, follow-up etc. Its practice is largely limited to the classroom. The Sudan is typical in this

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respect. English is introduced there at the age of 13+ and for 6 years as a mere school subject. Prior to the Arabicization of secondary education the final phase of which was completed in 1969 (El Hassan 1982) English was a major school subject introduced at 11+ and for 8 years (used as medium in the last 4 years). Paradoxically English is still maintained as the only or main medium in technical higher education. The deterioration of its standard has to be compensated for by ESP servicing units attached to the mainly English medium Sudanese universities and other institutes of tertiary education. This concentration on the situation of English in the Sudan is justified by its considerable bearing on this study as will be seen.

Although the psychomotor adaptation problems arising from the considerable differences between Arabic and English alphabets and orientations are predicted and catered for by many writers of basic TEFL courses, especially handwriting manuals (eg.Bates 1979, Hartley 1981, Philpot 1983) they are largely, if not totally, overlooked, ignored or played down in intermediate or advanced EFL and ESP courses widely in use in the Arab world or for teaching Arab students in English speaking countries as in British summer schools or English servicing centres in many British and American unversities which many Arabs as well as many other overseas students join before commencing or while receiving their specialist subjects or courses. In fact many of the teaching materials in current use have not been written specially for Arabic-speaking students. In addition to that EFL/ESP practioners and instructioners are either native speakers of Arabic who do not

themselves, at least consciously, face or experience any orientation-related problems due to their relatively higher competence in and continuous practising of English or <u>expatriates</u> who might be, for the first instance, unaware of the phenomena. The same can be said about native and expatriate teachers of subjects other than, but taught through the medium of, English.

Linked to such a lack of awareness or appreciation on the part of the teaching staff of the potential implications of the opposing diϕrectionality of Arabic and English is a similar one encountered in many Arabic technical textbooks. By virtue of their technicality these Arabic-medium sources contain a great deal of directionality - specific formatted materials. This is due in the main to the fact the Arabic textbooks are based on English or French sources, a matter which largely goes unacknowledged. The implications of all this to the present study are explored in the next chapter (Chapter Two) and the final one (Chapter Six).

Methodology:

The present study as indicated above tries to bring out in terms of overt behaviour predicted graphological and graphological-rekated practices believed to be caused by the influence of the dominant writing system (Arabic or English) when the participants in the study respond in writing to instructions given in the least known and practised language. Writing, in the sense used here, is not confined to writing as such but extends to include all graphological activities involving the use of pen and hand. Those of course include the making of diagrams of various kinds, eg.

tables, graphs etc.

Specially designed tasks (see appendix) which required or involved L-R or R-L directional decisions in their execution constituted the data. A full description of them, the way they were tackled as well as the subjects who attempted them will come at the right time and place. Suffice to say in this short introduction that the tasks are of educational relevance, the subjects are biliteral in Arabic and English, part of the experimental side was conducted in the Sudan, and above all video recording was used to capture attitudinal and temporal aspects which otherwise would be missed.

Order of Presentation:

Apart from this introduction (Chapter One) and the final chapter (Chapter Six) the study can be divided into two parts: theoretical and empirical.

Chapter Two (see introduction, p.16) examines in the main the implication of orientation for the classification of writing systems and written discourse with specific reference to Arabic and English. Chapter Three (see introduction to Chapter, p.53) reviews previous research judged to be of ranging, though occasionally controversial, relevance to the study.

The experimental side is divided also into two parts: non-video (Chapters Four and Five) and video (1-hour film). In the introduction to the experimental side (see p.83) the hypothesis is reiterated and a general description and justification of the methodology is given. Chapter Four shows and discusses the residue

of Arabic graphology. Similarly Chapter Five deals with English graphology and compares it with the Arabic one. The video film corroborates the results of both chapters and fully displays the potential of video not only in illustrating the graphological phenomena under investigation both at product and process levels, but in combating it.

The final chapter (Chapter Six) while giving a critical summary of the study's findings by bringing together the remarks made here and there throughout the thesis attempts to make the necessary suggestions for reducing, if not eliminating, serious orientation-related problems. The suggestions are aimed to help in designing a remedial or pre-emptive package drawing the attention of the students in an explicit way to the psychomotor adjustment required before commencing their studies through the medium of English. The implications for that are also relevant to all users of the Arabic system eg, Farsi, Urdu and to a comparable degree to the growing business of Arabic as a foreign language to speakers and users of English and other L-R languages.

CHAPTER TWO

Graphological Orientation and Textual Organization with Specific Reference to Arabic and English

Introduction to the chapter

This chapter investigates in the main the reprographic implications of graphological orientation on textual organization of written texts. It begins with a brief traditional classification of the writing systems based on linguistic criteria. An ad hoc orientation-based classification, relevant to the nature of the study, is then attempted. The models of this alternative typology try to accommodate all existing and past writing systems as well as theoretically possible models with no known manifestations. Two basic models (each with sub models) are suggested: one for horizontal writing and the other for vertical writing. The directional implications of each model or sub-model on the spatial arrangement of written materials and the reprographic layout of monolingual/unidirectional texts are explored first in terms of a general textual typology for existing writing systems, both vertical and horizontal, before a more detailed classification of Arabic/English bilingual texts is suggested. The bilingual models or types are based on the co-occurrence of Arabic (R-L) and English (L-R) texts and subtexts within the same discourse. Arabic technical discourse of pedagogical nature and which by its very nature contains a ranging amount of English subtexts, is taken as the main source of exemplification.

The chapter ends by a closer look at the graphological units both alphabetic (letters) and non-alphabetic (eg. numbers) of

Arabic and Roman (as realized in English) systems and conventions. Their distinctive characteristics and their suitability and adaptability to their respective orientation are emphasized with a special reference to the implications of their recognition and formation in a foreign language context by the user of either language as first language.

Section A: Writing Systems: A Linguistic-based Typology:

The definition of writing as "a device for expressing linguistic elements by means of visible marks" (Gelb 1974:13) excludes from the domain of writing proper pictorial or ideographic methods of visual recording as pre-writing activities. These pictures or ideographs did not represent or correspond to actual speech units or linguistic elements as words, syllables or phonemes (consonants and vowels).

Writing systems are normally classified according to the type of the basic minimum linguistic or speech unit for which a grapheme or character is assigned. By applying this to languages committed to writing, three basic writing systems would emerge:

(1) The Logographic: in which the minimum linguistic element assigned a distinctive character is the word (the utterance identifying an object, idea, action or attribute etc.). The Chinese writing system is logographic and to a far lesser extent is Japanese.

The major shortcoming of any logographic system is the need for a competent literate to be able to recognize (read), and

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produce (write) thousands of characters representing most, if not all, important lexical items in past and present use. Japanese school children, for example, have to learn 1850 characters (Pye 1980:4). Similarly an average Chinese college graduate knows about 4800 characters to handle a vocabulary of about 50,000 words (French 1976:106).

(2) The_Syllabic: In a typical syllabic writing system the same syllable, being a distinctive phonetic unit, is represented by the same grapheme wherever it occurs. In any natural language, the syllabary, i.e. the inventory of all possible syllables allowed by the phonological structure of the language, can be identified and each assigned a symbol or grapheme. The great advantage of the syllabic over the logographic is the relatively small number of identifiable syllabographemes which renders the system considerably economical:

> "A language possessing a phoneme inventory of fifteen consonants and five vowels and admitting only syllables of the types consonant—plus-vowel or vowel alone would have a maximum of eighty syllables. A language differing from the above only in that it allowed two consonants (say /n/ and /y/) to appear syllabic finally, would possess a maximum of 240 vowels." (French ibid:119).

Japanese adopts, beside its logogrpahic characters, known as Kanji (Morton and Sasanuma 1984) a syllabary system, called kana, realized in two forms, hiragana, and katakana (ibid).

(3) The_Alphabetic:

If the syllabary of any natural language is analysed into its constituent components, eg. phonemes whether they are

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consonants or vowels, a smaller inventory of distinctive sounds, between 3-4 dozen, could be identified. If each of the consonants and vowels is assigned a distinctive letter or grapheme the system adopted will be typically phonemic or alphabetic if the emphasis is on letters rather than on sounds. However some languages, namely the Semitic, in the course of their writing development assigned letters only to consonants. Some writing scholars e.g.Gelb (1974), Pulgram (1976) considered such systems as syllabic. Barr (1976) labels such systems as Consonantal Scripts and classifies them as belonging to alphabetic writing although they are not typical in that respect:

> "From a certain point of view, one might conceivably grant that in a Semitic Consonantal writing, with no vowels marked, each sign represents a "consonant plus any vowel" and in that sense theoretically syllabic. It is however difficult to see any sense in insisting on the term "syllable" when the script does absolutely nothing to tell you what vowel. A semitic writing like dbr or mlk determines graphically only the consonants and in no way registers which vowels are in the spoken form ... It is more economical and sensible to regard a Semitic Consonantal writing as an alphabetic writing in which the vowels are not marked." (p.74)

By adopting Barr's argument, which is highly convincing, Arabic and for that matter Hebrew, are alphabetic. Both adopt non-letter forms or diacritics for short vowels (see p.48). English on the other hand is clearly alphabetic because consonants as well as vowels are assigned letters although the phoneme-grapheme correspondence is neither complete nor consistent.

Irregularities of writing systems

Although most scholars of writing systems may agree on the theoretical definition of each major writing system, eg. logographic, they sometimes, may fail to agree on placing a particular script or graphology in one of the major systems. This is largely, as seen in the case of some Semitic languages, due to the fact that some writing systems are not typical and may exhibit some features which can be traced back to their prototypes or which may indicate the direction of future development. Modern Japanese, for example, is making use as mentioned earlier, of two systems, the logographic and two syllabic scripts, (Morton & Sasanuma ,ibid). Similarly modern Chinese follows a syllabic (phonetic) based system in writing loan words and foreign names. A number of chosen Chinese characters constitutes an inventory for writing such words. The graphemes have been chosen for their phonetic not lexical value (French 1976). Arabic numerals (p.50 below) in their different manifestation are logographic in nature and so are mathematical signs and both are now used in many languages irrespective of their writing systems.

Section B: Graphological Orientation:

In addition to its representation of actual speech units by visual elements or sign writing proper differs from pre-writing in that the temporal flow of speech is coded visually in a linear sequential progression corresponding to the temporal order of the linguistic or speech elements or units. The beginning and end of a text, is clearly marked in writing while in pictorial representation it is difficult to discern such marks. What matters in the latter

case is the overall message conveyed collectively by the combined impression created by all the constituent parts of the pictorial text taken as a whole.

On the other hand, what is said first is recorded first or at the beginning in writing proper and what is said last is written last or at the end. Each utterance has a beginning and end in time with corresponding positions in space as manifested on the writing surface which is usually two-dimensional. Although the concept of firstness or beginning and lastness or end is unambiguous in temporal terms, its translation into visual spatial terms may take different forms or orientations depending on the conventions adopted. For example a linear graphological progression can at least be either horizontal (p.23) or vertical (p.27). Its execution and perception may be from left-to-right or right-to-left if it is horizontal or from top-to-bottom or bottom-to-top if it is vertical. The position marking the beginning may be on the left in one language, eg. English and on the right side in another, eg. Arabic.

The final letter of an English word written in capitals may be singled out, for example, by an Arab who is illiterate in English and ignorant of its graphological orientation, as the first letter. In doing so he or she is imposing Arabic graphological orientation on his or her perception of English words. The implications of differences arising from graphological orientation as far as learners and users are concerned are discussed in the next chapter.

The stability and standardization of graphological signs in shape, size, orientation and their directional alignment to form

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longer units or texts eg. lines and pages, contribute to the full development of any writing system:

> "The establishment of a full system of writing required the conventionalization of forms and principles. Forms of signs had to be standardized so that everybody would draw the signs in approximately the same way ... Further regulations of the system had to take place in the matter of orientation of signs and the direction, form and order of lines." (Gelb ibid:68).

Orientation-based Writing Typology

Since the present study, as indicated more than once, is set to investigate some of the implications of different spatial and temporal organization and perception of written materials, an alternative classification of writing systems more relevant to the hypothesis of the research, is suggested here. Unlike the above classification based on linguistic criteria this one is based on the directional characteristic of the basic unit, ie. the grapheme. The orientation stability of the individual graphemes and the way they are ordered affect and at the same time are affected by the general linear orientation. Before considering the suggested models and sub models the two basic criteria for the typology which covers both past and present and theoretically possible systems, need to be pointed out.

(1) Interlinear Order: This refers to the order of lines (Top to Bottom or vice versa) in horizontal writing and the order of columns (Right-to-left or vice versa) in vertical writing.

(2) Intralinear Order: This refers to the order of signs within the line (Left-to-Right or Right-to-Left) in horizontal systems or

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within the column (Top to Bottom or Bottom to Top) in vertical systems.

The interlinear criterion is used for arriving at two basic models (horizontal and vertical) and the intralinear criterion is used in dividing them into submodels.

The_Horizontal_Writing_Model_(Model_H)

```
T      1 _____
 ·
 |     2 _____
 |
 ↓     3 _____

B      4 _____
                etc
```
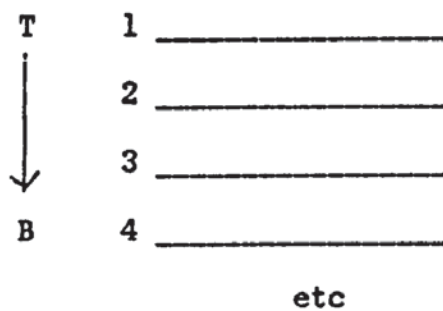
The lines run from top to bottom in this most common model. It is realized in three sub-models:

(i)   H (R — L): in which the graphological signs are ordered from Right to Left.

```
T      1 L←_____R
 ·
 |     2   ←_____
 |
 ↓     3   ←_____

B      4   ←_____
                etc
```
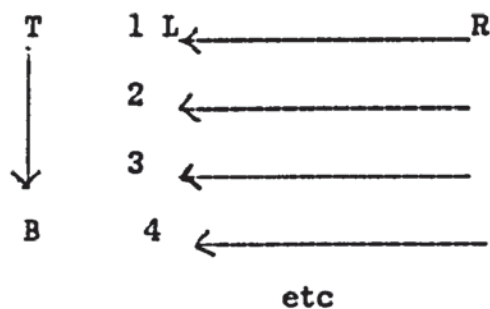
(ii)   H (L -- R): Here the signs are sequenced from Left to Right.
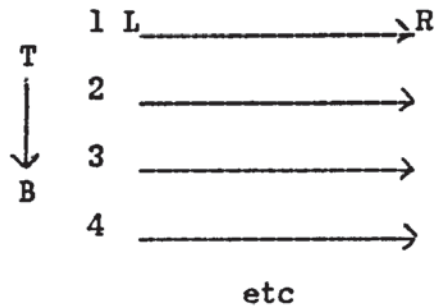
(iii)   H (L ⇄ R):   In this submodel the order of signs change alternately from line to line.
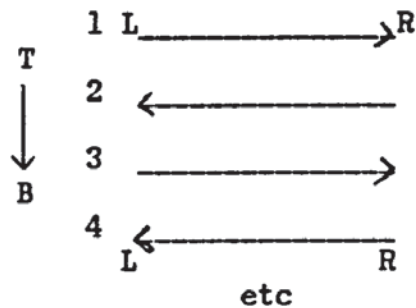
The R-L type was the most used in ancient times.   Hieratic, an earlier form of ancient Egyptian hieroglyphic "was originally written in a vertical direction;   subsequently it became horizontal and was written from right to left".   (Diringer 1962:51).   Demotic, a later cursive type which developed from hieratic continued in adopting the same R-L orientation and so did Meriotic, an ancient language in Upper Nubia (Northern Sudan).   Aramaic and most early Semitic languages were written from right to left.   Arabic and Hebrew are still maintaining the traditional Semitic orientation. Early Indic writing followed the R-L directionality (Gelb ibid:187, Diringer, ibid 145) before changing to the currently used L-R orientation.

Although the R-L directionality was more in use in ancient writings, L-R directionality may date back to writing itself. The Summerians of Southern Iraq who are thought to be the first people to invent writing, adopted the L-R orientation and so did their successors: the Assyrians, Babylonians, and Akkadians who continued to use the famous cuneiform writing (Diringer 39).

The present dominance of the L-R orientation was due to the spread of the Roman alphabet which developed in Graeco-Roman times and of which ancient Greek was the prototype. Greek itself adopted the L-R directionality consistently in its latest phase of development. The earliest Greek according to Diringer (p.149) was written from right-to-left. This echoes the strong semitic influence on its earliest state of development. Before the consistent adoption of L-R orientation, old Greek had experienced a period of unstable directionality when it ran "from right-to-left or from left-to-right, alternately changing direction from line to line. Only gradually did the classical method from left-to-right assert itself in the Greek system." (Gelb:178). The boustrophedon (Greek for "as the ox plows") (Diringer, p.56) orientation – submodel no.(iii) according to the above classification was also found in Cretan and Hittite inscriptions (Diringer p.56). The following is a Sabaen (ancient Yemeni) L⇌R inscription:

أحمد حسين شرف الدين (١٩٧٥) اللغة العربية
في عصور ما قبل الإسلام.

Source:1

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It is clear from the above example that letters which are not laterally symmetrical such as $\mathsf{1.\unicode{x25B3}\,,\,)}$ and $\}$ in the first line change directionally to suit, alternating line orientation by rotating 180° and assuming a lateral mirror image, e.g. Γ , $\unicode{x1E0C}$, $\mathsf{(}$, and $\{$.

So far we have seen model H – the horizontal model – with its three different manifestations both in past and current use. Theoretically it is possible to construct or perceive an inverted horizontal model – H′ – in which the lines are arranged from Bottom to Top (B — T):

```
                        etc
     T   4 ─────────────────────
       ▲
       │   3 ─────────────────────
       │                                    Mode H′
       │   2 ─────────────────────
     B   1 ─────────────────────
```
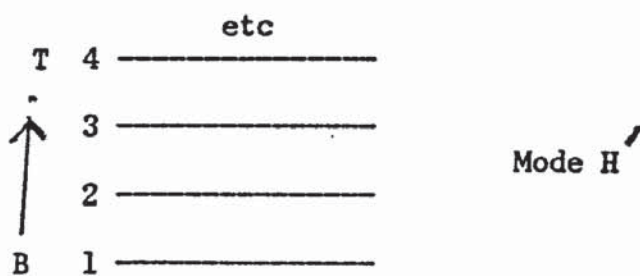
Similarly three submodels can be based on model H ; they respectively correspond to model H's submodels: L-R, R-L, and R—L. No writing system to date was found to adopt the above model. It seems that the bottom to top organiztion is less natural than the opposite top-to-bottom. When people need to manipulate or arrange objects in a vertical order they usually tend to do this from top-to-bottom. This includes of course the drawing of vertical lines as will be seen later (Chapters 3 – 5).

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The Vertical Writing Model (Model V)

```
        L  ←————————————— R
            |   |   |   |
   etc      |   |   |   |
            |   |   |   |
            4   3   2   1
```
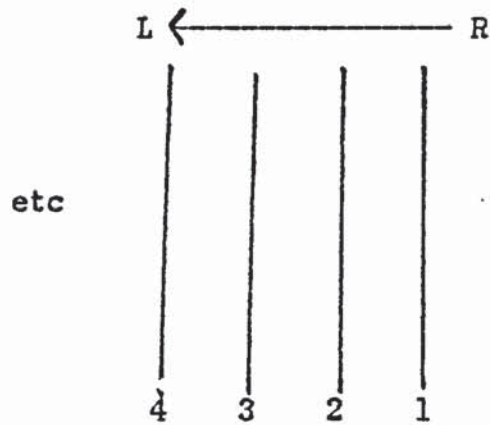
Model V

The lines or columns in this generic model run from Right to Left. The model can be realized in three submodels according to the order of signs or graphemes in columns:

(i) V (T-B)

```
                  L ——————————— R
                     |  |  |  |  | T
          etc        |  |  |  |  |
                     ↓  ↓  ↓  ↓  ↓
                     4  3  2  1  B
```

(ii) V (B--T)

```
                  L ——————————— R
                     ↑  ↑  ↑  ↑  ↑ T
          etc        |  |  |  |  |
                     |  |  |  |  |
                     4  3  2  1  B
```

(iii) V (T ⟶ B)
        ⟵

```
                  L ——————————— R
                     ↑  |  ↑  |  | T
                     |  |  |  | ⊓
                     |  ↓  |  ↓ ↓↓
                     4  3  2  1  B
```

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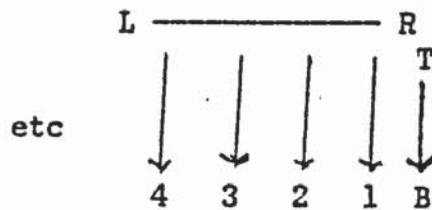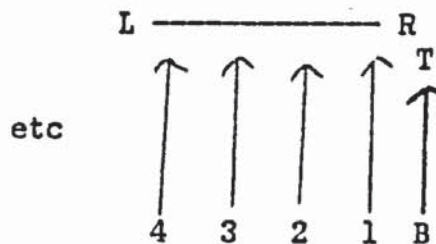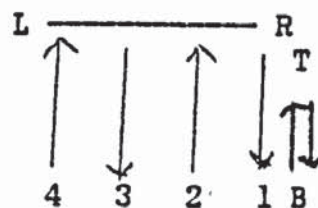
As done in the case of the horizontal writing types above it is theoretically possible to construct three lateral mirror images of the above in which the only difference is that the columns run in the opposite direction, ie. from Left-to-Right. They are in fact submodels of model V´ (below) which in turn is a lateral mirror image of model V (above)

L ————————→ R

| | | | etc

1   2   3   4
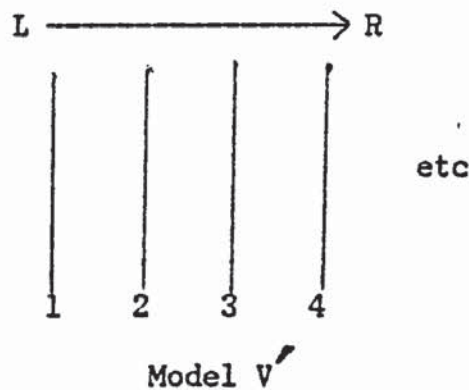
Model V´

Orientation Manipulation

No known system has been found to adopt any of the three submodels of model V´ and of model V only the first type: V(T — B) has been adopted by Chinese and Japanese when they are written in the traditional orientation.

Before closing this section on directionality-based typology of writing, it is important to note that as in the linguistically-based classification the adoption of one system exclusively and consistently by any language is not complete. This phenomenon is very clear in Japanese and Chinese (especially Mandarin Chinese). In both cases there is an increasing tendency to order the characters horizontally from Left-to-Right. Sometimes both orientations are used within the same text or page, eg. a title of a

newspaper article may be written horizontally while the main text remains in the traditional vertical orientation.

It is interesting to note that L-R directionality is being chosen as a recommended alternative rather than a R-L one. This is in accordance to the L-R orientation dominance worldwide with its practical and technological implications. In fact the Japanese Ministry of Instruction (Diringer:79) has attempted since 1942 to enforce the left-to-right orientation as a standard directionality but seemed to have achieved little in that respect.

The adaptability and flexibility of logographic writing to either orientation is that the characters stand for words and hence character boundaries are at the same time word boundaries. The individual orientation or upright position of a Japanese and Chinese character does not change if it becomes part of a horizontal sequence.

On the other hand if cursive alphabetic horizontal writing, eg. English, were written vertically, the words would change orientation by $90°$ clockwise or anticlockwise, eg.

(i)   (ii)
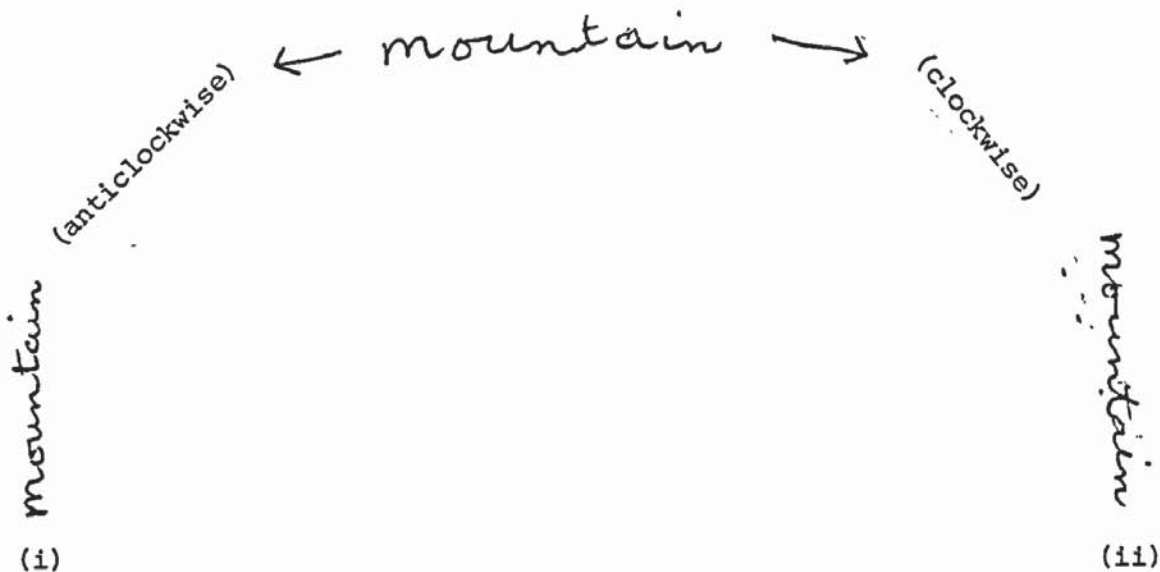
However when English is written vertically only the upper case or lower case printed type is usually used. Moreover the orientation of the individual letters is maintained, eg.

```
M                    m
O                    o
U                    u
N                    n
T                    t
A                    a
I                    i
N                    n
```

In both cases, unlike logographic writing, the visual structure of the alphabetic word is distorted and its recognition (reading) and production (writing) would take a longer time. These inbuilt constraints of alphabetic horizontal writing render it less flexible and adaptable to orientation change.

The change over to vertical writing if it ever occurred, would be to achieve special purposes, eg. adverts, commercial signs in which attention has to be drawn by resorting to non-conventional ways. The cursive nature of Arabic makes the transfer to non-horizontal writing more difficult and to a larger extent limits it to calligraphy.

Reprographic Implications of Orientation

Directional organization conformity with language visual orientation is not only confined to verbal materials. If non-verbal subtexts within a text involve or require any sequential arrangement or reference it is likely to conform to the directionality of the

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language of the text. For example reference made to people appearing in a row in a photographic picture in an English newspaper is generally made from left-to-right. In Arabic it is likely to be from right-to-left. A textual typology accommodating both contradictory and conforming orientations will follow later. Before that implications of the suggested orientation-based classification of writing which have so far been limited to the writing surface have to expand to include the necessary reprographic arrangements of putting writing, or for that matter, reading, surfaces or pages together, ie. binding to make a writing (notebook) or reading (book, magazine etc.) document. The reprographic layout of written and writing surfaces fixed together to make one text depends on two main things: (i) the place or side at which the pages are fixed together or bound; (ii) the sequence of paging.

The following types of layout are all in use:

Type 1

Type 2a

Type 2b
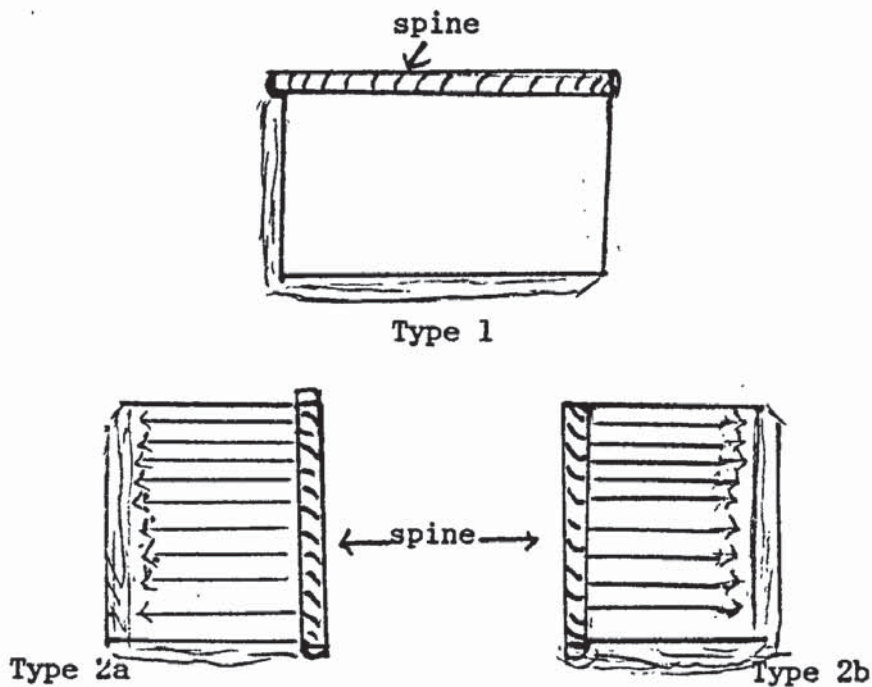
In type 1 the pages are fastened at the top and the type is orientation-free, ie. it can be used for both vertical and horizontal writing. However if it is used for writing the order of lines or columns, the position of the margin, if any of these is present, may determine its use by only one writing system. The front cover is the one at the top and the paging sequence is from top-to-bottom.

Type 2a is suitable for R-L horizontal writing, eg. Arabic and vertical writing in which the columns run from right to left (see model V above) eg. Chinese. Type 2b is for L-R horizontal writing eg. English. Both subtypes unlike type 1, are orientation dependent and their paging sequence is opposite to each other and so are their front and backcovers. Paging is from right-to-left in type 2a and left-to-right in type 2b. What is considered as front cover from the point of view of one orientation is back cover from the point of view of the opposite orientation. Stapling or pinning written documents is also affected by the particular graphological orientation. While English documents are stapled at the top-left corner Arabic documents are stapled at the top-right corner. The implications these various textual arrangements may hold for text users will be considered in the next chapter after other aspects of textual arrangements with more relevance to the present research are explored.

Graphological Orientation in Arabic Technical Discourse

Mention has been made above to non-verbal materials conformity to the overall graphological orientation of the text. Texts, especially those of a technical nature, besides containing non-verbal materials may include subtexts in a different language. These range from mere technical terms to longer stretches ranging in size. They are clearly visually marked if they are not only in a different language but in a different script. Arabic technical texts with English subtexts is a typical example. The difference in orientation needs special editorial arrangements and pre-planning for the inclusion and accommodation of the differently oriented subtext within the discourse of the main text.

An Arabic-based typology of Arabic and English bilingual texts is described below. It extends from purely monolingual Arabic texts to equally bilingual texts. Before looking into the details of the typology it is important to point out three things:

(i) Arabic rather than English is chosen as the base because as pointed out earlier Arabic technical texts, from which most of the illustrative examples will be drawn, do contain a ranging amount of English and other L-R subtexts. This is because Arabic technical discourse especially that of scientific textbooks is compiled from and based on European references and sources in which most of the cross-cultural conventions employed in technical discourse such as equations, graphs etc. have originated or developed.

(ii)   By bilingual text is meant any text which contains any English or L-R subtext even if it is a single term or label.

(iii)   A text or subtext is used here with no fixed length in mind.   It could be a page, part of a page, a line, a diagram, or a whole book as will clearly be seen in the typology.

A: Purely Arabic Monolingual Type:

These are largly non-technical texts, eg. fiction, poetry, history, journalese etc., or simplified technical texts, specially written to Arabic monolinguals or school children with little or no knowledge of English.   This type of text is outside the interest of the present study.   It has been included only to give a comprehensive picture of an Arabic-based textual typology in regard to language or languages of discourse.

B: Largely Arabic Type:

In these texts the language of discourse is Arabic but English subtexts are accommodated as part of the discourse.   These English or non-Arabic subtexts range both in type and quantity and the potential reader is expected to be able to comprehend them although he or she is forced to change the direction of scanning:

$$A \ (R\text{-}L) \longleftarrow \longleftarrow (E(L\text{-}R)) \longleftarrow \longleftarrow A(R\text{-}L)$$
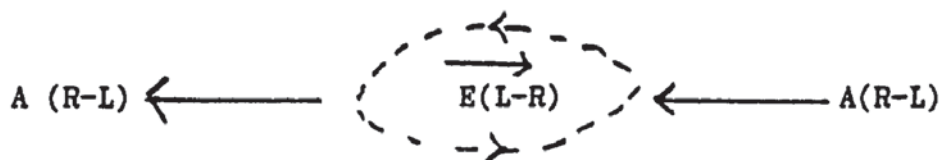
The dotted lines represent non-reading stretches which the eye has to jump over in order to change from the reading position in one graphological orientation to the other.

There are three major subtypes of L-R or English subtexts within type B Arabic text:

(i) Discourse related:

Here the subtexts are inherent parts of the discourse; their omission may render the text incomplete or incomprehensible. They range from technical terms, formulae, to photocopied diagrams from English sources.
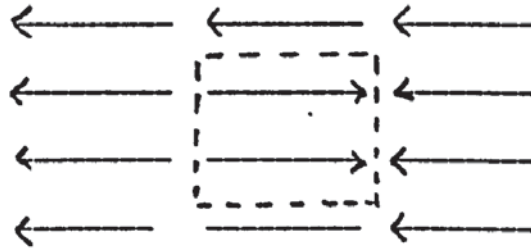
(see example A below)

Example A:

والجدول التالي يوضح التوزيع الالكتروني لذرات عناصر هذه الدورة والتعبير عن هذا التوزيع .

العنصر	1s	2s	2p$_x$	2p$_y$	2p$_z$	3s	3p$_x$	3p$_y$	3p$_z$	3d	التعبير عن التوزيع
$_{11}$Na	↑↓	↑↓	↑↓	↑↓	↑↓	↑					$1s^2, 2s^2 2p^6, 3s^1$
$_{12}$Mg	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓					$1s^2, 2s^2 2p^6, 3s^2$
$_{13}$Al	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑				$1s^2, 2s^2 2p^6, 3s^2 3p^1$
$_{14}$Si	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑			$1s^2, 2s^2 2p^6, 3s^2 3p^2$
$_{15}$P	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑	↑		$1s^2, 2s^2 2p^6, 3s^2 3p^3$
$_{16}$S	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑		$1s^2; 2s^2 2p^6, 3s^2 3p^4$
$_{17}$Cl	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑		$1s^2, 2s^2 2p^6, 3s^2 3p^5$
$_{18}$Ar	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓		$1s^2, 2s^2 2p^6, 3s^2 3p^6$

يتضح من التوزيع السابق أن المستوى الثالث قد بقيت منه أفلاك 3d الخمسة خالية .

Source: 2

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(ii) Discourse independent:

These are not part of the main discourse eg. English advertisements and announcements in an Arabic daily. (They are of little or no relevance to the present study).
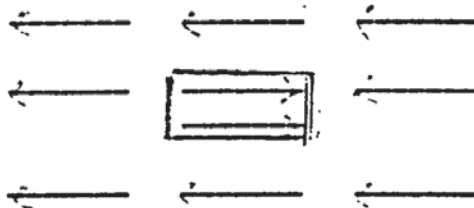
(iii) Organizational:

These include the use of "Arabic" numerals (see p.50), Roman numbers and Roman letters, mainly the upper case for numbering, paging, sequencing, formulae etc. Their very use in an Arabic text imposes a L-R orientation and hence their relevance to the study as will be seen.

The three subtypes are not mutually exclusive, ie. one, two or the three of them can be found in the same text. Moreover (i) and (iii) are not limited to type B but may appear in type C below:

C: Ambilingual Type:

In this type of bilingual text the same message is given equally in both languages. This type can be divided into three main categories:

(a) <u>Autonomous</u>, in which ambilingualism, ie. the equal use of both languages is throughout the whole text.

	E		A	
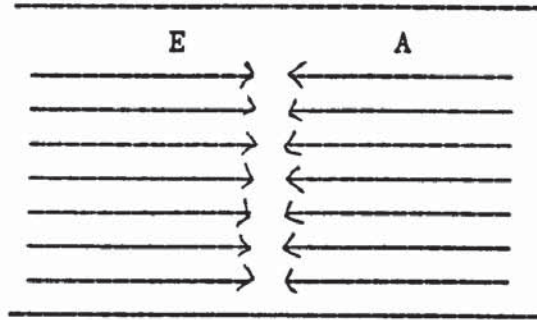
(See example B below)

Example B

Source: Nahmad (1970)

the necessity of forming a drama group among prisoners for the presentation of cultural, social, and moral (ethical) plays. This in addition to providing for (attention to) the training of prisoners in light industry.

From *al-Balad*, daily, Baghdad, 7.11.63.

Discussion on Unification of Teachers' Unions (associations) in Cairo, Damascus, and Baghdad

Yesterday a delegation of the Association (Union) of Iraqi teachers arrived in Cairo under the leadership of Mr. Muhammad 'Ali Khalaf, second deputy to the teachers' chief in Iraq. The delegation consists of thirteen members, of whom five are women. The members of the Iraqi delegation declared that the aim of the visit was to strengthen the ties (bonds) of brotherhood among Arab teachers in Iraq, Syria, and the United Arab Republic. This was preparatory to the unification of their associations (unions) and joining of forces in (their) objective, programme and means so that they may be an example (model) to other bodies. They said that they had examined (studied, discussed) with those responsible (concerned) in the Damascus Teachers' Association the idea of a unified association of teachers in the three countries. They said, too, that they would discuss this subject with the Teachers' Union in Cairo.

The Teachers' Union in Cairo has received a telegram from the teachers of Damascus informing them that the Syrian delegation would probably arrive in Cairo today or tomorrow, headed by Professor Na'im Homsi, representative of the Association. The time and place of a meeting of the three delegations will be fixed after the arrival of the Syrian delegation.

Sayyid Yūsuf, representative of the Teachers' Union in the United Arab Republic, and the Minister of Education, gave a dinner party yesterday in honour of the Members of the Iraqi delegation in the Funduq al-Burj.[1]

[1] *lit.* Tower Hotel

From *al-Ahrâm*, daily, Cairo, 25.3.63.

والأخلاقية بالإضافة الى الاهتمام بتدريب المسجونين على بعض الصناعات الخفيفة.

« البلد » بغداد : ٧ تشرين الثاني ١٩٦٣

بحث توحيد نقابات المعلمين في القاهرة ودمشق وبغداد

وصل الى القاهرة بعد ظهر أمس وفد من نقابة المعلمين العراقيين برياسة محمد علي خلف النائب الثاني لنقيب المعلمين بالعراق ويضم الوفد ١٣ عضوا بينهم ٠ سيدات. وصرح أعضاء الوفد العراقي بأن الغرض من هذه الزيارة هو تقوية أواصر الأخوة بين المعلمين العرب في العراق وسوريا والجمهورية العربية المتحدة وذلك تمهيدا لتوحيد نقاباتهم وكتلتهم في الغاية والمنهج والوسيلة ليكونوا نموذجا لغيرهم من الهيئات. وقالوا انهم بحثوا مع المسئولين في نقابة المعلمين بدمشق فكرة النقابة الموحدة للمعلمين في البلدان الثلاثة. وقالوا انهم سيبحثون هذا الموضوع مع نقابة المعلمين في القاهرة.

وقد تلقت نقابة المعلمين في القاهرة برقية من نقابة المعلمين في دمشق تفيد بأن الوفد السوري قد يصل الى القاهرة اليوم أو غدا برياسة الأستاذ نعيم حمصي وكيل النقابة وسيحدد موعد اجتماع الوفود الثلاثة عقب وصول الوفد السوري.

وقد أقام أمس الأستاذ السيد يوسف وكيل أول نقابة المعلمين في الجمهورية العربية المتحدة ووزير التربية والتعليم حفل عشاء تكريما لأعضاء الوفد العراقي في فندق البرج.

« الأهرام » القاهرة : ٢٥ مارس ١٩٦٣

(b) <u>Non-autonomous</u>: in which the ambilingual text or stretch is part of a largely Arabic text (type B).
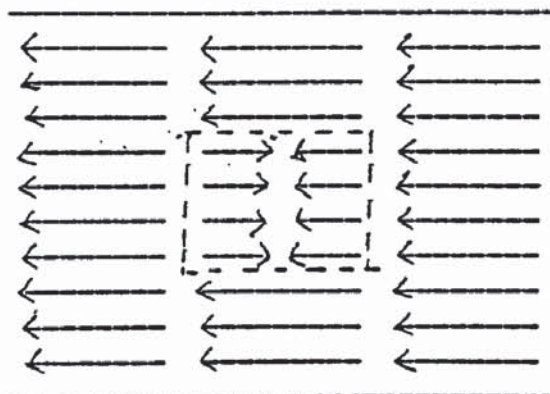
(See example C)

Example C:

عبدالرحمن عبيد عبدالنور وآخراى :(١٩٧٩)
الكيمياء ـ الصف الأول الثانوى ٧ السودان "

كبريتيد الحديدوز + حامض الهايدروكلوريك ← كلوريد الحديدوز + كبريتيد الهايدروجين

$$FeS + 2HCl \longrightarrow FeCl_2 + H_2S \uparrow$$

لاحظ أن الحديد والهايدروجين ـ فى المواد المتفاعلة ـ قد تبادلا شقيبهما لتكوين النواتج الموضحة .

ب ـ أن يكون احد المواد الناتجة ماء كما هو الحال فى التفاعلات التى تحدثُ بين الأحماض والقواعد والتى تعرف بالتعادل

(Nuetralization)

حامض + قاعدة ← ملح + ماء

حامض الكبريتيك هايدروكسيد الصوديوم كبريتات الصوديوم + ماء

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$
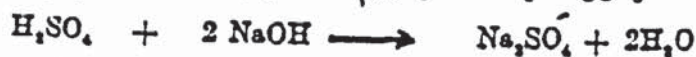
حامض الهايدروكلوريك + اكسيد الماغنيزيوم ← كلوريد الماغنيزيوم + ماء

$$2HCl + MgO \longrightarrow MgCl_2 + H_2O$$

جـ ـ أن يكون احد المواد الناتجة راسباً هو المادة التى تقبل الذوبان فى الماء،أو المادة القليلة الذوبان فى الماء لدرجة ترسبها فيه كمادة صلبة ، ويدل عليها فى المعادلات الكيميائية بسهم يشر إلى أسفل ↓ نترات الفضه + كلوريد الصوديوم ← نترات الصوديوم + كلوريد الفضه

$$AgNO_3 + NaCl \longrightarrow NaNO_3 + AgCl \downarrow$$

38

(c) <u>Separate/converging</u>:

Here the two versions are separate but are bound within the
same covers (type 2 p.31 above).   Each   one begins from its
respective front cover and both ends ·: ⁚ meet in the middle of the
document.

The two (Arabic and English) versions of any ambilingual
text, irrespective of its length which may range from two equivalent
words to a whole book, are juxtaposed in the writing surface in one
of two arrangements: Parallel and Lateral.

(1) <u>Parallel</u>: This is realized in two forms:

$$\text{E} \longrightarrow \qquad\qquad \longleftarrow \text{A}$$

(i) $\underset{\longleftarrow}{\text{A}}$ or (ii) $\underset{\longrightarrow}{\text{E}}$ (examples D and
E below)
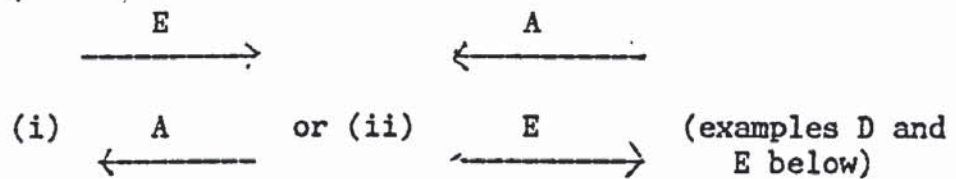
This type is very rare and more often than not belongs to the non-
autonomous category.   Documents, titles and newspaper names are
typical examples.   If an autonomous text is arranged in this manner
it is likely to be bound in the neutral form (type 1, p.31.
above).

<u>Example D</u>:

انتقالية	عمودية مهدبة	عمودية	حرشفية
Transitional	Ciliated columnar	Columnar	Squamous
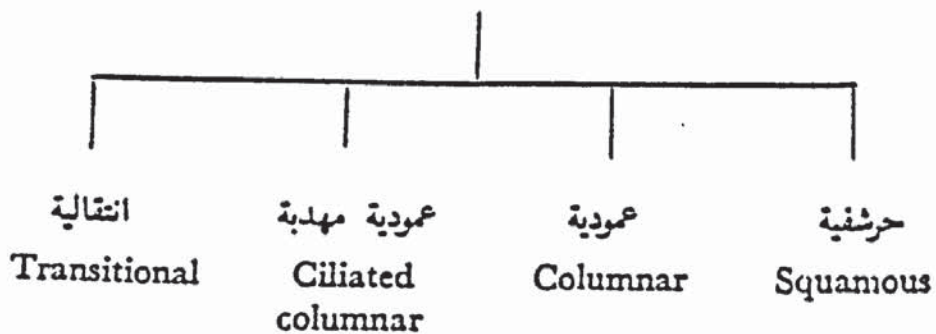
Source: 4   أحمد حماد الحسيني ـ أميل دميان:(١٩٨٤)
بيولوجية الفيران العملية (مصر)

39

Example E:

ماء كما هو موضح بالمعادلة الآتية

جلوكوز + جلوكوز ⟶ مالتوز + ماء .

$$HCO[H] \quad HCOH \qquad HC \quad HCOH$$
$$HCOH \quad HC\,OH \qquad HCOH \quad HCOH$$
$$HOCH \quad HOCH \qquad HOCH \quad HOCH$$
$$HCOH \quad HC[OH] \;O \qquad HCOH \quad HC \qquad +H_2O$$
$$HC \quad HC \qquad HC \quad HC$$
$$CH\,OH \quad CH_2OH \qquad CH_2OH \quad CH_2OH$$

Malose + Water

(2) Lateral: This as well is realized in one of two types either (i) each page contains the two versions:

Example F:

B — The Central Nervous System and the Cranial Nerves

To dissect the central nervous system, the toad should be placed in the dissecting dish in a particular position, because this system, as is the case in all chordates, lies in the *dorsal region of the body* (characteristic feature). Therefore, the toad should be pinned down with its back facing you.

Instructions for dissection:

• Turn over the same toad in which you have just examined the spinal nerves, or another toad that had been preserved in formalin, lay it on its belly and pin it down to the dissecting dish.

• Cut the skin transversely behind the head region, then pull it forwards and remove it away from

←87

والسلسلة السبيه على احد جابى الجسم ووضح الأسماء على الرسم .

ب ـ الجهاز العصبى المركزى والأعصاب المخية

يحتاج الجهاز العصبى المركزى لتشريحه إلى وضع خاص توضع فيه الضفدعة ، ذلك أن هذا الجهاز ، كما هى الحال فى جميع الحبليات ، يقع فى الجهة الظهرية للجسم (صفة مميزة) ، ولذلك ينبغى تثبيت الضفدعة وظهرها إلى أعلى متجهاً إليك .

إرشادات التشريح :

• اقلب نفس الضفدعة التى سبق ك تشريحها لدراسة الأعصاب الشركية ، أو ضفدعة أخرى حفظت فى الفورمالين ، وثبتها فى طبق التشريح .

• اقطع الجلد قطعا مستعرضا خلف الرأس وحاول أن تشده إلى الأمام وتنزعه من فوق منطقة الرأس بمساعدة المشرط .

٨٧

is a delicate nerve. It gives off a branch to the sacral plexus, and supplies the posterior region of the trunk.

— Note that each of the two **sympathetic chains** lies along one side of the vertebral column. It has been called "chain" because it is formed of a long cord bearing a number of swellings or **nerve ganglia.** These are the **lateral ganglia.** Their number varies according to the specimen. Typically there are ten lateral ganglia in each chain, one opposite each spinal nerve. However, two of them may fuse together to form a common ganglion. Each ganglion is connected to the opposite nerve by a very short branch — the **ramus communicans.**

Note that some nerves leave out this chain to some organs of the body where they form **nerve plexuses** such as, for example, the

←86

عصبى ، حسب رقم يخص عصب إلى الضفيرة العجزية وبعد المنطقة الخلفية للجذع بالألياف العصبية .

— تبين وجود السلسلتين السمبتين ، واحدة على كل من جانبى العمود الفقرى ، وتقع وثيقة منه ، وسميت سلسلة لأنها عبارة عن حبل طويل عليه بعض الانتفاخات أو العقد العصبية ، وهى هنا تسمى العقد الجانبية ، ويختلف عددها من عينة إلى أخرى ، وفى الحالة النموذجية توجد عشر عقد فى كل سلسلة ، عقدة لكل عصب شوكى ، غير أنه قد تتحد اثنتان منها لتكونا عقدة مشتركة . وتتصل كل عقدة بالعصب المقابل بفرع قصير جداً يسمى الفرع الموصل .

تبين خروج بعض الأعصاب من هذه السلسلة إلى بعض أعضاء الجسم مكونة ضفائر عصبية ، مثل

٨٦

or (ii) the English versions occupy the left-side pages, and the Arabic versions the right-side pages:
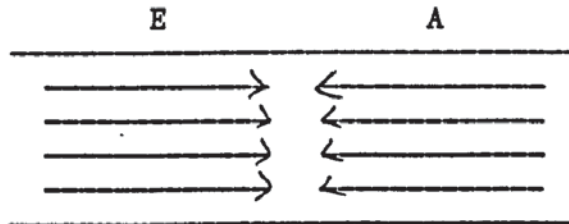
(See example B above)

Both lateral types are in wider use, particularly in education and administrative contexts especially in Arab countries of the major English zones. The ambilingual format especially the lateral one is used in bilingual dictionaries, textbooks especially in technical higher education, official (eg. application forms) and personal (eg. passports) documents.

The availability of two linguistic versions, each a translation of the other, in physical juxtaposition ensures better understanding of and interaction with the message which by being available in two languages will appeal to more users whether they are monolinguals or bilinguals, native or foreign. In higher education where Arabic has taken over from English as medium, an ambilingual text is thought to be of great benefit in keeping in touch with foreign references. On the other hand if English is still maintained as the medium following an Arabic-medium general education, the availability of an extra reading text in Arabic is likely to consolidate and speed up the students' academic attainment.

The fact that Arabic is the basic education medium in the first case and English is in the second case where an ambilingual text is in use is marked often by a slight prominence of Arabic and English respectively in the used text. This marginal prominence of one language in ambilingual texts is not limtied to educational textbooks. One language rather than the other is likely to be more convenient for use, eg. in filling in an application form or issuing a personal or official document, eg. an ID card or a driving licence. The place where the document is processed, issued or used, may determine the use of one language in particular or in some cases both languages. The precedence of either language is usually positively marked by organizational or typographical cues, eg. direction of paging (L-R or R-L), use of comparatively different letter-type size, the availability of specific information or sub-

texts in footnote form or small print and in one language only, eg.
a section headed "for official use" in some official forms.
Sometimes the reader's or user's attention is drawn directly to the
dominance of one language (see R-L arrows beside page number in
example F above) at least in the overall orientation of pages.
After the introductory papers in English in the same source the
reader is reminded:

IMPORTANT

This book is to be read
from Right to Left.

Section C: Graphological_Signs

So far we have seen how graphological orientation affects
the overall textual organization of both monolingual texts and
Arabic/English bilingual texts. The specific nature of the
graphological units, eg. letters, numbers, etc. of which the actual
text is made up, is yet to be considered to see how they affect and
are affected by their respective orientation. A closer look at
these constituent units in Arabic and English seems in order now.
It extends the so far global implications of the interaction between
orientation and text in organizational terms to a more detailed
interaction between orientation and the building of graphological
units.

The brief survey of Arabic and English alphabetical and non-alphabetical signs that follows will stress the pedagogical implications for their learning in a second or foreign language context. These will be briefly discussed in the light of differences and similarities of the signs of both systems as with regard to the graphological composition, manner of formation, ie, direction of pen and hand movement, and the writing and reading of multi-digital numbers. These of course involve the language learner or user and how he or she interacts with both alphabetical and non-alphabetical signs. The interaction between the learner or text user on one side and the text and its graphological orientation on the other will be exclusively treated in the next chapter as pointed out earlier.

Alphabetical_Signs

Arabic-speaking learners of English have to cope simultaneously with an alphabet, which is not only different in orientation but, realized in three subsystems or types:

(i) The_cursive: this shares a common characteristic with Arabic in that the letters are joined.

(ii) The_capital: (handwritten or printed). Unlike Arabic the letters are normally separate.

(iii) The_printed_small: (also separate letters).

The learners are required to produce and recognize the first two types especially the cursive but to recognize the last which is

exclusively used for reading printed or typed materials. The
restriction of one type to reading and another to longhand writing
is likely to confuse some Arabic-speaking learners of English since
that distinction is not clear cut in Arabic. The common
characteristics of the individual Arabic letter are maintained both
in handwriting and typing or printing. However there are stylistic
or artistic versions of the alphabet. The most popular of these is
"naskh" نسخ which is "above all characterized by graceful free-
flowing curves. Normal modern type faces are ultimately modelled on
this style". (Beeston 1970:117). It is also used for teaching
beginners before they become acquainted to ruq'a رقعة, which is the
normal style used for handwriting today. (Mitchell 1953). Other
styles are restricted to calligraphic writing.

The non-existence in Arabic of a similar dichotomy to the
upper/lower case is responsible for many mistakes. The obligatory
punctuational use of capital letters at sentence beginning is often
ignored and so is the initial capitalization of proper names.
Lower and upper case mixing in non-initial position and within the
same word is not uncommon (see video).

Conversely English-speaking learners of Arabic and for that
matter all users of the Roman alphabet find it rather difficult to
recognize letter-boundaries in Arabic words in which letter joining
is obligatory. 22 out of the 28 letters which constitute the whole
Arabic script join on both sides to the preceding and following
letters in the same word if those letters belong to the same
category, ie. obligatory joining at both sides. In "naskh" the
remaining 6 join at the right (back) side only if they were

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preceded (keep Arabic orientation in mind!) by letters from the first category.

joining at both sides   تة   كتب

joining at the right side only   ر   يدى

       A marking characteristic of the Arabic script as evident in the above example is the use of dots. 15 out of the 28 letters have dots. Their presence or absence, number (one, two or three) or their position (above or under the letter) may be the only criteria to distinguish letters which share one basic form (see below). They are inherent parts of the letter; and so their omission or placement where they are not necessary will result in letter confusion and hence failure in writing or reading correctly.

Examples:

(i)   ر   نر , ذ ذ د

        |r| |z| |ð| |d|

(i) are distinguished only by absence or presence of dots.

(ii)   ث , ن

        |θ| |t|

(ii) are distinguished by number of dots

(iii)   ت , ب

        |t| , |b|

(iii) are distinguished by number and position of dots.

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However the main difficulty in mastering the Arabic script by users of other systems lies in the fact that most Arabic letters undergo a form change according to their position in words especially those which join at both sides. The full form as in the above example is maintained only in final unjoining position. Below is an extreme example of form change according to position using Arabic /t/ and Arabic R-L orientation.

4	3	2	1
final (independent)	final (joining)	medial	initial

This characteristic of form change has imposed the use of about 80 type faces in the Arabic typewriter. The seemingly great challenge for· learners to grasp all these forms is substantially reduced by the fact that the actual number of basic forms is far less than that. Letters which are distinguished by presence/absence, number and position of dots are 23 letters. These constitute 9 sub-groups. In each subgroup the letters share the same basic form which in turn may change according to position but the distinction between letters within the same subgroup is based as seen earlier on presence/absence, number and position of dots. The grouping of Arabic letters according to shared basic forms renders their recognition easier. This strategy is adopted in some teach-yourself-Arabic materails (eg. Tritton 1977).

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Another distinctive characteristic of the Arabic alphabet, shared by other Semitic languages, eg. Hebrew, as pointed out earlier, is the lack of letter forms for short vowels. Arabic short vowels are marked by diacritics placed above or below the letters representing the consonants which the vowels follow to form syllables (C + V).

e.g.   /d/   da   di   du

Diacritic placement is essential in beginner readers, poetry and sacred texts, eg. the Koran, to preserve the exact pronunciation. For ordinary everyday writing and reading purposes they are usually omitted.

One basic difference between Arabic and Roman letters is that most Arabic letters extend horizontally on the line, ie. they are largely flat in shape,

e.g.

while the Roman letters extend clearly above the line, and sometimes below it as well e.g. so they need and take more space on the writing surface. In other words they are more salient and contain redundant features if compared to the more linear Arabic letters. They require more curves and strokes to make and hence a considerable amount of shuttling (El Hassan 1984) which increases when they are joined in cursive writing.

The movement of the writing hand in a left to right progression for the formation of cursive Roman letters is achieved

mainly through clockwise and anti-clockwise pen movement. An analysis (based on the researcher's longhand) of the way lower case cursive letters are formed has shown that over half of them are made wholly or mostly in an anti-clockwise fashion and most of the rest in a clockwise mode:

A/C   a   b   c   d   e   f*   g*   i   l   o   s*   t   y

C   h   j   k*   m   n   p   r   3

NB. *Only the first half or more is made in the stated fashion.

On the other hand the right to left movement of pen and hand in writing Arabic letters involving curves takes the shape of a clockwise movement which for some letters changes into an anti-clockwise, usually without stoppage, before the letter is completed.

ن   ح   ه   ط

ن   ج*   ه   ظ

NB. *Clockwise changing into anti-clockwise.

When horizontal strokes or linear stretches constitute part of the letter it is compatible to Arabic to be made from right to left and from left to right in English. These differences of pen and hand movement in writing either Arabic or English letters or words as a first language are bound to negatively affect writing

speed in the other language when learned as second or foreign. Standard procedures in letter formation in one language may be non-standard in the other. Evidence of graphological interference in letter formation is available in the video.

Numbers and other non-alphabetic signs

The mastery of the number system of a foreign language is an essential part of the learner's linguistic competence. This task, fortunately, is facilitated for Arabic and English bilinguals by the adoption by both languages of the decimal system in speech and writing. The decimal system is based on the number "10" and its multiples. Moreover each number from one to nine has a distinctive written symbol, plus one for "zero". The invention of the decimal system itself is one of the most remarkable human achievements. ever which developed over many centuries and was crowned by the use of a zero symbol firstly by the Hindus (Smeltzer 1953).

The ten basic symbols (0—9) are usually taught with letters for beginners of either language. Although they are known as the 'Arabic' numerals in Europe, the credit of their invention as that of the zero is thought to be an ancient Indian contribution which the Arabs adopted and perhaps adapted before they brought it through Spain to European notice and subsequently use (Srinivasingar 1967). It is interesting to note that the version of Arabic numerals in use in the eastern Arab World is different from the one used in the West and ex-French Arab countries of North Africa. Throughout this study we will refer to the oriental version by "Arabic Language

Numerals" (A.L.N.) reserving "Arabic Numerals" (A.N.) to the occidental version:

A.N.   0 1 2 3 4 5 6 7 8 9
A.L.N. • ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩

A L-R orientation user learning Arabic for the first time may expect that the opposing orientation of Arabic, R-L, requires writing Arabic multidigital figures (the units, tens, hundreds etc) from right to left to conform with Arabic orientation. For example he or she would think that "seventeen" "17" should be "١٧". This accidental agreement between Arabic and English and for that matter many other languages arises from the simple fact that what is said first is written first. In uttering "17" in Arabic the lexical item denoting "seven" is said before that denoting "ten" and so written first, ie. at the beginning on the right. In other words number writing is a mere reflection of the temporal order of uttering but corresponding to and reflecting the graphological directionality.

In spite of this similarity of Arabic and English the opposing directionality is clear when two or more numerically written quantities are sequenced horizontally, ie. addition, subtraction etc. For example:

$$3 \times 2 \div 2 + 13 - 1 = 15$$ is written in Arabic:

(i) using A.N.

$$\overleftarrow{\rule{4cm}{0.4pt}}$$
$$15 = 1 - 13 + 2 \div 2 \times 3$$

(ii) using A.L.N. as

$$\overleftarrow{\rule{4cm}{0.4pt}}$$
$$١٥ = ١ - ١٣ + ٢ \div ٢ \times ٣$$

It is clear from the above example that the mathematical signs +, −, ÷ and = are the same in both languages. However some other signs, eg. those lacking in lateral symmetry change directionality or side to suit Arabic, eg.

$$\sqrt{16},\ 8 > 7,\ 3 < 5,\ 10\%$$

appear in Arabic (to be followed in a R-L order):

$$\% \backslash . \ (\Im > \natural \ \iota \lor < \land \ \iota \sqrt{\sqcap \natural}$$

It is obvious that the symbols for "square root", "more than", and "less than" have changed directionality while "the percentage sign" has changed its position to correspond to Arabic reading. The English comma (,) separating the statements has also changed into (ٴ). Other widely used symbols and notations change orientation, position or both to be compatible to Arabic writing, e.g.

L-R		R-L
?	⟶	؟
:−	⟶	−؛
35°	⟶	°٣٥ د
14²	⟶	١٤

In the experimental side of this study (Chapters Four and Five) the reaction of subjects to non-alphabetic signs of the kind already surveyed will be investigated in contexts where English and Arabic are learned and used by non-native speakers to see what strategies they employ in responding to directional tasks involving the production or perception of such graphological symbols.

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CHAPTER THREE

Biological and Environmental Trends of Horizontal Directionality with Specific Reference to L-R/R-L Graphological Orientations

Introduction to the Chapter

The selected body of research reviewed here comes largely from the domains of neurology, neuropsychology and child psychology. These areas contain studies which impinge on the present work without immediately influencing it. The researcher's knowledge in the aforementioned domains is of a lay nature, the work reviewed is pure rather than applied. First, the apparent distance between the reviewed studies and the present one, and second, the limitation of the researcher's knowledge, have therefore made him rely on merely common sense assumptions and insights in his conservative discussions and interpretations of the data of others. He has also refrained from explicit comment when it is felt that such comment might raise issues beyond the scope of the present thesis.

The common obvious link, however, between the selected studies and this project is that they all deal with directional or perceptual exploration, and organization of information and stimuli in the spatial dimension. Human behaviour and preferences in these respects are affected by a host of simultaneously interacting factors: genetic, developmental, and cultural or environmental.

The present study is concerned in the main with a set of culturally acquired behaviour and its implications. Such behaviour is certainly affected by genetic and developmental factors as will

be seen. The selected literature is given in four sections - A, B, C and D, starting from the least to the most relevant in the researcher's judgement.

Section A offers the necessary conceptual framework. it introduces basic useful genetic concepts and terms recurring in the section that follows. Some of these concepts are believed, though controversially, to have an impact on the acquisition of literacy (see dyslexia below). In this respect section A may have indirect relevance with graphological orientation which is only an attribute of literacy.

Sections B, C and D investigate in different ways the interaction between the two opposing (L-R/R-L) directionalities. Section B, emphasizes the interaction at the perceptual level in the visual dimension. Section C extends beyond the visual perception to manipulatory exploration and spatial arrangements. Section D investigates the directional tendencies in actual graphological practices. Both C and D, explore in the main, the developmental tendencies of children.

The Chapter ends with section E which critically reassesses the reviewed research from the point of view of the study. It emphasizes the distinctive features of the latter and sets the scene for the experimental side of the study which follows.

Section A: Language and Laterality:

A.1: Cerebral Dominance

In spite of the physical symmetry of man, eg. two hands, two nostrils etc., one member of the pair, more often than not, is dominant. It seems that lateral dominance or laterality differences is a fuction of normality so such a phenomenon is not always obvious. The most obvious dominance is that of hand, whether it is the right or the left. Lateral dominance in many cases is very weak or too subtle to be recognized, eg. eyedness, unless certain devices including careful designs of experimental procedures and controls are used.

Laterality, however, is not confined only to the sensory or other external organs. The brain itself is largley asymmetric in function, in spite of its symmetrical structure. Different activities within the cognitive, affective, and psychomotor domains across all of which language operates, are controlled and co-ordinated from different areas either in the left or the right hemisphere. Cerebral dominance and hemispheric specialization are far better understood today although such concepts had been recognized since 1836 (White 1969).

Newton and Thomson (n.d.) summarizing the works of Zangwill (1960), Kimura (1964), Sperry (1964), Luria (1970), and others on Laterality as related to language, concluded that:

"Language, symbolic order, analytic and discrete skills
are processed in the left hemisphere whereas global,
visuo-spatial and artistic skills have a pre-eminence in
the right hemisphere."

Evidence confirming the dominance of the left hemisphere for
language is supported by an overwhelming quantity of clinico-
pathological research on right-handed aphasics who acquired the
aphasia syndrome as a result of a lesion in the left hemisphere.
Artificial methods could also be used to determine hemispherity.
Barton et al (1965:431) referred to an

"increasingly wide spread use of Wada's (Wada and
Rasmussen, 1960) carotid artery injection procedure ....
as a means of temporarily suppressing the activity of one
hemisphere at a time to induce a transient aphasia with
the injection of one side but not the other."

A:2 Cerebral dominances and handedness

The once predominant simplistic assumption that right-handed
people, who are the majority of the population, are left-brained and
all left-handers are right-brained has been challenged. White (ibid.
399) basing his arguments on the statistics of previous studies on
handedness and cerebral dominance concluded:

"Extrapolatiang from the data, it may be expected that in
a random sample of right-handed subjects, about 90% can
be left-brained, and in a random sample of left-handed
subjects, 64% can be left-brained".

This conclusion still seems to consolidate the general
belief that cerebral dominance is significantly stronger among
right-handers. Studies on laterality differences (Section B below)
confirm this view but also show that left-handers enjoy a clear

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dominance when compared to ambidextrous or ambilateral who usually fail in establishing any clear or consistent lateral or cerebral dominance.

A:3 Laterality and Dyslexia

Dyslexia, or the extreme difficulty facing some people, in spite of equality of opportunities in acquiring the fundamentals of literacy has been a great concern to neurologists and educationalists. It has been defined by the World Federation of Neurology, 1968 (Newton & Thomson ibid:1) as:

> "a language disorder in children who despite conventional classroom experience, fail to attain language skills of reading, writing and spelling commensurate with their intellectual abilities".

Similarly Bannatyne (1971:7) refers to dyslexia:

> "as a generic term to cover the whole category of reading and spelling disturbances which appear to have a primary cause in their own right and which cannot be said to be caused by retardation, asphasis, autism etc."

Orton (1937) suggested a link between the syndrome and unstable patterns of individual laterality. Subsequent researchers on reading difficulties also noted the high incidence of ill lateralized individuals among people of specific reading difficulties an alternative term for dyslexia, favoured more by educationists. Researchers favouring the poor lateralization hypothesis include Bannatyne and Wichiarjote (1969), Critchley (1970), Harris (1957), Klasen (1972), Money (1962), Naido (1972), Newton and Thomson (1974 and n.d.). Poor lateralization implies of

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course weak or inconsistent cerebral dominance which may be genetically transmitted. In many studied cases of specific reading difficulties where a poor or inconsistent laterality is found the phenomenon may be traced back to include other members of the family in addition to the referred case or individual concerned (Critchley 1964, Hallgren 1950).

At Aston University, Birmingham, England, where a dyslexic project and clinic were set up, a diagnostic index of the syndrome (Newton & Thomson, 1974:7) was worked out. This was meant to help "teachers to recognize those children at risk in the verbally-based educational system and to recognize them at the earliest stage in order that appropriate teaching can be devised."

The Aston index examines among other things the laterality of the individual and his family (blood relatives). Other important aspects of the index include: visual and auditory sequential memories, grapheme/phoneme correspondence, copying geometrical figures etc.

Section B: Percpetion in the Visual Field

One of the most studied Laterality differences is that related to the visual perception within different areas of the visual field. The differences of accuracy of recall or recognition of verbal and non-verbal stimuli were studied using different modes of presentation. Mishkin and Forgays (1952) under the influence of Hebb (1949) pioneered this line of research "which has continued for over 25 years on two continents and had been of central importance in determining the effects of lateralization." (Greenbaum and

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Kugelmass 1980:113). Most of the research as implied in the quotation was carried out in America (USA) and Asia (Israel) using English and Hebrew/Yiddish monolinguals and bilinguals as well as English and Hebrew/Yiddish words and letters.

Mishkin and Forgays (ibid) investigating the interaction between the acquired directional set due to literacy in one directionality (R-L/L-R) and presentation mode in either the left or right visual hemifield found that when English words (L-R) were presented tachistoscopically, and unilaterally, ie. in one visual hemifield at a time they were significantly better recalled in the right visual field (RVF). Conversely Yiddish words (R-L) achieved slightly better recognition in the left visual field (LVF) under the same mode of presentation ie. unilateral. Their findings were confirmed for Yiddish (Orbach 1953), and for English and Hebrew (1967). Harcum and Finkel (1963), Harcum and Jones (1962), Terrace (1959), Bryden (1966) and Bryden and Rainey (1963) also corroborated the previous findings for English, ie. a lateral recognition differential for the RVF when the unilateral presentation mode was adopted. Harcum and Finkel (ibid), however, found that when English words were reversed (R-L), the differential turned in favour of the LVF.

The opposite LD's for both directionalities (L-R/R-L) might be attributed to the difference in graphological orientation, Mishkin and Forgays (ibid:47) suggested: "a more effective neural organization [developing] in the corresponding cerebral hemisphere

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(left for English and right for Yiddish) as a result of training processes that are specific to reading these languages."

So far only unilateral presentation has been considered. When the presentation extended bilaterally across the fixation point, Heron (1957) found an LVF differential for English. Bryden (1966) and Harcum (1964) using strings of random letters achieved similar findings. Heron (ibid) attempted to explain the opposing differential for both types of presentation. His explanation rested on the fact that in scanning L-R words the eye tends to move first to the beginning of the word and then to follow the directionality of the letters. When the word (L-R) is presented in the right visual field the eye movement from the central fixation point to the right to the beginning of the word and its scanning in the same direction i.e. to the right is in accord to left-right scanning. On the other hand if the same L-R word is placed in the LVF the movement of the eye from the central fixation point to the left to reach the beginning of the word on the far left is in discord to the left-right scanning of the letters of the word. The same explanation could apply for the slightly better recognition of Hebrew/Yiddish words in the LVF in unilateral presentation. The LVF differential recognition of English in bilateral presentation was also explained by Heron (ibid). The tendency to begin at the beginning i.e. to the left of fixation (in the LVF) and then to proceed to the right overrides and consequently the parts seen first, ie. in the LVF stand a better chance of concentration and remembrance. Heron's hypothesis is seen by White (ibid:387) as an extension of Mishkin and Forgays intepretation incorporating a

'directional post-exposure scanning' of a rapidly decaying memory trace" of the stimulus after the tachistoscopic exposure.

Heron's hypothesis however does not explain the weaker unilateral differential for Hebrew and Yiddish. This may suggest a cerebal dominance operating on all subjects irrespective of their writing/reading directionality but working in favour of a RVF superiority. In the case of English words the genetic and the acquired tendencies are of the same kind; in the case of the Hebrew/Yiddish words they are contradictory but the acquired tendency, though weaker, still prevails. The resultant is that the LD's, although reflecting opposing directional habits, differ in their respective strength.

To assess the cerebral factor, environmental (acquired) factors have to be eliminated. This could be done either by the use of non-letter stimuli or the use of neutral directionality ie. vertical for the presentation of verbal material, or both. Bryden and Rainey (ibid) and Wyke and Ettinger (1961) eliminated the directional set by using outline sketches of familiar objects. They found a range of LD's for the RVF for the unilateral mode of presentation. This of course cast doubt about the sole responsibility of acquired directional set in favouring a RVF and implied a cerebral dominance factor. Goodglass and Barton (1963) and Barton et al (1965) investigating the role of cerebral dominance as indicated by handedness administered the tachistoscopic presentation vertically for Yiddish and English words. They only used right-handed subjects and unilateral presentation. They "found

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accuracy of recall to be better for words appearing in the RVF".
(White, ibid:389). This was found for both languages. It also
demonstrated a clearer role of left cerebral dominance which
correlates highly with right-handedness.

Subsequent researchers followed Barton and his associates in
considering the handedness factor which was largely overlooked in
previous studies and therefore might have affected the findings.
Contrary to the findings of Mishkin and Forgays and those who
followed them, many quoted above, Obrach (1967:132) experimenting on
native Hebrew speakers literate in English as well and adopting the
unilateral mode of presentation for English and Hebrew found that
right-handed subjects had correctly "identified both English and
Hebrew words better on the right side of fixation though the
difference was much more marked for English than for Hebrew words"
(p.132). He also found that left-handers had shown a lesser
differential than right-handers but the difference was significant
only for Hebrew. These findings support in the case of English or
L-R what has been indicated earlier that when both the innate and
cultural tendencies are of the same type, ie. they reflect better
perception of stimuli to the right of fixation. But contrary to
what has been noted earlier the innate or constitutional tendency
has overtaken the culturally or environmentally acquired one in the
case of Hebrew. Moreover left-handers seem to be more affected by
acquired directional tendencies than right-handers (sections C and D
below) particularly in Hebrew where acquired reading habits
seem to consolidate innate tendencies of left-handers
many of whom are believed to be largely right-brained and

so perceive stimuli better left of the fixation in clear contrast to the overwhelmingly left-brained right-handers.

Section C: The Development of Directional Exploration

Some researchers tried to detect any possible developmental trends of the directional behaviour by observing and experimenting on subjects of different ages ranging from pre-school children to college students and other adults. Examples of observations and studies relating to such aspects have already been given in the introduction to the thesis (Chapter One), in addition to the insights offered by studies reported in the previous section which, though valuable, have concentrated on perception in the visual field.

The interaction between literacy levels, graphological directionality, and age was studied by Regan and Cropley (1964). They experimented on three age groups: (i) pre-literate, who in most cases were able to print their names (average age 3 years, and 9 months); (ii) interliterate (average age 6 years 1 month). All of them could easily write their names; and (iii) literate university students (average age 22 years). The experiment involved three serial perceptual and motor tasks. The first required the placement, using only one hand, of 12 identical cards on a testing length marked off into equal rectangles each for one card. The second task required the collection of 12 blocks, one by one and also using one hand, arranged serially on the testing surface. The last task required the filling in, using a crayon, of 12 equal squares, also one by one, and using one hand. The results

squares, also one by one, and using one hand. The results demonstrated that the adoption of the L-R directionality was dominant and progressively increasing with age. This had also established a highly significant correlation between the level of literacy in English and the preference of a left-to-right manipulation of the serial materials. Regan and Cropley had referred to directional skills acquired by literacy and numeracy as formographic. The progressive development of a L-R directionality in tasks other than writing relates in Regan and Cropley's concluding words "to the hypothesis that formographic skills may well actually impose, rather than merely reflect, a directional set on perceptual motor operations". (p.579)

A frequently quoted work on the development of perceptual exploration of children was carried out by El Kind and Weiss (1967). The age of the children who took part in the experiment ranged from 5 to 8 years. Although the nationality, language and country of the subjects were not mentioned in the paper, it could be reasonably assumed that they were Western (perhaps Americans) and English monolinguals. However, the authors clearly state that the subjects were roughly comparable in ability and socioeconomic status. The experiment involved two tasks and each subject was instructed orally and individually to carry them out. The first task required the naming of 24 pictures of familiar objects and animals pasted in an unstructured manner on a card. If the child failed to name the picture he or she was required to point at it. The second task contained 18 pictures arranged in a triangular shape. The children were also asked to name or point to them. The subjects' exploration of both the first unstructured array (UA) and the second, structured

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array (SA) was recorded by the experimenter. The development of L-R and top-to-bottom (T-B) strategy was tested for both array types. The result was that systematic exploration for the unstructured array was found to increase with age but that of the structured array was systematic at all ages. El Kind and Weiss concluded that "perceptual exploration is a joint function of the child's level of perceptual development and the nature of the stimulus configuration". (p.553) Interestingly they seemed to have taken for granted horizontal systematicity as the left to right one without any direct mention of the possibility of an influence from the formographic skills of the western culture as suggested by Regan and Cropley (ibid) and others, as seen before (previous section) and will follow below.

Metwalli (1974) using Egyptian and American subjects, El Kind and Weiss's triangular array and all Regan and Cropley's three tasks tried to see if differences in graphological orientation (formographic skills) and culture could confirm the findings of both studies. She experimented on five groups of subjects, the first three comprised Egyptians in Egypt and the remaining two Americans in the USA:

(i) Low-literate Arabic monolinguals; average age 11 years 8 months (range 6-21); some of them could only write their names.

(ii) High-literate Arabic and English (EFL) bilinguals; all drawn from Al-Azhar University; average age 24 (range 20-42); they were tested in Arabic in an English class;.

(iii) High-literate Arabic and English bilinguals; all students in the English-medium American University of Cairo; average age 24; tested in English.

(iv) High literate English monolinguals; average age 22 years 6 months (range 18-55); they acted as controls for groups (ii) and (iii).

(v) Low-literate English monolinguals; average age 12 years 6 months (range 6-19); they were meant to match group (i).

Without going into a detailed consideration of the responses of each group the results of the study demonstrated beyond doubt the clear preference of monolinguals of the directionality compatible to their basic language and culture. Also a development of an L-R directionality among the Egyptians was found to increase with age and more familiarity with the western culture, ie. better knowledge of English.

Metwalli's findings had confirmed what Kugelmass and others had already observed (Kugelmass et al (1970, 1972)). Investigating the perceptual exploration of Israeli Jewish children they noticed that they were developing "a right-to-left orientation during their first year of school which would specially be predicted from the right-to-left directionality of written Hebrew". (Kugelmass et al 1972:345). Extending the research to include Bedouin (Arab) children in Israel Kugelmass et al (ibid) found that the R-L influence was stronger in the Arabic children than in the Jewish who were more familiar with the largely L-R dominant western culture,

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eg. layout of musical notation. In a later study Kugelmass and Libelich (1979) compared two groups of right-handed Jewish and Arab children from the first to the ninth grades. In spite of the introduction of English for both groups "the right-to-left tendency in the Arab children was much stronger, lasting into the upper grades" (p.406). The stronger tendency of the Arabs to resort to an R-L orientaiton could be attributed in addition to their minimum exposure to western culture to differences in writing individual Hebrew and Arabic letters. In spite of the same R-L overall directionality more Hebrew letters involving horizontal strokes are printed from left-to-right. This matter is followed up below (section D).

Prior to Kugelmass and his associates, Braine (1968) indicated that right-handed Israelis tended to organize a series of items from left-to-right. She also found that "the left 'attentiveness' began around the seventh grade and developed from an earlier tendency to 'attend to the right'" (p.73). By that she confirmed Takala's (Takala 1951) findings that right-handers attended better to stimuli in the left visual field.

This section on the interaction between biological, developmental and environmental or cultural factors in relation to perceptual exploration and scanning within the horizontal dimension will close by giving a summary of an important study which recapitulates the whole issue before moving to section D which deals exclusively with actual graphological execution of horizontal directional tasks which by their very nature demand pen and hand movements.

Nachshon et al (1977) carried out a series of experiments in which 64 American-born and native-born Israeli subjects (32 from each group) were required to record the order of horizontally arranged stimuli after being presented for a short time. All the subjects were right-handed students. The American born students had been in Israel for about a year and their knowledge of Hebrew was minimal. The native-born on the other hand had studied English as a second language in school. The first group hence called ER (English readers) represented the basic L-R directionality. The second group or HR (Hebrew readers) had acquired the R-L directionality as their basic orientation.

The experiment tended to assess the relative influence and interaction between basic reading habits, presence or absence of inherent directional stimulus characteristics, and immediately established directional set. The stimuli seen below were 6 rows of letters and different figures, each on a separate card.

K D L H Y C U R F N Z B	English letters
٦ ט ⊐ ש ץ ד ו ⊐ ⊓ ⊓ ע א	Hebrew letters
▨ ▨ ▨ ▨ ▨ ▨ ▨ ▨ ▨	Coloured rectangles
○ ◉ ○ ○ ◉ ◉ ○ ○ ◉ ◉ ◉ ○	filled/unfilled circles
⊖ ⊖ ⊖ ⊖ ⊖ ⊖ ⊖ ⊖ ⊖ ⊖ ⊖ ⊖	Circles with bars
⊓ ◺ ◇ ⌐ ⊏ ○ ⋈ △ △ ⊿ ⊏ ○	geometric figures

The order of card presentation and the internal arrangement of the stimuli within each card or row were randomized. The above figure represents only one possible mode of presentation.

The first two rows are English and Hebrew letters respectively. They represent stimulus types with built in or inherent directionality. The other 4 rows represent non-letter stimuli which do not suggest any directional set. The rectangles are differently coloured and half of the circles (4th row) are filled.

Each card was presented for five seconds and then the subjects were asked to reproduce the stimuli in the order of their presentation. This was done by filling 12 slots of provided sheets for letters, filling in plain circles corresponding to the filled ones (also sheets with circles provided), adding bars to given circles in the required direction, and arranging provided carton chips corresponding to the coloured bars and geometric figures in a manner reflecting their presentation order. Each stimulus type was presented in four different arrangements (2 basic arrangements with their respective mirror-images). This meant that each subject was presented with a total of 24 cards in 4 series or sequences each including 6 cards representing the 6 stimulus types. In half of the sequences and for half of each group (16ER/16HR) each sequence started with a letter card to create an immediate directional set (set condition) and in the other half a letter card ended each sequence of presentation (non-set condition).

The results of the experiments showed that both ER and HR scanned English letters from left to right and Hebrew letters from right to left although the letters in each case were not arranged or meant to give meaningful words. This partly reflected the perception of each individual letter in a way implying its intrinsic orientation. However the basic reading habits (L-R for ER, and R-L for HR) played a clear role in that the L-R tendency was stronger among ER in scanning English letters; conversely the R-L tendency was stronger for HR and Hebrew letters. Detailed examination of the results indicated a significant difference in favour of ER scanning English letters in the LR mode compared with their scanning of Hebrew letters in their respective R-L directionaltiy. This could clearly be attributed to the clear dominance of the L-R directionality for ER (English readers). On the other hand the scanning of Hebrew letters by HR (Hebrew readers) in the R-L orientation was not significantly stronger than their scanning of English letters in the L-R directionality. The difference between the behaviour of the two groups may be partly because the influence of English on HR may be greater than that of Hebrew on ER or an innate factor as suggested before might be working in favour of a stronger L-R dominance irrespective of the acquired reading habits (Braine 1968; Kugelmass and Lieblich 1970; Mutwalli 1974; Weiss 1969, 1971 etc.)

Non-letter stimuli were generally scanned by ER from left to right and by HR from right to left. In the non-set conditions, i.e. when the letter stimuli followed the non-letter ones the right to left tendencies of HR were weaker than in the set condition, i.e.

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when the non-letter stimuli followed the letter ones. The ER on the other hand had almost shown equal tendencies in favouring the L-R for both experimental conditions. The weaker R-L trends of HR in the non-set condition indicated that such tendencies were not readily activated as in the case of L-R ones of ER. The ER also did not generalize the application of a R-L orientation for stimuli other than materials originally in that directionality namely R-L or Hebrew letters. HR however may sometimes apply the R-L directionality to non-letter or non-reading events while ER apply their reading directionality almost to all non-reading events to make serial horizontal arrangements.

Section D: The Development of Graphological Directionality

In a study of directionality trends as a function of handedness and reading and writing habits, Dreman (1974:247) wrote:

> "It is generally accepted that tensor movements outward from the body are superior to flexor inward movements. The former has been described by several authorities as being smoother, more rapid, more accurate, and less fatiguing (Bartell, 1957; Brown, Knauft, and Rosenbaum, 1948; Downey, 1932). This phenomenon could be due to neuromuscular or central characteristics. In either case, right-handed subjects would be expected to draw horizontally extended figures from left to right and left-handed subjects to execute such figures from right to left. There is research (Reed and Smith 1961; Gessell and Ames 1946; Rice 1930) that lends support to this hypothesis."

Weiss (1969, 1971) examining the direction of drawing tendencies of Israeli children in the horizontal dimension found an admittedly small number of left-handed subjects within the sample behaving differently. In both studies Israeli children (grades 1 to 9, age 7 to 14 years) were observed while executing four of Bender-

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Gestalt (nos. 1, 2, 3 and 6, Bender, 1938). The drawing of the figures required horizontal strokes. Weiss in both studies observed that the predominantly right-handed sample showed a stronger preference to left-to-right executions. When the left-handed minority were excluded from the results the general left-to-right tendency increased although all the subjects were with basic R to L reading directionality. The left to right execution in the two studies taken together (Weiss 1971) increased from 48% in kindergarten to 92% in grade 9 (14 years) with a plateau at about 80% in grades 3 to 7.

Weiss concluded that the development of L-R directionality in horizontal drawing is independent of reading/writing directionality and attributed the plateau to clash between the left to right developing natural tendencies which increased with maturation and the right-to-left orientation of Hebrew which by then (grades 3 to 7) was firmly established and so for some time had inhibited the natural development. Surprisingly Weiss did not consider any influence from a possible introduction of English in encouraging the L-R tendencies.

Weiss suggested that the explanation of the plateau could be tested by observing children with a basic L-R reading directionality. In this case no clash between the opposing directionalities would be present. Dreman (ibid:252) pointed out that such a study did exist. He reported that Reed and Smith (ibid) had examined the directional trends among English children of comparable age (9-13). According to Dreman Reed and Smith found

that 90% of their right-handed English children executed a horizontal line from left to right. Although the development of the L-R execution in both Israelis and English children of the same age was very similar no plateau was noticed for the latter. This seems to support Weiss' hypothesis that when basic reading and writing habits do not counteract the innate left-to-right developmental trends the emergence of a pre-dominant left-to-right execution for right-handers will be earlier and smoother.

Dreman himself (ibid) investigated how adult university students executed the same Bender-Gestalt figures used by Weiss. His sample consisted of comparable numbers of Israeli (R-L) and foreign (L-R) students (Americans and Europeans) studying in Israel. Nearly half of the subjects were left-handed. He found that right-handers in the two groups had drawn about 90% of the figures from left-to-right (92% for the Israelis and 88% for the foreigners). Foreign left-handers on the other hand whose natural tendencies as left-handers were counteract their cultural tendencies executed about 79% of the figures from left-to-right. Their cultural trends seemed to have overridden their natural ones. On the other hand Israeli left-handers whose natural and cultural preferences were in conformity executed about 72% of the figures from right-to-left. Dreman concluded that when natural and cultural tendencies of right-handers are in conflict (eg. Israeli right-handers) the natural tendency prevailed. Adult left-handers on the contrary would be more infuenced by the cultural factors than by the innate ones in cases of conflict (foreign left-handers). Even the Israeli left-handers whose left-to-right execution did not exceed

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18% would not have reached that level without the strong influence of the L-R cultural influence from the West. To reach that level of 18% they had counteracted both their basic cultural and innate tendencies combined together.

Shanon (1979:457) who carried out similar experiments on American and Israeli adults reached the same conclusion:

"The graphological patterns suggest that the writing behaviour of right-handers of either culture is determined by biological factors, whereas left-handers are influenced by environmental factors, and exhibit compromises when these are in conflict with the biological ones."

Goodnow et al (1973) compared American and Israeli children and adults in copying a number of geometric figures:

$$\overline{\sqcap}\ \square\ \vdash\ +\ \dashv\ \nabla\ \daleth\ \lrcorner\ \sqcup\ \triangle\ \dot{\bigcirc}$$

In copying the figures the extent to which the subjects followed 2 sets of rules in drawing all the figures except the circle was recorded and assigned statistical values:

The first set assessed how far the subjects were observing the following rules believed to be conventional and formally acquired:

(1) Starting at a topmost point

(2) Starting at a leftmost point

(3) Starting with a vertical stroke

Similarly the rules of the second set were:

(1)   drawing all horizontal lines from left to right

(2)   drawing all vertical lines from top to bottom

(3)   drawing with a continuous line i.e. threading (without stopping)

The analysis of the results was based on age, nationality (basic directionality), and sex. As far as horizontal lines and starting points are concerned there was a growing tendency to observe the rules with increasing age. These rules are compatible with an L-R culture. El Hassan (1984) in a study of the graphological behaviour of a small group of Arabic-speaking students in the UK found that the left side was clearly preferred for starting graphological tasks other than writing proper in spite of a clear temporary and spontaneous resort to practices comparable to Arabic graphology.

As far as vertical lines are concerned there is a general agreement supported by Goodnow et al and El Hassan (ibid) that the top-to-bottom movement is more common and easier to execute. Moreover it is neutral to both L-R and R-L directionalities.

For executing the circle task Goodnow et al (ibid) had considered the counter-clockwise fashion as the culturally dominant mode and their findings seemed to support that argument. On the other hand results of tasks that involved circling (El Hassan ibid) showed that most adult Arabs who had their basic education in Arabic had favoured the clockwise mode. In both studies the direction of circling was linked to the formally taught or

culturally acquired procedures of writing some letters of the Hebrew and Arabic alphabets. Before considering that I would like to explore any possible correlation between horizontal and circling directionalities.

Metwalli (ibid:75) in discussing the relation between circling and horizontal directions claimed that clockwise movements could be identified with L-R directionality (opposing Goodnow et al's substantiated claim) and anti-clockwise with R-L orientation. She produced no evidence for her claim which seems highly unconvincing. To identify circling directionality with either L-R or R-L the starting point of clockwise/counter-clockwise movement has to be established first:

A: <u>Clockwise</u>

B. <u>Anti-clockwise</u>

X starting point
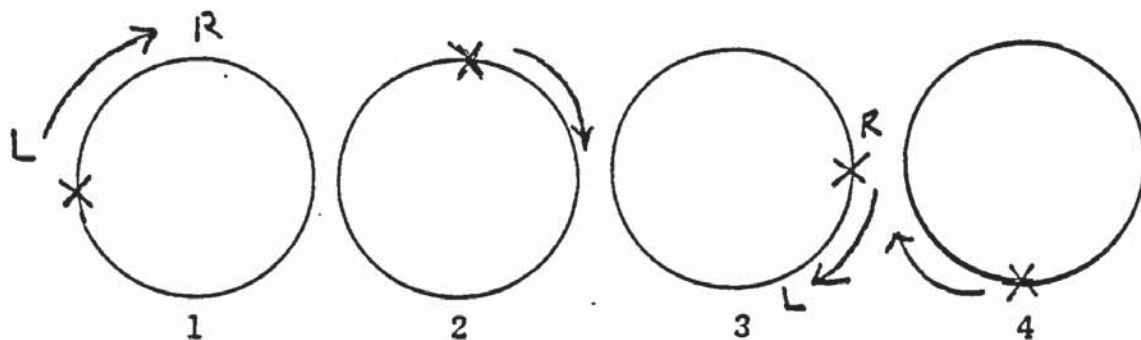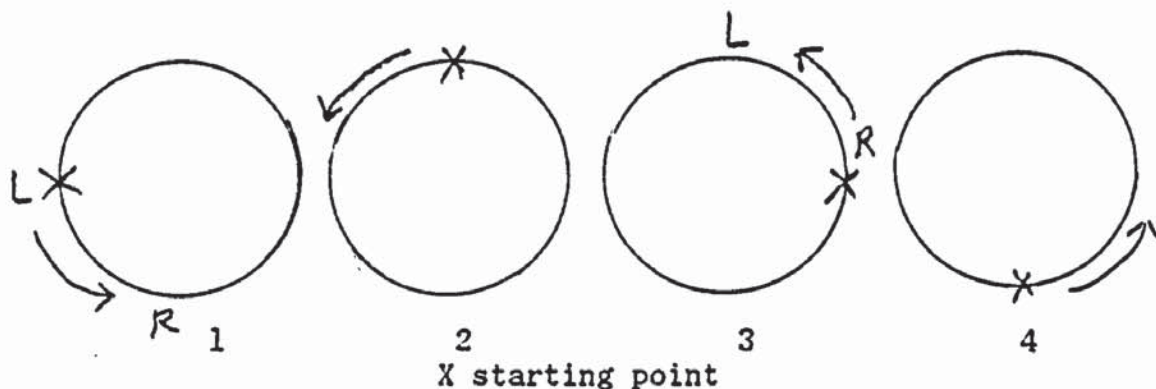
Points which can clearly be identified with the right (R) or the left (L) are A.1, A.3, B.1 and B.3. Metwallis' claim applies only to A.1, and B.3. She could have equally come to the opposite conclusion had she considered B.1, and A.3, The aforementioned (Chapter Two) correlations between the anti-clockwise mode and the Roman (English) letters, and the clockwise mode and Arabic letters are represented by position B.1, and A.3 respectively. As indicated in Chapter Two there are clear exceptions to these general rules where both modes are used in the execution of some letters, and where the less common circling mode is implemented in writing certain letters (El hassan ibid:80):

clockwise written Roman letters

anti-clockwise written Arabic letters

In their attempt to explain the progressively developing L-R tendencies of Israeli subjects in executing the graphological tasks Goodnow et al (ibid) worked out the following analysis of the way many English and Hebrew letters are executed:

Figure 3: PATHS TAUGHT FOR WRITING LETTERS IN ENGLISH AND IN HEBREW

It is clear from the graphological analysis that horizontal strokes of Hebrew letters are normally executed from left-to-right in clear opposition to the general flow of writing. This, according to Goodnow and his associates had consolidated the already developing L-R orientation among the Israelis in opting for a left entry in the execution of directional tasks.

Nachshon (1981, 1983) studying the effects of simultaneous acquisition of opposing reading/ writing habits of right-handed Israeli bilingual children (in Hebrew and English) also found that the overwhelming tendency to execute the graphological tasks was from left to right except for Hebrew letters. It was not clear in Nachshon (1983) what Hebrew letters he had chosen. Even if he had

chosen some of the letters in Goodnow et al's analysis presented above he might be referring to an R-L order of the execution of whole strokes contributing to the completion of one letter. It is apparent from the above figure that when a Hebrew letter needs more than one stroke for its formation the one on the extreme right is executed first.

Comparing among other things the execution of horizontal strokes of Arab and Jewish children Leiblich et al (1975) interpreted the stronger preference of the R-L direction by the Arab subjects to the different ways in forming individual Arabic and Hebrew letters. This seems to support the aforementioned interpretation of Goodnow and his associates. In their opinion Leiblich et al (ibid:509) the nature of Arabic writing imposes a stronger tendency to execute horizontal strokes from right to left:

> "The central factor affecting drawing directionality is apparently the nature of the script, which includes the overall directionality and the prevalent directionality in which a single letter is executed. The results of the horizontal drawing confirm the hypothesis ... that the critical linguistic characteristic which affects the drawing habits is not the overall directionality of the scripts, but that of the single letter."

The fact that horizontal extending stretches of Arabic letters are executed from right-to-left has already been pointed out (Chapter Two p.48). The influence of this practice on the formation of English letters will be seen in the video-taped performance of some of the subjects participating in this study.

Section E: The Distinctive Features of the Study

As indicated in the introduction to this chapter, most of the studies referred to in the previous four sections which constituted the selected literature review were conducted within the domain of neurology, neuropsychology, child psychology, etc. They do not, with the important exception of those on dyslexia, explicitly and directly address or relate to directional issues from a problem-solving strategy with pedagogical orientation towards language use in an educational context as the present study attempts to do.

As all pure research where the emphasis lies in pushing forward the frontiers of knowledge, such studies may incidentally throw some light on or offer implications and explanations of existing problems.

The present study on the other hand as indicated before, especially in the introductory chapter, tries to deal with a real problem (Chapters Four and Five). It aims to eliminate or reduce the residual graphological influence of the basic Arabic R-L orientation when that influence proves to be inhibiting academic progress in an English medium education. In addition to that, it brings to attention the strong residual L-R directionality when its users learn Arabic. In addition to its practical orientation it differs from the reviewed studies in that the latter were largely concerned only with the development of a L-R directionality, especially among children.

This study is concerned in the main with adult users and learners of foreign and second languages, particularly Arabic-speaking learners of English. In the previous studies it was very obvious that Arabic language and Arab subjects were in the minority since the R-L orientation was for understandable reasons largely represented by Hebrew and Hebrew speakers who differ in some cultural respects from Arabic-speakers in that they are more influenced by the L-R dominant western culture as indicated more than once above.

As far as methodology is concerned the present project has benefited from the spreading use of video in capturing on pen and hand movements and recording in many instances momentary confusion and hesitation wherever a directional decision has to be made. The tasks performed and the designs used differ from the previous ones in that they are of more educational relevance to the actual tasks and undertakings students are involved in while embarking on an English medium education particularly a technical one.

Another important difference is that the interest here is in the overall practices of the students irrespective of the individual difference, eg. handedness, eyedness, intelligence or sex. The basic important criterion used for group identification is the basic directionality. No effort has been made to identify handedness or sex or to resort to any positive discrimination methods to obtain comparable numbers of either sex or handedness. The percentage of left-handed after all is very small, although may be significant, in any random sample. They are however as proved in the literature

more influenced by cultural factors which is the basic assumption underlying the investigation. Regarding sex, there is no suggestion in the literature that the sex difference is of any significance as far as directionality is concerned so any sex-based dichotomy is seen here as irrelevant, given the general nature of the topic. If some of the groups of the subjects are male-dominated it is just a reflection of the actual composition of the class used for the experimentation.

A full description of the subjects, tasks and designs, methodology and the results will follow in the following chapters.

The Experimental Side of the Study

Introduction to the experimental side/methodology

Product and Process:

To execute any conventional graphological task, eg. a grapheme, a numeral, a diagram etc. easily and economically in terms of effort and time, a standard or conventional procedure compatible with the task's nature and context has to be followed. The procedure is bound to be also compatible with and influenced by the graphological experience and training of the performer.

A letter from the Roman alphabet may be executed in a R-L manner by subjects with basic R-L orientation. This non-standard procedure or process may lead to an acceptable product. In the example given by Swales (quoted in the introduction) a minority of the majority of the students who produced

were still likely to have been influenced by Arabic and hence started by _B_ ie. a right side entry, and also drew the line or arrow from right to left. Eventually they arrived at the right product through the wrong non-standard process.

The temporal order of execution if not observed or video recorded is bound to be lost but the end product on paper would remain. This end product as in the example above may be judged

correct from the point of view of the language of instruction,

English in this case, or incorrect eg.

$$B \longleftarrow A$$

Conversely (Swales ibid) all or the majority of the minority of the students who produced the above product were likely to have started by drawing [A] first and might have also drawn the line or arrow from right to left. From an English graphological point of view they erred in both process and product. Similarly the process could not be judged as right or wrong, alternatively standard versus non-standard, if not observed or video recorded.

The aim of this study as indicated many times before is to isolate such graphological residue and to assess its pedagogical implications when students with basic Arabic (R-L) or English (L-R) graphology learn or use the other graphological system or language. The emphasis is on Arabic-speaking students learning through the medium of English for the first time.

The experimental side of the study was designed to bring out or isolate for further consideration the residual graphological influence of the first or basic language both in the end product and the process leading to that product.

A preliminary video-based investigation case study of U.K.- based Arab students conducted early in 1983 by the researcher (El Hassan 1984) before the idea of the present study had fully developed established the video as the ideal medium for conducting the research. Later on and for practical reasons the video

technique was used as a supportive, yet very important, instrument. The recording of statistically satisfactory number of subjects individually was found to be time-consuming. Above all it needed the control of a host of functions eg. the availability of the video-recording equipment at a place and time suitable for the right subject.

The exploratory video study, however, had established beyond doubt that the residual influence evident in the end product let alone the process was quite significant. As a result the video recording would be necessary only as evidence of graphological interference in the process and incidentally the end product.

The non-video technique was thus established as the main instrument of data collection. The video as indicated earlier was used as a supportive and illustrative instrument. In fact the same basic designs used in the first investigative study were reused in the non-video part in addition to other designs as will be seen.

Subjects

In all 185 subjects, bilingual in Arabic and English, took part in the experimental side of the study. For most of them as mentioned earlier, Arabic was the first or basic language. The table (table 1) below summarizes their distribution into two main categories and in terms of the medium used. The first category or category I included those with Arabic as the better known literary language. The second one or category II comprised those with

English as the more practised language for written purposes. The medium is either video or non-video.

Category	Non-video No.	Non-video %	Video No.	Video %	Totals
ARABIC (Ctg.I)	133	91.72	12	08.27	145
ENGLISH (Ctg.II)	35	87.50	5	12.5	40
ALL	168	90.81	17	9.18	185

Table 1: Distribution of participants according to main language and medium

A full description of the first category in terms of its distribution into groups and sub-groups will follow in Chapter Four which deals with Arabic or R-L graphological residue in an English (L-R) graphological environment or context. Similarly Category II subjects will be described on comparable lines in Chapter Five which deals in the main with L-R graphological malpractice committed within an Arabic (R-L) graphological environment or context. The chapter also contains comparisons between the two categories in common tasks. In both chapters the description of subjects and the analysis of the results will be confined to the non-video experiments.

Designs

To trigger off any potential graphological residue the subjects were presented with carefully designed tasks (see appendices) which by definition required graphological response, ie.

the use of pen or pencil.   They were not, of course, designed or
meant to test the linguistic competence of the subjects in the least
graphologically practised language although incidentally the overall
performance of a particular individual, a sub-group or group, might
give an idea about the relative competence of that individual, sub-
group or group in relation to the other individuals, sub-groups or
main groups.

The tasks as indicated earlier are of pedagogical relevance
as will be seen.   Each task involves at least one directional
decision compatible with the graphological orientation of the
language in which the subject is instructed to perform the task.

Some of the tasks in addition to their directional component
helped in gathering relevant information about each individual,
e.g.:

1)   a)   In the first box write the name of your country and your
            age.

      b)   In the second box write the date of your arrival in the
            U.K.

      c)   In the third box write your field of study ie. your
            course.

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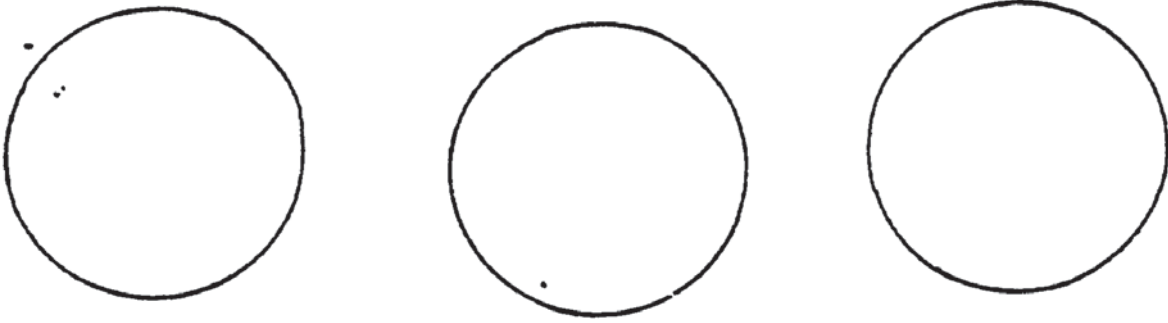
2) a) In the first circle write the date.

   b) In the second circle write the time.

   c) In the last circle write the name of this town ie. .....

Although the results of non-video tasks will be considered first for category I (Chapter Four), chronologically most of the tasks were carried out first by category II (Chapter Five). These in turn were the Arabic equivalent of the tasks of the first exploratory video case study referred to above. The feedback received from that study and category II performance helped in formulating and diversifying the eventual designs used by category I on which the present study concentrates (Chapter Four). These final designs contain a maximum of 22 identified directional tasks which the first category subjects were instructed to carry out in English and in the absence of the video camera. 15 of them had already been presented in Arabic to category II subjects (Chapter Five) also as non-video tasks. Despite the involvement of most of the subjects in the non-video side of the experiment as evident in table 1 above the experimental side has ended as it began by conducting extra video experiments on subjects from both categories as indicated in the same table and described and discussed in the video film and Chapter Six.

Measurement

Graphological phenomena believed to be caused by the basic writing system or a failure to adapt to practices compatible to the language of instruction will be quantified statistically. The total number of residual or wrong instances for each identified task will appear as a percentage of the total correct and incorrect instances attempted by all individuals who tried that particular task. The mean of residual or wrong instances, also in percentage, for each sub-group, groups or category is based on the means obtained for all the members of that particular sub-group, group or category.

Interestingly no other statistical measurements or correlations beside the percentage were needed. The assumed and expected differences between groups, variables and factors thought to be relevant were too clear to need any sophisticated and delicate measurement such as conventional levels of significance as will be seen in the results.

CHAPTER FOUR

R-L Phenomena in English Graphological
practices of category I

Category I Subjects:

As shown in table 1, page 86 above, 133 students with Arabic as their first or basic language took part in the non-video experiments. 59 of them were studying in the U.K. during the time of experimentation: July and August 1984. The rest, ie. 74 were first-year students at the University of Khartoum, the Sudan. They took part in the study in December of the same year, ie. 1984. The researcher was not able himself to return to the Sudan to administer the experiments. That was done on his behalf by reliable colleagues at Khartoum University.

A.   The U.K. Groups:

The 59 U.K. students were all males, coming from different Arab countries. They were located at 3 different places: 36 were at Banbury, 15 at Bedford and 8 at Birmingham.

Table 2 below shows their distribution according to country, date of entry, and studies pursued in the U.K. Table 3 depicts their latest level of education reached at home, age range and any other relevant comments.

Country	No:	Approximate Date of Entry	Type of Course or Training
Saudi Arabia	24	July 1984	Vocational and military training, eg. Maritime and Policing.
United Arab Emirates	8	July 1984	7 attending summer school of English, 1 aiming for a business higher degree.
Libya	8	March 1983	Mechanical Engineering Diploma
Iraq	7	April 1984	Mainly civil and military aviation
Sudan	4	June–July 1984	Technical and professional higher degrees
Qatar	3	June–July 1984	Summer School
Bahrain	3	July 1984	Police training.
Oman	2	July 1984	1 a vet, educated in Tanzania; the other an Engineer trained in Russia; both pursuing higher degrees
TOTAL	59		

Table 2: U.K.-based subjects

The 36 Banbury students were studying at Banbury English Training Centre. Similarly the 15 at Bedford were at Bedford English Study Centre. Both centres, as many other comparable ones belong to ARELS (Association of Recognized English Schools). Their clients as evident in the above tables also include young students who only come to improve their English during Summer School vacation. Many of these are Arab nationals mainly from oil-producing countries.

Latest Education Attained at Home	No:	Age Range	Comments
Still at school	8	16-18	Attending Summer school to improve English.
Intermediate	13	21-32	Most with practical experience and vocational training.
Secondary	20	21-24	Aiming at or pursuing post-secondary education of technical nature.
Tertiary	18	24-34	University and professional college graduates, eg. police, aviation. Seeking extra professional studies and training.
TOTAL	59		

TABLE 3: U.K.-based subjects (continued)

The students in such English language centres are usually grouped according to linguistic ability although other factors may help shape the composition of a particular group: mainly the intended course of study or type of training to be pursued after the English course.

Banbury Groups:

All the 36 Arab students at Banbury belonged to all-Arab classes. They were divided into two main levels: elementary and intermediate and each level into two sub-levels, upper and lower (see table 4 below). The experiments were carried out in English classes on the 24 July 1984. Because the experimental packages were given to the students at the same time, the researcher was able to supervise only one group. The others were supervised by their respective class teachers as seen in the table below.

Groups and size	Age Range	Comments
Lower Elementary (16)	16-42	2 classes; 9 and 7 students respectively. One supervised by researcher; the other by class teacher.
Upper Elementary (9)	18-33	One class - supervised by class teacher
Lower Intermediate (6)	17-27	One class - supervised by class teacher
Upper Intermediate (5)	21-34	One class - supervised by class teacher

TABLE 4: Banbury Subjects

1. Lower_Elementary: (16-18 years)

8 of the students in the lower elementary were still at school; they arrived in the U.K. mainly to improve their English. Another 4 (20-21 years) came to study civil aviation. The remaining 4 (23-42 years) were police officers aiming at more professional training. The oldest officer had only intermediate education. All the others reached secondary education before joining police colleges.

2. Upper_Elementary: (18-33 years)

8 of the 9 in this group studied up to the secondary level. The ninth, the youngest, was in the final year of secondary education; he came for English. 6 of the 8 were also police officers who graduated from police colleges in the Arab world; one of them had a Masters' degree in military sciences. The remaining 2 were aiming at aviation training.

3. <u>Lower Intermediate</u>: (17-27)

The youngest of the 6 members of this group, a United Arab Emirates secondary school-boy was only studying English. All the other 5 were Saudis. One of them had technical post-secondary training. The other 4 had on-the-job post-intermediate technical training as well.

4. <u>Upper Intermediate</u>: (21-34)

All the 5 members of this group had post-secondary education. 4 of them graduated in police colleges in the Arab region and were aiming for further studies and training in the U.K. The fifth, with a home degree in business, was in the U.K. for postgraduate studies in his field.

<u>Bedford Groups</u>:

The 15 Bedford students carried out the task at different times but on the same day, 9 August 1984, under the supervision of the researcher. They belonged to three classes or groups (see table 5 below).

Group and size	Age range	Comments
Lower elementary (5)	15-36	Experiment done in the language laboratory
Maritime Group (5)	21-24	Experiment done in lunch-time
Graduate Group (5)	26-33	Experiment done at the end of classes

<u>TABLE 5</u>: Bedford Subjects

1. <u>Lower Elementary</u>: (15-36 years)

This group is comparable to Banbury's lower elementary although it is less than one third the size of that. The basic education of 2 of the 5 in this group ended at the intermediate level in their countries; one of the two was a police officer, the other an engineering technician who received previous training in Russia. The remaining 3 were still at school and were only coming for English.

2. <u>Maritime Group</u>: (21-24 years)

The 5 members in this group were all Saudis working for a maritime company. They constituted a homogeneous group in terms of educational background, age, job experience etc. All of them had successful secondary education before joining the company where they had in-service training of 2 to 3 years. They were rather familiar with the professional jargon in English. Linguistically they could be assessed as intermediate. They carried out the tasks under the supervision of the researcher in a rather relaxed atmosphere in the tea-room just after lunch.

3. <u>Graduate Group</u>: (26-33 years)

All the members of this group were university graduates, some of them with considerable professional experience. Within the centre they were a part of a multinational class mainly made up of graduates. All the 5 in this group had experienced English as the medium at university. 4 of them graduated from the University of Khartoum (see table 2, p.91 above). The other was an Omani vet who

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was educated in Tanzania (see table ibid). The researcher got hold of these students when leaving classes at the end of the studying day. They executed the task in a rather informal environment in the presence of the researcher outside the classroom but within the boundaries of the Centre. Though they had not used English for a long time, ie. since they finished their education, they were assessed as upper intermediate. Their English course concentrated on study skills more than on linguistic competence.

The Libyan Groups (19-21 years)

The remaining 8 of the 59 students constituting the first category were all Libyans. They were currently studying at the Matthew Boulton Technical College in Birmingham. They constituted a truly homogeneous group (table 2). All of them were successful secondary school leavers employed and sent for training by the Libyan Iron and Steel Corporation.

Unlike the Banbury and Bedford groups who entered the U.K. only a few weeks or months prior to the experiment, they entered the country 15 months before carrying out the tasks.

Although they were studying with English students at the college they were receiving English tuition which continued, though marginally, up to the time of the experiment. Their linguistic competence was judged as upper intermediate mainly becuase of the longer stay in the U.K.

They carried out the tasks on 13 August 1984 at the Language Studies Unit, Aston University, where the researcher was based, in a

class mode under the researcher's own supervision. Their arrival was in fact arranged by a fellow-researcher who used them for his own research. The present researcher knew in advance of their arrival and subsequently took the chance of using them to expand and diversify his sample.

B. Khartoum Groups

As mentioned earlier the same 22 directional tasks given to the U.K. Arab students were later given, in December 1984, to 74 first-year students in the University of Khartoum, the Sudan.

All the Khartoum students joined the mainly English-medium university later in November for the academic year 1984/85 following a 12-year Arabic-medium general education in which they studied English only as a school subject for the last 6 years.

The questions of the information boxes and the last question of information circles were adapted to gather relevant information (cf. p.87 above).

a) In the first box write your age and sex (Male/Female).

b) In the middle box write the name of your secondary school.

c) In the last box write your "boxing".
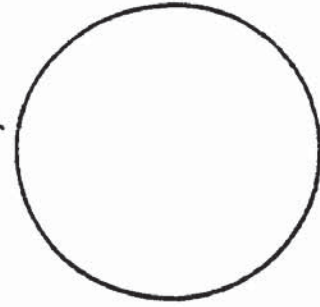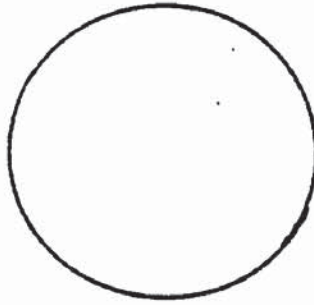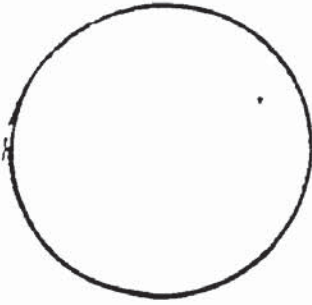
a) In the first circle write the date of today.

b) In the second circle write the time now.

c) In the third circle write the name of your faculty.

NB 1: "Boxing" is the total, out of 500, of the best five subjects (a maximum of 100 for each) obtained by the student in the Sudan School Certificate (SCC).

NB 2: Each candidate for SSC must take a minimum of six subjects including Arabic and English. "Pass" in Arabic is an essential condition for the award of the Certificate, Khartoum University usually accepts students with the highest boxing. Entrants of each faculty have to achieve a minimum boxing set by the admissions office, including particular subjects required by the particular faculty.

The tasks were carried out by the students in English (ESP) classes during the third or fourth week of the students' first encounter with English as a medium. The researcher would have preferred and indeed suggested an earlier date perhaps during the first or second week but that was not possible for practical and administrative reasons as explained to him in a written report by

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the colleague in the English Language Servicing Unit, University of Khartoum, who with the help of another colleague had supervized the administration of the task packages.

Originally more than 100 first-year students participated in the experiment from the faculties of General Science, Agriculture, Engineering and Law. Only the results of two groups are considered in the study: one from the faculty of Law (30) and the other from the faculty of Engineering (44).

Table 6 below provides more information about the two groups (74 in all).

Particulars	Faculty	Law	Engineering
Boxing	minimum	340	372
	range	340-389	372-481
	Male	19	41
	Female	11	3
	TOTAL	30	44

Table 6: Khartoum Groups

NB: Average age about 19 years.

The exclusion of other students and faculties resulted from the fact that under pressure of time and shortage of staff some of the groups in other faculties were not able to finish all the tasks. Some of the unfinished experimental packages were later given to other groups to complete. As a result, the researcher decided to exclude any unfinished package or any package completed by more than

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one student. The two Law and Engineering groups were thus chosen first: because their members finished all the tasks; second: they represented two academically distinct areas: one belongs to the domain of humanities; the other to the domain of mathematics and physical sciences.

The 5 academic subjects ie. boxing subjects, required for admission in the faculty of Law should include, English, Arabic, a social subject and any other two subjects, eg. English literature, Geography, General Mathematics etc. Those required by the faculty of Engineering should include: General and Advanced Mathematics, Physics, Chemistry or Biology. Although English could not necessarily be in the boxing, a mere pass in it is required for acceptance in the faculty of Engineering. Those who obtain the right boxing for Engineering but fail English would be accepted on condition that they pass a special English test set by the university.

As indicated in the above table the boxing for Engineering is higher than that for Law. In fact science/mathematics-based faculties usually demand a higher boxing than the other faculties. As a result students accepted in the former faculties are generally considered as "brighter" than those accepted in the latter. The boxing for Engineering (see table ibid) in 1984/85 started at 372 (ie. over 70%). The range for students accepted for that year and who participated in the experiment extended up to 481 (over 96%). The boxing for the faculty of Law for the same year started at 340 (68%). The range for the Law group extended up to 389 (about 78%).

The Law group was likely to be better in English and Arabic. The Engineering groups on the other hand, would be expected to be far better in mathematics and science and tasks related to those fields as will be seen in the results.

NB: The sex distribution of the students (see the table) is given only for information since the sex variable is not considered in the study as indicated in Chapter Three.

RESULTS

An orientation-based analysis of the experimental package presented to both categories revealed as pointed out earlier, a maximum of 22 identified tasks used as a basis for computing the results. These tasks are assumed to be influenced by the relative strength of either graphology, on each individual. They also give an idea about the performer's sensitivity to tasks requiring graphological awareness and adaptation.

The tasks are grouped into two parts: part A and part B. Part A (A1-A6) tasks are of global nature. Part B (B1-B16) deals with particular graphological conventions and entities. The differences between the two types will become clearer when each task is considered separately. The rationale behind each task, will also then, be clear.

One of the important differences between the U.K. groups on the one hand and Khartoum groups on the other is that the latter groups completed all the tasks in both parts while many students in the former ones, ie. U.K. groups, failed to complete or even to

attempt part B. The reasons and implication of this difference will also be considered throughout the discussion of the results.

Now follows a description of each task, its rationale, and how each group responded to it. Photocopied examples of the actual responses are given. The Arabic or R-L graphological residue or influence is quantified for each task as pointed out earlier in percentages collectively for the U.K. groups, Khartoum groups, and all of them (category I). The different behaviour of different groups or sub-groups will be discussed in the light of their distinctive features such as linguistic competence, past experience, type of education, etc., and experimental circumstances, eg. completion ratio.

The results will be considered not in the chronological order of tasks execution but largely in ranking order reflecting the graphological interference for all the category. The ranking order in each part is from the least to the most graphological residue or failure to adapt to the requirements of the language of instruction.
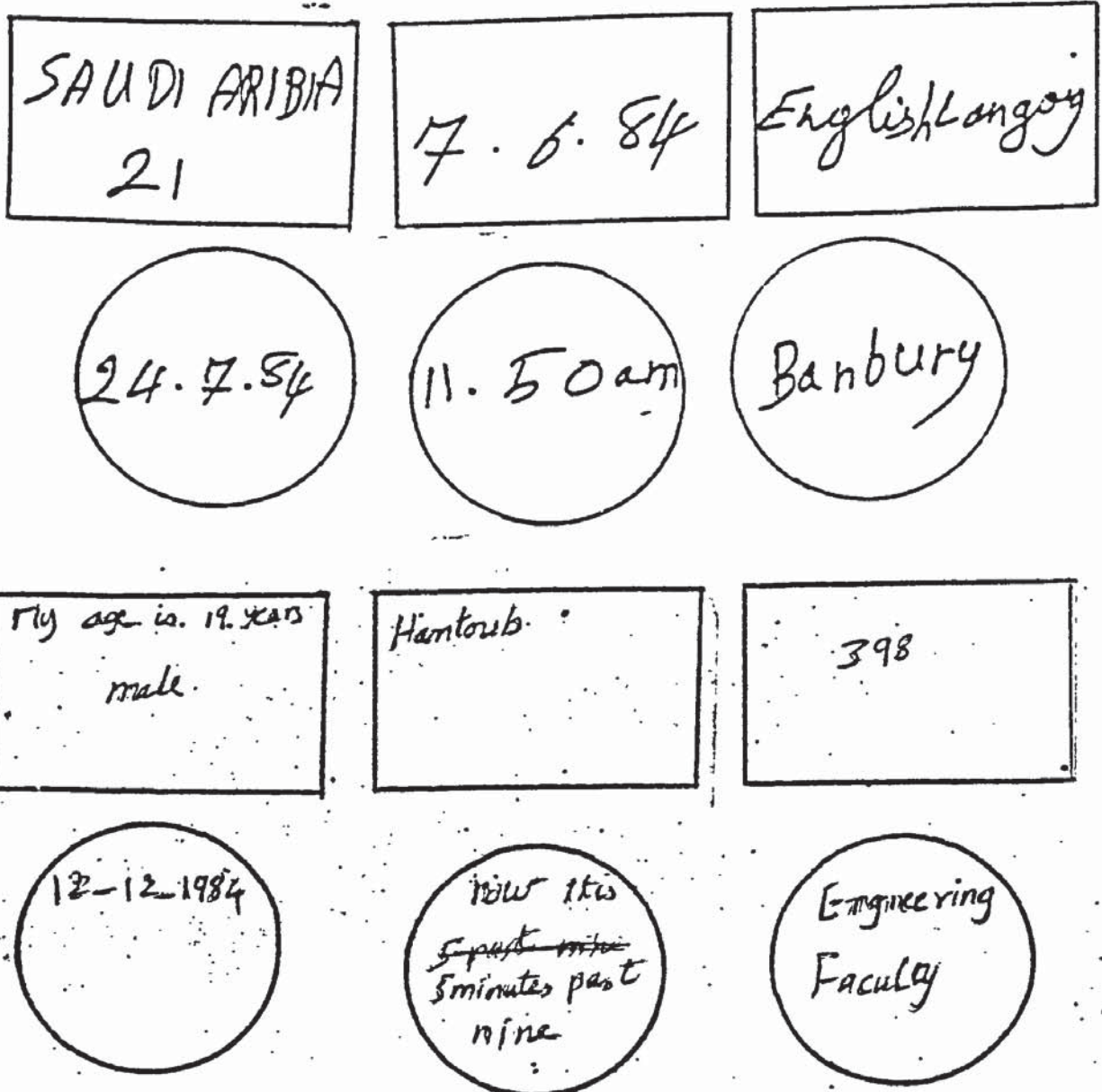
PART A

Tasks A1-A6

A.1: R/L entry and sequencing data horizontally:

This task was presented in three different versions and designs: information boxes, information circles, and pictures. The first two designs, ie. the boxes and circles for the U.K. and Khartoum groups have been met on pages 97 and 98 respectively. The third will be given below. The task in all its versions aimed to

test the obvious correspondence between such concepts as "firstness", "lastness" and their spatial realization and ordering according to the graphological orientation of the language of instruction.

All the 133 students of Category I filled the information boxes and circles, and except for one, filled them in the right L-R order required by English directionality, as seen in the two examples below (U.K. and Khartoum respectively).

The only student who produced a R-L order belonged to the lower elementary group of Bedford.

He was still at school in Saudi Arabia. He failed to understand the English instruction so the questions were explained to him in Arabic. This was likely to be the main reason why he started answering in Arabic.

2 of the 74 Khartoum students started with "camera" in naming the 6 pictures in the third version of the task. The first, a female Law student, produced the following:
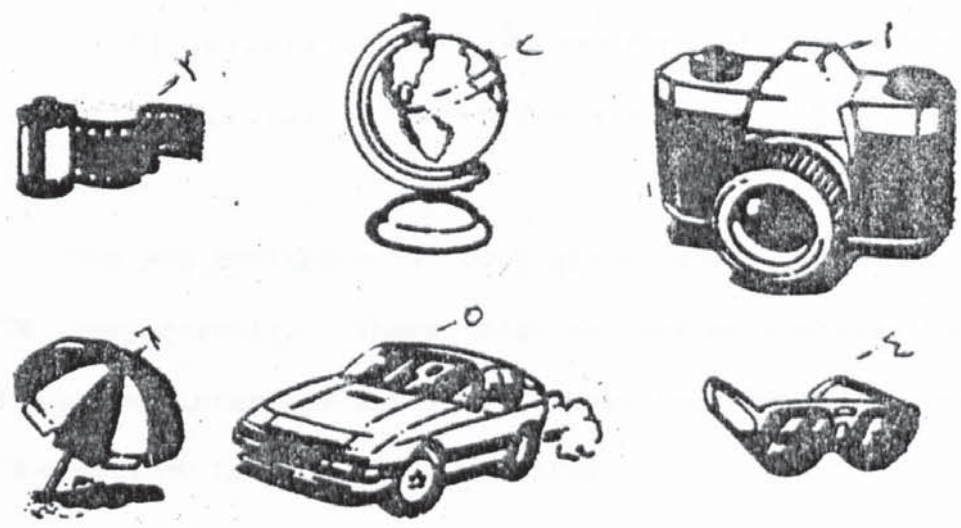
Write the names of the objects shown in the pictures:-

1) Camira.... 4) Glasses........

2) Earth....... 5) Car.........

3) Film......... 6) Imprela.....

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Clearly she started numbering the pictures in Arabic adopting a R-entry. Name writing then followed the Arabic order. The other, also a girl, but from the faculty of Engineering, although she did not finish the naming, has started with camera, ie. a R-entry.
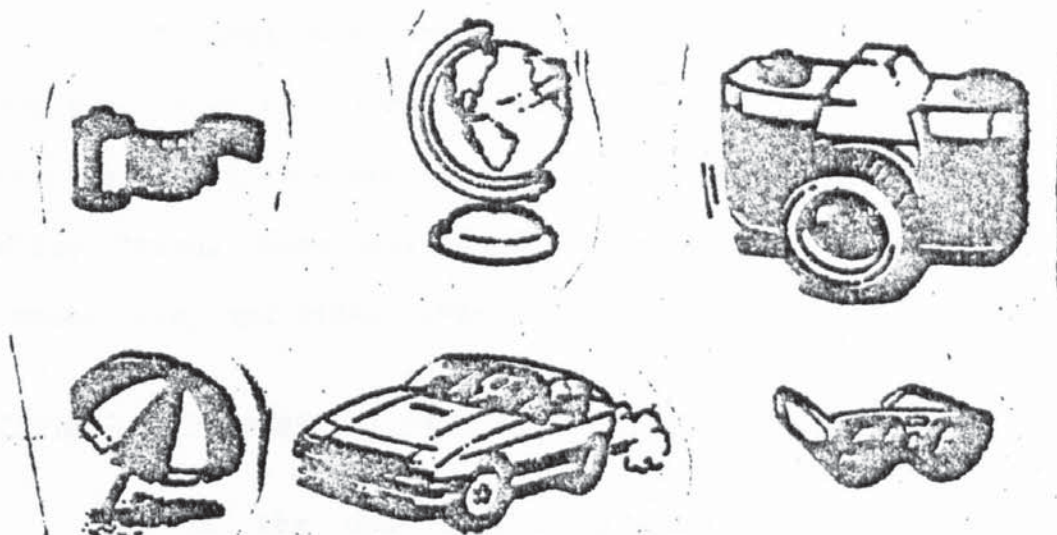
Write the names of the objects shown in the pictures:-

1) .....Camera..... 4) ....

2) .... 5) ....

3) .... 6) ....

The R-L influence for both girls in all tasks was 22.72% and 27.27% respectively. These figures are well above the average graphalogical interface for both groups, ie. Law and Engineering, as will be seen at the end of the chapter.

The fact that only 3 (2.25%) out of the 133 students had started with a R-entry indicates that spatial ordering of data horizontally according to the language of instruction directionality is too obvious to pose a serious problem. However one would assume

that settling on a spatial order compatible with graphological orientation though obvious could not always be immediate and automatic if the language of instruction was not practised enough. Momentary hesitation and uncertainty might in many cases precede the final right decision.

Such hesitation and confusion is evident in the 1983 video experiment and the final video experiment (video-tape) where 6 Kuwaiti students were presented with the above picture naming task. Similar trends were observed for category II, both in non-video (Chapter Five) and video experiments.

A.2 and 3: Graphological expression of multi-digited data:

Two of the questions of information boxes and circles required date (A.2) and time (A.3) writing. The order of writing day, month and year in Arabic is opposite to that of English while that of expressing time using numbers is the same, ie. hours on the left, followed on the right by minutes and sometimes seconds.

As far as time writing is concerned, no-one of those who expressed it numerically made a mistake (see examples on pages 103 and 104 above). The spread of digital watches might have helped in consolidating the common digital time order for Arabic and English and all other R-L/L-R languages.

In English date writing only 4 (3.00%) of the 133 subjects had opted for an Arabic-order. All of them belonged to the U.K. lower elementary groups. One of them (see p104 above) was the same, and the only student who reversed information boxes and circles.

This is another example from Banbury:


1984-7-24
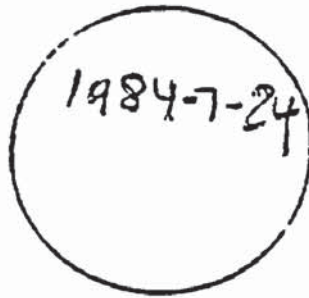
English date writing is clearly a well-established routine acquired at an earlier stage. English teachers, as many other teachers, often write the date on the board at the start of every lesson. They also usually require their students to write the date on any class or home work.

Arabic date and time writing had on the other hand presented quite a problem for category II students for most of whom Arabic date writing was not an established routine. Their problem with both date and time tasks will be discussed later (Chapters Five and Video).

A.4: (4a-4c) Point Joining and Numbering:

3) a)Join the similar points in order to obtain 6 boxes.

b)Number them I-6,put the number of each box in its corner.

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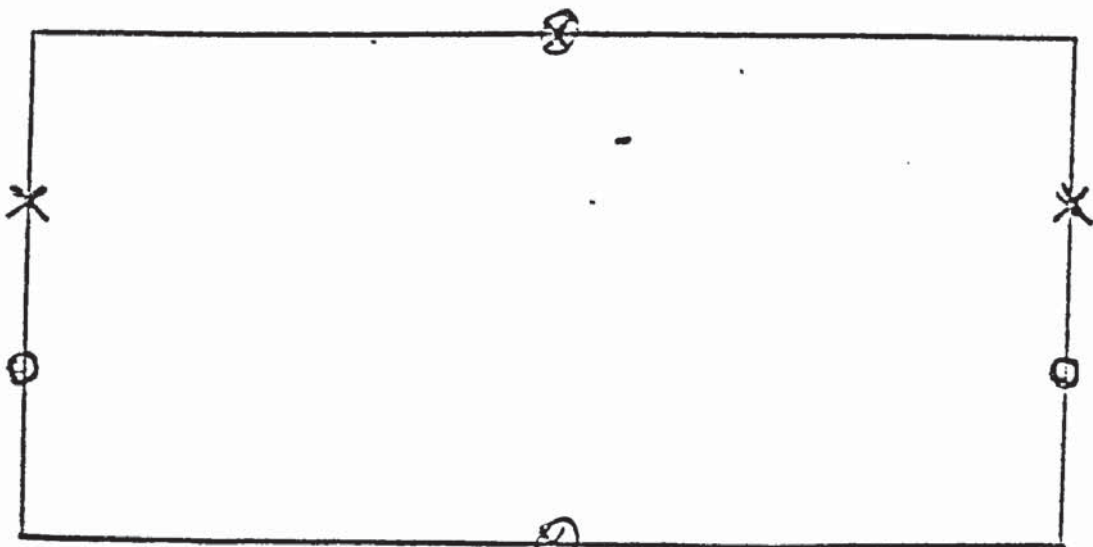
The above tasks were originally set for the investigative video group of 1983 and lastly for the Kuwaiti video groups.

Now we will consider the reaction of the non-video U.K. and Khartoum groups to the same tasks.

Sub-task 4a, point joining, is a typical video task which can not be indicated by an end product on paper. However, many of those whom the researcher happened to observe while joining similar points did the joining of horizontal lines from right-to-left; no figures are available for this.

For sub-task 4b, ie. box numbering 126 out of the 133 students produced numbering compatible to English ie. starting with the top left-hand box:
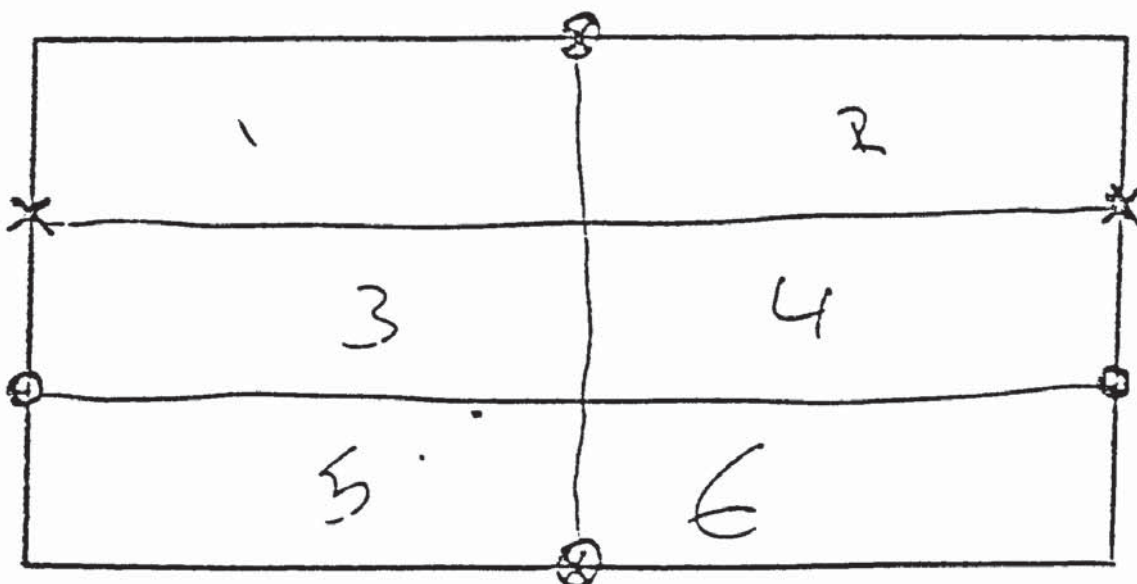
The remaining 7, ie. 5.26%, all U.K.-based students had opted for an R-entry.
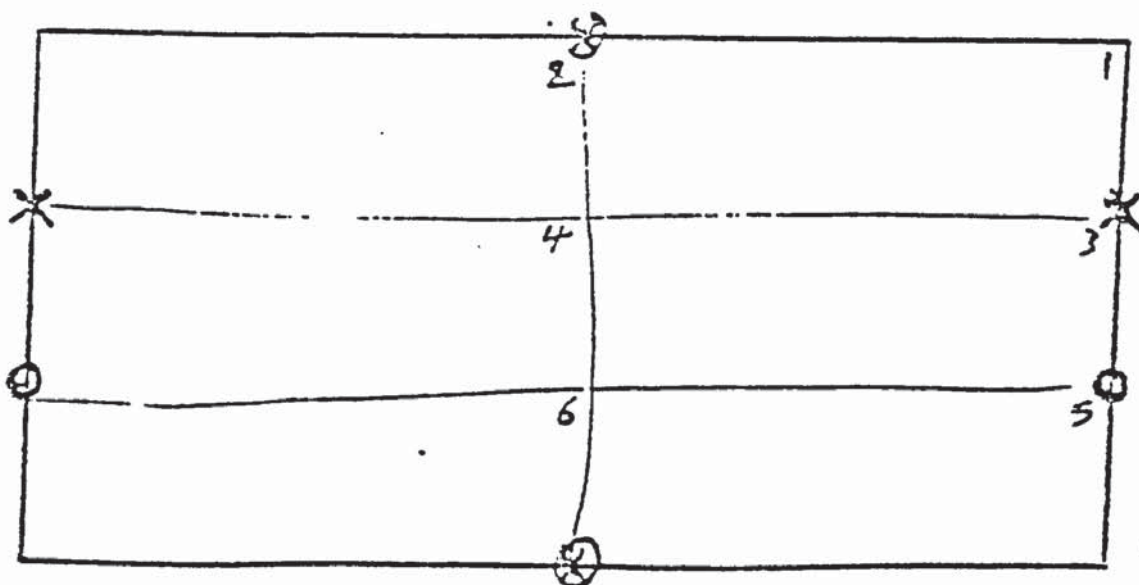
As would be expected 6 of them came from the elementary groups. Although no Khartoum student produced a R-entry in numbering, closer examination of the data produced by them revealed that 13 (17.56%) of the 74 Khartoum students did in fact choose a right rather than a left corner (task 4C). This may reflect a weak influence of Arabic graphology. (Compare with the wrong example above, on which the Arabic influence in this respect is also very clear).
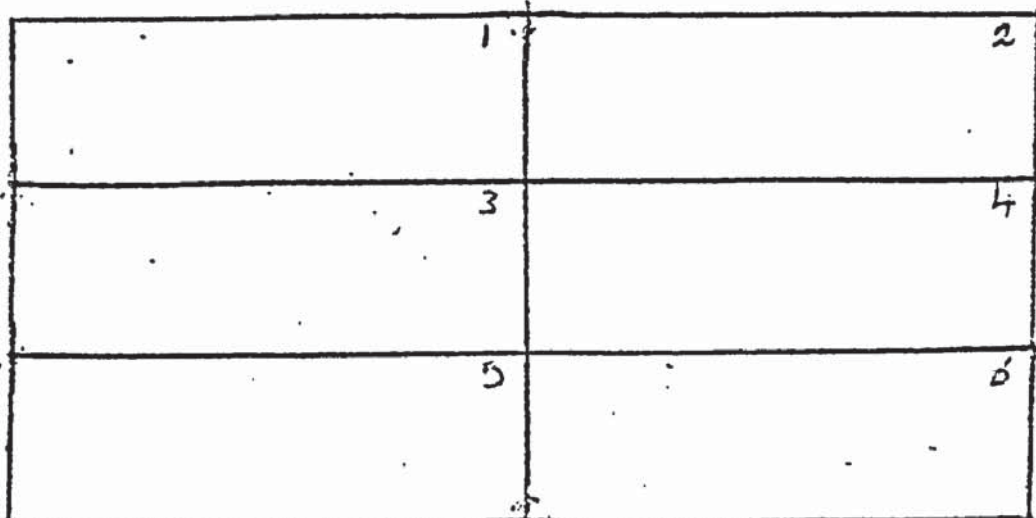
NB: Khartoum subjects were not required to do any joining (4a)

<u>A.5 and A.6</u>:

These two tasks (see below) and all part B tasks are translations from Arabic into English. The interest in all these tasks is not in the correctness of the translation as far as syntax, lexis or spelling is concerned. The tasks themselves, as will be seen, were not designed for, and could not satisfactorily serve such purposes. The interest as might be expected is to "quantify" the degeree of graphological directional awareness as is the case with the above tasks.

<u>A.5</u>: <u>Table Translation</u>:

مرقم	الأبسم	العمر	العنوان
١	سـالم . مالك	أسـنة	ت ٠ ٢٥>٨٤ لندن
٢	كامل مرسى	١٩ سـنة	ص . ب . ٧٠٢ القاهرة
٣	هدى على	٢٤ سـنة	ص . ب . ٢٦ طرابلس/لبنان

I) Translate the Arabic table into English in the provided space (complete the drawing).

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What mattered was not the provision of accurate English translation but the overall order of column and headings. 121 out of the 133 subjects changed the R-L Arabic layout to the required L-R English order. 12 (9.02%) produced laterally reversed tables. Below are two examples: the first correct, the other reversed:

8 of the 12 who kept the Arabic table format belonged to the U.K. groups; 6 of them came from the lower elementary groups. The other 4 were from Khartoum. The higher incidence of disoriented tables among the most-linguistically vulnerable U.K. students may be

understandable. Many of those in these groups as seen before were younger intermediate and secondary school boys. However, the linguistic argument is not by itself enough to justify the significant percentage of the askew products. 3 of the 4 Khartoum students were Law students who were supposed to be generally better in English than their Engineering counterparts. Were the Engineering students less vulnerable because they were brighter or more alert as implied by their higher boxing? Or was it because they were more familiar with formatted diagrams? Even if this was true their experience with formatted diagrams was likely to be in Arabic formats. Had their very short, 3 to 4 weeks, experience of English as medium prior to the experiment contributed to their better performance (assuming that they had come across some English tables)? There may be an element of truth in all or some of these, and, maybe, other arguments.

While the task was being executed the researcher noticed that some of those who kept the Arabic layout did not show any signs of pre-planning. They immediately and automatically embarked on the task. Others, at one point or another, realized their error especially on starting filling in the table particulars. At that stage some started correcting their mistakes; the rest continued thinking that what really mattered was the correct translation of information not the table format.

The same task was given to the Kuwaiti video group. None of the 6 produced R-L English tables. The non-video category II groups were also presented with similar tables to be translated from

English into Arabic (Chapter Five).   The whole issue of the effects of   tranlsation   on   non-linguistic   forms   and   formats,   eg. mathematical,   scientific and punctuational conventions will   become clearer in Part B.

A.6: Pie Charts Translation:

2)Study figures I–3 and translate into English in the circles provided in the space below.
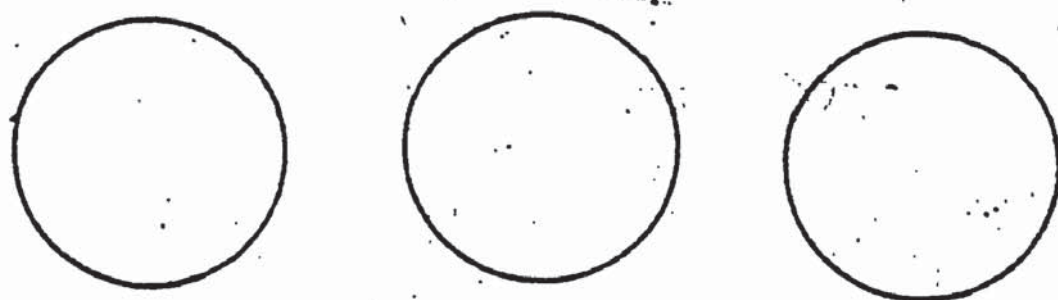
Here   as in the table task the source language is the first (Arabic) and the target language is the foreign (English) which is also the language in which the instructions are given.   The source charts are numbered, 1-3 in Arabic;   the target ones are left unnumbered.   Numbering them using "English" numbers is part of the task.   For the task to be executed in the right way the first Arabic chart,   ie. No.1 on the right should be translated in the blank one on the far left; the one in the middle goes to the one just below it and   the   last   one on the left corresponds to the one   on   the   far right.

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Reversing the Arabic order for English proved to be very subtle. Only 58 of the 133 subjects, less than one half, succeeded in doing that:

The majority - 75 (56.39%) - translated each pie chart in the one immediately below it:

The incidence of R-L English pie charts was higher among the U.K. groups. 38 (67%) of them kept the Arabic order; 23 (over 60%) of those were members of the elementary groups. Exactly 37, ie. half of the Khartoum subjects, made the same mistake. The ratio was higher (18, ie. 60%) among the 30 Law group and lower (19, ie. 43%) for the 44 Engineering students. The trend noticed in the behaviour of the two Khartoum groups in the table task is repeated here; the same arguments and explanation suggested there could equally apply here.

The higher incidence of reversed order in this task compared with the previous one could be explained by the fact that the present tasks, ie. charts tasks involved ordering independent entities which are not interrelated as in the case of the table. The only clue the students had to reverse the Arabic order for English was the numbers assigned to the source charts.

Many did come to notice that clue only after starting or finishing translating each task in the one below it. Some, on discovering that English numbering from right to left was awkward decided to ignore numbering altogether and so left the English charts unnumbered. Others numbered them in the right order but by doing this Arabic No.1 had become English No.3 and so on (wrong translation).

The same task was also presented for the Kuwaiti video group. Only 2 of them, ie. out of 6, did it in the right way. Similar tasks given to category II were also found to be problematic as will be seen in the following chapter.

Table 7 below summarizes the results so far considered, ie. all Part A results.

The results clearly demonstrate the influence of Arabic graphology on the global directional decisions (12.65%). The influence on the U.K. groups is about twice that on the Khartoum groups (16.38% and 9.68% respectively).

No.	TASKS Type	R-L INSTANCES U.K. No.	%	Kh. No.	%	All. No.	%	COMMENTS (if any)
A.1	Horizontal Sequencing	1	1.69	2	2.70	3	2.25	boxes, circles & pictures
A.2	Date Writing	4	6.77	0	0	4	3.00	
A.3	Time Writing	0	0	0	0	0	0	
A.4a	Point Joining	–	–	–	–	–	–	Excluded here
A.4b	Numbering (R-entry)	7	11.86	0	0	7	5.26	
A.4c	Corner (Right side)	–	–	(13)	(17.56)	–	–	Obtained for Kh.Gps only
A.5	Table Translation	8	13.55	4	5.40	12	9.02	
A.6	Pie Charts Translation	38	64.04	37	50.00	75	56.39	
All Part A Tasks		58	16.38	43	9.68	101	12.65	
(TOTALS)		(354)		(444)		(789)		

TABLE 7: Part A results for Category I

The table below gives the detailed performance of Khartoum groups for Part A tasks:

Group (Size)	R-L instances	Total of instances	Mean %
Engineering (44)	25	264	09.46%
Law (30)	18	180	10.00
ALL (74)	43	444	09.68

TABLE 8: Part A results: Khartoum groups

It is clear from the table that there is little difference between the two Khartoum groups. The vulnerability of the Law group is 10%, slightly higher than that of the Engineering group: 9.46%.

The wider linguistic, educational and professional variation of the U.K. groups is reflected in table 9 summarizing the performance of all the groups in Part A tasks as well:

Group (Size)	R-L instances	Total of instances	Mean %
Upper Intermediate Banbury (5)	01	30	3.33
Libyan Birmingham (8)	03	48	6.25
Lower Intermediate Banbury (6)	03	36	8.33
Upper Elementary Banbury (9)	07	54	12.96
Graduate Bedford (5)	05	30	16.66
Maritime Bedford (5)	05	30	16.66
Lower Elementary Banbury (16)	25	96	26.04
Lower Elementary Bedford (5)	09	30	30.00
All	58	354	16.38

TABLE 9: Part A results: U.K. groups

A closer look at the results shows that linguistic competence, (lower versus upper), post experience in studying through the medium of English (Graduate group), length of the study in the U.K. (Libyan) and experimental circumstances all contributed

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in one way or another to shape the overall performance of all the groups and each group.

The better performance of Banbury groups compared to those at Bedford may be partly attributed to experimental circumstances. The first group, as pointed out earlier, carried out the tasks in a rather relaxed class atmosphere in their class teacher's presence. Bedford groups, on the other hand, with the exception of the lower elementary group, responded to the task in a rather informal manner outside the classroom during lunch time or at the end of classes. Moreover the size of the groups (each having 5 members) makes them less representative; an odd behaviour of one member could clearly affect the average result. This characteristic of size smallness, although very clear for Bedford groups, is noticeable also at Banbury. The Upper Intermediate, Banbury in spite of its small number showed the least interference from Arabic. Their better command of English may be mainly responsible for that. The long stay of the Libyans in the U.K. had contributed in their ranking at the second place. The Maritime group (assessed as intermediate) scored equally to the Graduate group who although they had studied through English in the past had not used that language for a considerable time. The lower elementary groups at both centres (26% and 30%) showed the expected correlation between weak English competence and strong Arabic influence.

Tasks B.1-B.16

All the tasks considered so far, ie. the 6 Part A tasks were carried out by all the 133 students. No one of them, whether correctly or incorrectly, failed to try any one of the tasks. The situation in the 16 tasks, B1—B16 of Part B is different. These tasks, as will be seen, required a varied amount of background knowledge which not all the subjects equally possessed or lacked. This was particularly true for most of the U.K. students who were drawn from different backgrounds. The different nature of Part B tasks might explain why these tasks were wholly or partially avoided by a considerable number of U.K. students ranging from 9 to 14 for different tasks. The tasks were mostly avoided by Banbury students where the researcher was not able to supervise all the classes since the tasks were being carried out by the students in different rooms and at the same time. Had he been able to be present as was the case in Bedford, the completion ratio would have been higher. The Khartoum groups achieved the maximum completion ratio. This is mainly due to their better average familiarity especially the Engineering group with the type of tasks presented.

The tasks were translations from Arabic into English of three mathematical statements (one including punctuation marks), a chemical equation, and two graphs.

These are the mathematical statements and the chemical equation.

I) Translate the following into English;

1) $CO_2 + CO_5 = CO_{100}$

3) $CO < L_{17}$

3) منوسط .٢٥٪ ، .٢٠٪ ، ؟٢٪ ، ١٠٪ = ٥٢٪

.. ؟٢٪ = .٢٠٪

4) $C_{بريد} + H = C_{بريد}$ ؟ $(ماء)$ ملحوظة:

يد = H

$H = $ يد

$P = O$

NB:

1) The graphs are shown on page 133 below.

2) Notice the translational aids on the left

The performance of the students in these specific tasks needed to be assessed in reference to their past educational experience ie. use of English as a medium, familiarity with Arabic/English chemical symbols etc. As far as Khartoum groups are concerned generally they had no experience prior to university of learning through English but all of them were familiar with the Latin chemical symbols and their L-R sequencing to form equations.

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In spite of Arabicization of secondary education in the Sudan the
chemical symbols have been maintained.

In the case of the heterogenous U.K. groups, the situation
was varied or unknown. So before doing Part B they were required to
answer in Arabic the following three questions (each followed here
by translation).

ا - ما هى آخر مرحلة دراسة وصلتها ﻓ بلادك ؟

1. What was the highest or last educational level you reached in
    your country?

ب - هل سبق لك أن درست الرياضيات أ والعلوم الطبيعية أو
غيرها بلغة غير العربية (كالإنجليزية أوالفرنسية) إذا كانت
الأجابة نعم أذكر اللغة والمرحلة الدراسية.

2. Have you studied mathematics, physical science or any other
    subject in a language other than Arabic (English or French)?
    If yes, what language and when?

ج - هل لك معرفة بالرموز الكيمائية باللغة الإنجليزية أم
العربية أم الأثنين معاً ؟

3. Have you any knowledge of the chemical symbols in English,
    Arabic or both?

(Information gathered from the first question together with
that provided by information boxes helped in forming tables 2 and 3
on page   describing the U.K. subjects).

As far as medium is concerned only 7 students used English at higher education. 5 of them belonged to the Bedford Graduate group. 29 of the 59, including the above 7, admitted knowledge of the Latin chemical symbols; 19 from Arabic medium secondary education. All the 19 were non-graduate; they included the 8 Libyans who admitted knowledge of the Arabic symbols as well. (see p.124 below). The remaining 3 of the 29, after subtracting the 7 graduates and the 19 with secondary education, encountered the use of the Latin symbols while at in-service and up-grading training sessions. About 20 mentioned ranging knowledge of and experience in mathematics or mathematical-related materials in English.

Table 10 below shows the completion ratio for all the 8 U.K. groups in Part B. The maximum of possible instances for all the tasks for each group is obtained by multiplying the group's size by 16. The actual number of tried instances is given as a percentage of the possible maximum. The Libyan, Maritime, and Graduate groups finished all the task followed by Bedford elementary group. All these groups, as said before, were supervised by the researcher himself; he encouraged the students to do what they thought was right. The lowest completion ratio was registered for the Banbury lower elementary group which constituted two classes. The researcher was able to supervise only one of them as pointed out earlier; but the completion in that group was higher than in the other but was still considerably low.

The translation of each statement, equation or graph involved a set of directional tasks. The overall directionality of

the translated set of tasks is a common task to all the sets of tasks. The sets of tasks after being analysed in their identifiable constituents are coded, ordered and their results are given and discussed below. The order employed in their discussion and description is not chronological reflecting the presentation and

Group (Size)	Number of directional instances		Completion %
	attempted	maximum	
Upper intermediate Banbury (5)	63	80	78.75
Upper elementary Banbury (9)	114	144	79.16
Lower intermediate Banbury	71	96	73.95
Lower elementary Banbury (16)	151	256	58.98
Lower intermediate Bedord (5)	67	80	83.75
Maritime Group Bedford	80	80	100.00
Graduate Group Bedford	80	80	100.00
Libyan Group Birmingham	128	128	100.00
ALL	754	944	79.87

TABLE 10: Part B Completion: U.K. groups

execution order. As in Part A, the order adopted is according to the overall R-L residue for each set of tasks starting from the set with the least interference and ending with the one with the most.

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B.1 — B.3 (No.4: The chemical equation)

$$4) \; c \; \underset{c}{ب_{ل}} \; + \; أ_c \; = \; c \; \underset{c}{ب_{ل}} \; ? \; (م أ) \; \overset{ملحوظة:}{يد} \; = \; H$$
$$P \; = \; O$$

Only 46 of the 59 U.K. students attempted the set of tasks
(see table below). 38 of them and all the 74 Khartoum students
arrived at the L-R overall directionality:

$$2H_2 + O_2 = 2H_2O \; (WATER)$$

The above example is right in all respects. It was written
by a member of Bedford Graduate Group. The student, as all those
with previous knowledge of the Latin chemical symbols and equations
made no mistake in translating $ب_{ل}$ (task B.2) or $أ_c$ (task B.3).
They placed the number allocated to the respective H and O in the
right place ie. $2H_2$ and O_2 respectively.

8 students, all from the U.K. groups, maintained the Arabic
format in the English equation. Consequently they erred in the
three tasks:

$$(Water) \; C_2H \; 2 = _2O + _2H2$$

The Arabic chemical symbols, known in Egypt for a long time,
were adopted simultaneously in Libya with the Latin symbols. As
mentioned, the Latin symbols were retained in the Sudan after
Arabicization. In Egypt their use was confined to post-secondary

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education but now they are in the process of being used from the start, ie. the Arabic symbols are being abolished.

4 students, all from the lower group, experienced problems only with O_2, eg.

$$2H + 2O = 2H_2O \quad (WATER)$$
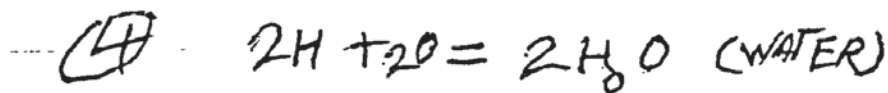
Table 11 below details the results in each and all of the three tasks.

Tasks	Participants			R-L instances					
B1-B3	UK No.	Kh No.	All No.	UK No.	%	Kh No.	%	All No.	%
B.1 L-R	46	74	120	8	17.39	0	0	8	6.66
B.2 H2	46	74	120	0	0	0	0	0	0
B.3 O_2	46 20	74	120	4	8.69	0	0	4	3.33
All	138	222	360	12	8.69	0	0	12	3.33

TABLE 11: Results of B1-B3

The number of U.K. students who produced correct translations ie. 38, exceeds the number of those who admitted knowledge of the symbols. This means that students used their directional commonsense, helped by the translational aid, to arrive at the right production.

B.4—B.6 (No.2: 1st mathematical statement)

50 students from the U.K. attempted the above statement. 40 of them and 72 of the 74 Khartoum students did all the necessary changes: overall orientation (B.4), English square root ($\sqrt{}$, B.5), and "more than" symbol (>, B.6).

$$2. \quad \sqrt{25} > \sqrt{16}$$

This means that 12, 10 from the U.K and 2 from Khartoum (Law students), maintained the Arabic layout; they only changed the numerals:

$$\overline{16}^{\,L} < \overline{25}^{\,L} - 2$$

All the 12 who produced translations of the type above plus another 19 who arrived at the basic directionality kept the Arabic square root. Similarly all the 12 preserved the 'more than' sign. This in fact did not affect the correctness of the message which could be read in either direction and in either language. In Arabic the above reads "the square root of 25 is more than ....."; conversely in English it reads "the square root of 16 is less than that of ...". But ideally reading should follow the direction of the language. Although the maintenance of the Arabic square root symbol does not affect the correctness of the message as in this example above or the one below (to the left), a mistake in directionality of the 'more/less than' symbol may produce an incorrect statement in either language as seen also in the example below (on the right).

$$2- \sqrt{25} \angle \sqrt{16}$$

$$\sqrt{25} > \sqrt{16}$$

Table 12 below illustrates the results of the U.K. and Khartoum groups in all B.4—B.6 tasks:

Tasks B.4-B.6	Participants			R-L instances					
	UK No.	Kh No.	All No.	UK No.	%	Kh No.	%	All No.	%
B.4 R-L	50	74	124	1 10	20	2	2.70	12	9.67
B.5 √	50	74	124	18	36	13	17.56	31	25.00
B.6 ...>	50	74	124	12	24	2	2.70	14	11.29
All	150	222	372	40	26.66	17	7.65	57	15.32

TABLE 12: Results of B.4-B.6

B.7—B.9: (No.1. 1st mathematical statement)

$$1) \ \angle_{30}° + \angle_{00}° = \angle_{..}1°$$

49 of the U.K. students attempted this geometrical statement. 41 of them and all the 74 Khartoum students succeeded in arriving at the correct L-R orientation (B.7):

$$\angle 45° + \angle 55° = \angle 100°.$$

But not all of them succeeded in adapting the angle symbol to English orientation (B.8) or in placing the degree sign in the correct position for English (B.9).

$$1 - > 45° + > 55° = > 100°$$

$$1 - < 45° + < 55° = < 100° \quad ?> \quad <45° + <55< = <100°$$

20 and 39 students erred in tasks B.8 and B.9 respectively. 8 of them (see below) kept the Arabic format for the three tasks, ie. they produced a totally reversed English equation.

$$°100 > = °55 > + 45° >$$

All the 8 who maintained Arabic orientation belonged to the U.K. lower elementary group. One of them produced this:

$$^5 100 \rangle = {}^{3}55 \rangle \times {}^{5}45 - 1$$

Notice the placement of a small 5 for the degree sign. This is because the degree sign (o) resembles in shape Arabic language 5 (O). Clearly the respondent was not aware that the degree sign as many other symbols are cross-cultural.

Table 13 gives a summary of the results of B.7—B.9 tasks:

Tasks B.7-B.9	Participants			R-L instances					
	UK No.	Kh No.	All No.	UK No.	UK %	Kh. No.	Kh. %	All No.	All %
B.7 R-L	49	74	123	8	16.32	0	0	8	6.50
B.8 L	49	74	123	18	36.73	2	2.70	20	16.26
B.9 o	49	74	123	19	38.77	20	27.02	39	31.70
All	147	222	369	45	30.58	22	9.90	67	18.15

TABLE 13: Results of B7-B9

The only 2 Khartoum students who had difficulty with the angle sign were Law students. Most of the 18 U.K. students with the same problem belonged to the lower elementary groups. It seemed that the incompatability of the Arabic angle symbol to an English text is too obvious to be overlooked by the mathematically-minded Engineering students and the linguistically better non-elementary U.K. groups.

The incompatability of placing the degree the Arabic way in an English task seemed to be far less obvious. 39 students overlooked it. Surprisingly 20 of them came from the Khartoum groups, 12 Law and 8 Engineering students, ie. 40% and 18% of each group respectively.

The Libyans who on all aspects performed better than most other U.K. groups seemed to be equally aware or unaware of the right positioning of the degree sign. In spite of their longer stay in the U.K. and Engineering training, 3 of them (37.5%) misplaced the

degree symbol. The high incidence of mistakes in this respect among all groups confirms the view expressed earlier about the subtlety of the task. Its visual incompatability is not strong or odd as that of the angle sign. As will be seen later (video tape) one of the tasks given to the Kuwaiti video group contained among other things degree and angle symbols translation.

Arabic equaivalents of all the 15 tasks (A.1-A.6 and B.1-B.9) considered so far had been given to category II. The remaining two sets of tasks (B.10-B.13; B.14-B.16) were given to the first category only:

B.10--B.13: (3rd statement):

$$\% \circ \circ = \% \backslash \cdot \quad \circ \% \int \quad \circ \% \epsilon \cdot \quad \circ \% \nu \cdot \quad \text{منوسط} \quad (ج$$

average/mean = متوسط $\qquad \% \epsilon \cdot = \% \int \cdot \quad \therefore$

Besides changing the overall orientation (B.10), the subjects were required to change: the Arabic comma (B.11), position of percentage symbol (B.12), and the question mark (B.13).

36 of the 46 U.K. students and all the 74 Khartoum subjects changed the overall orientation as required by English.

3-averg 30% و 20% , ?% , 10% = 25% , --- ?% = 40%

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10 U.K. students kept the Arabic layout in the 3 tasks:

$$25 = \%10 \quad \text{ل} \% \quad ? \quad \text{ع} \% \quad 20 \quad \text{ل} \%30 \quad -3$$

In fact many of those who arrived at the English basic orientation had problems with the comma, the percentage sign, and the question mark. They mixed Arabic and English punctuation marks. Such mistakes were committed by subjects from all groups including Khartoum groups and all those with post experience of learning through English. Many of these mistakes resulted not from ignorance of English basic punctuation marks but lack of concentration. Most of the students, as in the pie charts, automatically embarked on translation underestimating the requirements of proper form translation.

Table 14 below details in the usual manner the results of B.10-B.13:

Tasks B.10-B.13	Participants			R-L instances					
	UK No.	Kh. No.	All	UK No.	%	Kh No.	%	All No.	%
B.10 R-L	46	74	120	10	21.73	0	0	10	8.33
B.11 ٠٠٠	46	74	120	25	54.34	21	28.37	46	38.33
B.12 :-...%	46	74	120	10	21.73	19	25.67	29	24.16
B.13 ؟	46	74	120	12	26.08	19	25.67	31	25.83
All	184	296	480	57	30.97	59	19.93	116	24.16

TABLE 14: Results of B10-B13

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The comma proved to be the most problematic of the three tasks. This in addition to lack of concentration as suggested above could be equally attributed to lack of practice in the use of English punctuation. The proper use of punctuation poses a problem which all teachers of English to Arab students are and/or should be aware of. The underestimation of the role played by punctuation in English is largely due to the marginal use of punctuation in Arabic which is a much more recent development.

The students seemed to have fewer problems with the question mark and the percentage symbol. The former is more widely used and seen than the latter. Some might have generalized that since the multidigital numbers are written in the same order in Arabic and English the % symbol, and all numeral-related symbols, eg. degree and angle signs ought to be on the same side for both languages.

2)Translate the two graphs below into English by completing .the
two provided diagrams.

" ب "

" م "

المحور السيني

الزمن بالساعات

التردد بالثاري

صفر

ص = ١٠٠م

صفر المحور السيني

سلحوظة : المحور السيني
x axis = المحور السيني
y axis = المحور الصادي

x = س
y = ص
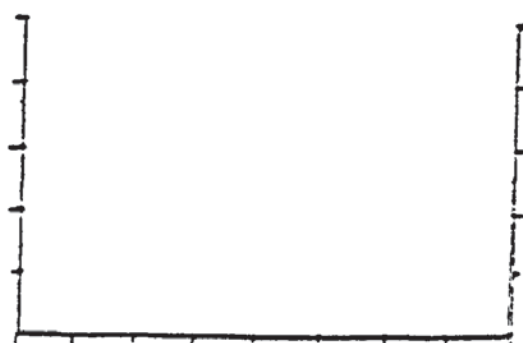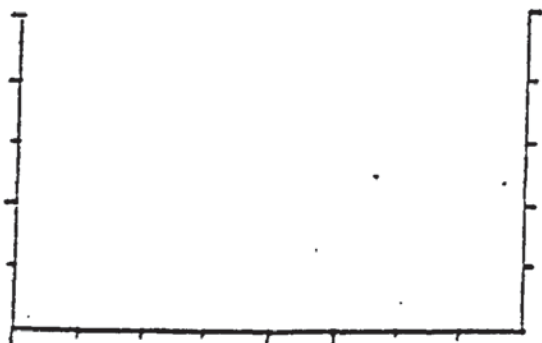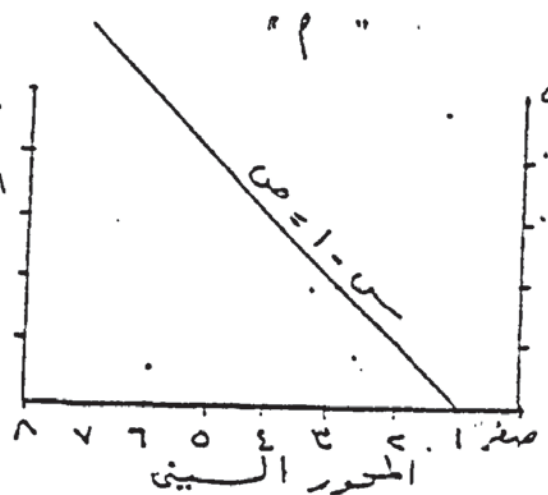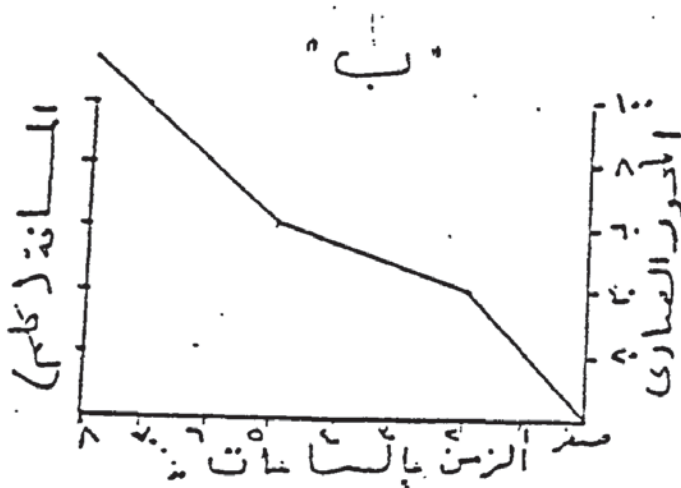
Before considering the results of these tasks it is necessary to point out that the layout of the Arabic graphs as they appear breaches the standard cross-cultural conventions set for graphs. In the above graphs the positive values of the X ordinate run from right to left, from the point of intersection of the two ordinates. This is exactly in opposition to the standard position, irrespective of the language orientation, where the positive value along the X ordinate increases towards the right starting from the point of intersection. (0).

Some of the U.K. students with previous knowledge of the standard conventions of graphs layout pointed to the non-standard format of the above Arabic graphs.

As a result, when the same tasks were given later to Khartoum groups, the students were asked in writing to make any comments about the graphs or any other aspects of the whole package. They were required to write their comments, if they had any, on the back of the final page:

هـــام : إذا كانت لديك أى ملاحظات أ وتعليقات على الرسومات البيانية أو غيرها أكتبها باللغة العربية (إن شئت) على ظاهر هذه الصفحة.

Only 4 students bothered to comment. They all, in their different ways, pointed to the wrong layout of the two graphs. All the 4 were Engineering students who by virtue of their specialized studies, involving many graphs, were better placed than the other group to make such observations: eg. (translation between brackets):

الرسومات البيانية عن صحيح لأن هناك
السطحات للعادة الأصراتي لـ... معرب وهذا خطأ د

(The graphs are wrong because the X axis on the left of the Y axis
is positive and thus is wrong)

تن صحة الرسم الـ...عوم البيانيه ها ، ا ، ب ، .. ان يبار الصفر
تأتي الأبعاد سالبه وليست موجبه كما هو تمني في الرسم .
وايضا في العادي برمز للاحداثيات السينيه ما لنفصم نز لجي أكل الحلو
والصادس بالسين .. نة الخط الراسي وليس الفرد كتابه اسادالجدير..

(Only negative values appear on the left of the zero; not positive
as in graphs A and B.)

Having these anomalies in mind we will consider the
results of the graphs which were the most avoided tasks. Only 45 of
the U.K. subjects attempted them. The first task, B.14 indicates
whether the two graphs labelled A and B are ordered in a L-R manner
or by maintaining the Arabic R-L order. Only 7, and 29 from the
U.K. and Khartoum respectively were aware of the need to make that
change:

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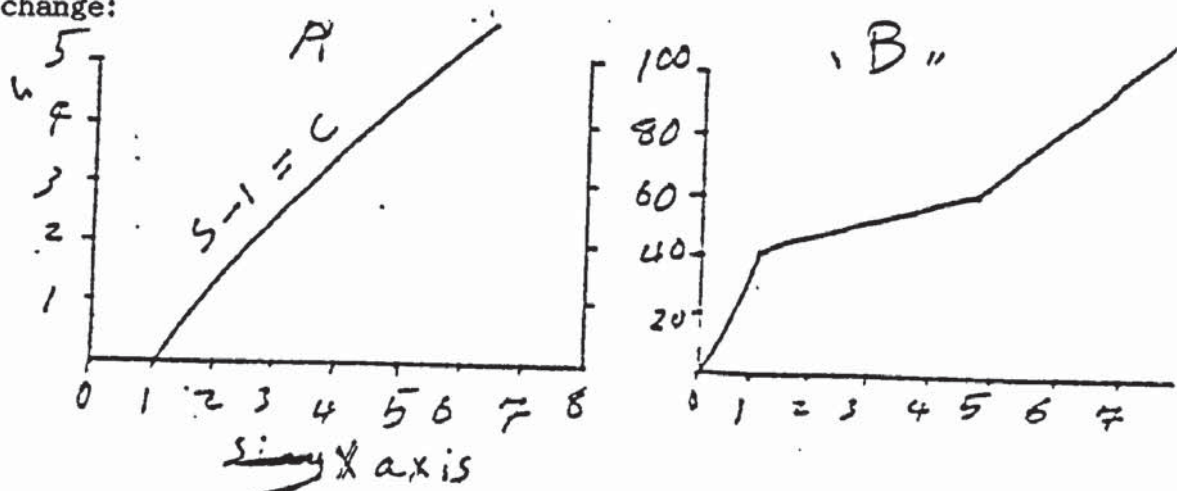
The majority, 38 U.K. and 45 Khartoum students preserved the B-A source order:
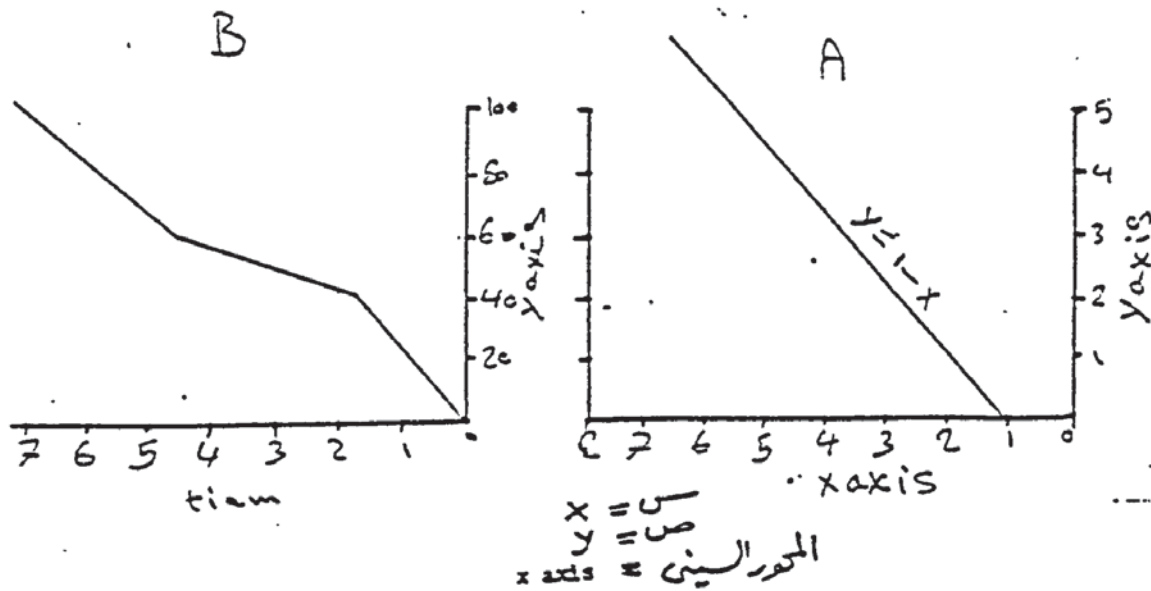
In addition, many of them, maintained the Arabic format for both graphs A (B.15) and graph B (B.16).

Interestingly very few got the right A-B order (B.14) but kept the Arabic layout of the graphs.
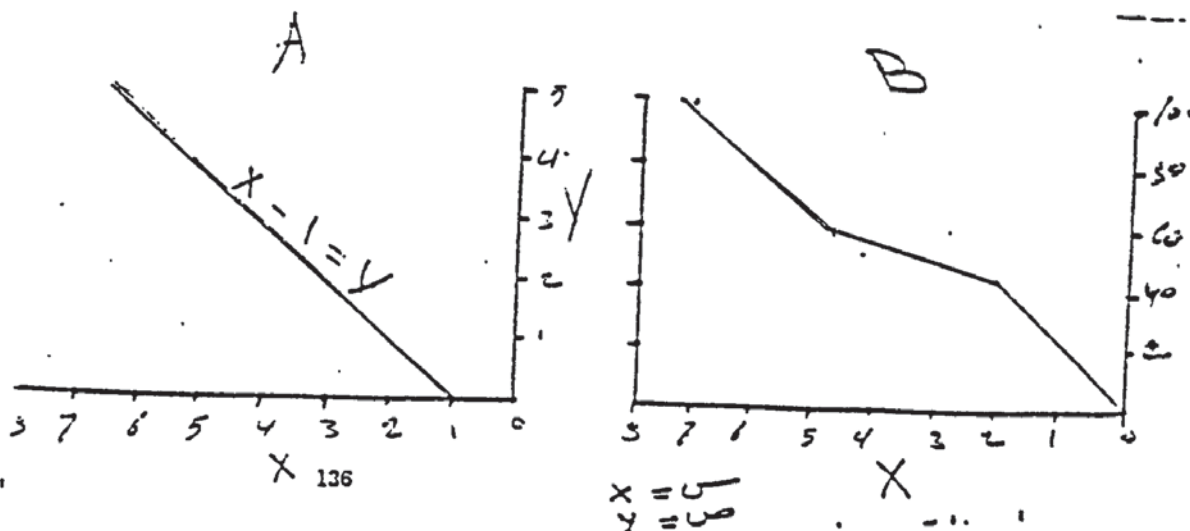
Graph A contains an equation. The students' responses to that type of task have already been discussed. However the three photocopied examples above illustrate the most common responses. In the first two examples the respondents arrived at the correct directionality, though, the first, a secondary schoolboy, made his own translation of X and Y. The other, on the other hand, made use of the provided translation aids which the first seemed to have failed to notice. The third example is a typical directional reversal of the type met before although the respondent did make use of the translation aids.

The following table (Table 15) illustrates the overall results in the graph tasks (B.14-B.16).

Tasks B.14-B.16	Participants			R-L instances					
	UK No.	Kh. No.	All No.	UK No.	%	Kh No.	%	All No.	%
B.14 R-L	45	74	119	38	84.44	45	60.81	83	69.74
B.15 Graph A	45	74	119	25	55.55	10	13.51	35	29.41
B.16 Graph B	45	74	119	19	42.22	7	9.45	26	21.84
All	135	222	357	82	60.74	62	27.92	144	40.33

TABLE 15: Results of B14-B16

The high incidence of B-A order is only comparable to that registered for the pie charts. The better performance in graph B is likely to be because some students, on discovering their mistakes in

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graph A, which they carried out first, avoided repeating the same mistake with graph B.

Despite the structural anomalies of the source graphs which no doubt had caused some confusion for many students and consequently affected their performance the tasks had also helped in assessing directional awareness among the participants.

Table 16 summarizes the results for the 16 tasks of part B (cf. Table 7, p. 116, summarizing Part A results).

Sets of Tasks	Participants			R-L instances						
	UK No.	Kh. No.	All	No.	UK %	Kh No.	%	All No.	%
B.1-3	138	222	360	12	8.69	0	0	12	3.33
B.4-6	150	222	372	40	26.66	17	7.65	57	15.32
B.7-9	147	222	369	45	30.61	22	9.90	67	18.15
B.10-13	184	296	480	57	30.97	59	19.93	116	24.16
B.14-16	135	222	357	82	60.74	62	27.92	144	40.33
All	754	1184	1938	236	31.29	160	13.51	396	20.43

TABLE 16: Summary of Part B results

A comparison of the overall results of the U.K. groups in both parts as indicated by the mean percentage reveals that the R-L practices have almost doubled in Part B (A=16.38%, B=31.29%). For the Khartoum groups, an increase of about 140% (9.68% and 13.51%) is

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also registered. The average increase for all, category I is about 160%. (12.56% and 20.43%). The substantially big difference in the results obtained for both parts reflects, and justifies to some extent, the dichotomy suggested for dividing them into global versus particular. Although the dichotomy is sometimes arbitrary: all Part B tasks included global orientation decision, it is clear that msitakes had been actually commited more, for various reasons, in the detailed aspects and components of tasks, eg. non-linguistic forms and gestaltic entities, namely overall orientation.

Now the results of the individual groups in Part B will be discussed and compared with those obtained for each group in Part A.

Table 17 below (cf. Table 8 on p. 116) gives the overall picture of Khartoum groups in Part B:

Group (size)	Completion %	Total number of instances	R-L instances	Mean %
Law (30)	100	480	90	18.75
Engineering (44)	100	704	70	9.94
All (74)	100	1184	160	13.51

TABLE 17: Part B results: Khartoum groups

NB: The total number of directional instances is obtained by multiplying the total of participants by 16 (the total of tasks).

The table shows that the orientation errors of the Law group are almost twice those of the Engineering group. The difference

between the two groups in Part A was very small (10% and 9.46%, see table ibid). The mathematically biased tasks of Part B might have appealed more to the Engineering students. Though both groups came from Arabic-medium education, the Engineering students were certainly already involved in learning and reading exclusively through the medium of English during the two weeks or so prior to the experiment. It was very unlikely that the Law students who were learning through English and Arabic (co-medium in the faculty of law) had come across material comparable in nature to those of the tasks.

The following table (No.18) gives the mean % of R-L influence in the 16 Part-B tasks for each of, and all, the U.K. groups. The table is similar in format to that giving the results for Part A (p.116) but it has an additional column for tasks completion (based on completion table p.123 above).

The ranking order of the groups for Part B corresponds to that for Part A (ibid p.123 with two exceptions:

1) The Upper Elementary groups have fallen from the fourth to the sixth rank.

2) The two Lower Elementary groups have exchanged ranks but with very small difference (0.75%) in favour of the far smaller Bedford group. The poor performance of the Banbury group is reflected as well by the low completion ratio.

Group (Size)	Completion %	Directional Instances		
		Total attempted	R-L total	R-L mean %
Upper Intermediate Banbury (5)	78.75	63	8	12.69
Libyan Group Birmingham (8)	100	128	22	17.18
Lower intermediate Banbury (6)	73.95	71	14	19.71
Graduate Group Bedford (5)	100	80	17	21.25
Maritime Group Bedford (5)	100	80	18	22.50
Upper Elementary Banbury (5)	79.16	114	42	36.84
Lower Elementary Bedford (5)	83.75	67	35	52.23
Lower Elementary Banbury (16)	58.98	151	80	52.98
All U.K. Groups (59)	79.81	754	236	31.29

TABLE 18: Part B results: U.K. groups

As a whole the ranking order of and the differences between, the U.K. groups. shows in a clearer way than in Part A, the relative role of various factors such as linguistic level, post experience, immediate experience, and experimental circumstances in determining the overall pattern of Arabic graphological interference. The picture is clearer in Part B tasks because by virtue of their obvious pedagogical nature and wider range and number, 16, they are better suited than the 6 Part A tasks to explore the phenomena of graphological residue and how it is affected by relevant factors of the types mentioned above.

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The Overall Results

The greater weight of Part B tasks is strongly echoed in the overall results, ie. when two the parts are combined; its ranking order is almost repeated in the overall pattern. This is very clear in the Khartoum groups, as illustrated in table 19 below:

Group (size) R-L Range in %	Total attempted	R-L No.	R-L mean %	R-L mode %	R-L median %
Law (30) 0 ——— 31.18	660	108	16.36	15.90	22.70
Engineering (44) 0 ——— 27.27	968	95	9.81	11.36	13.63
All (74) 0 ——— 31.18	1628	203	12.46	11.36	13.63

Column header note: the values fall under "Directional Instances".

TABLE 19: Overall results: Khartoum groups

NB: Completion is 100%

The influence of Arabic graphology and the students' unawareness of the graphological requirements of the tasks are significant for both groups. The substantially better performance of the Engineering students, given the nature of most of the tasks, fulfills expectations. The implications of these clearly significant results will be discussed later.

Similarly (table 20 below) the ranking order for R-L phenomena for the U.K. groups in all tasks is a repetition of the same pattern obtained for Part B with minor exceptions of rank exchange for the two lower elementary groups (a return to their position in Part A).

Group (size) R-L Range in %	Completion %	Directional Instances					
		Total attempted	R-L No.	R-L mean %	R-L mode %	R-L median %	
Upper intermediate Banbury (5) 0 ——— 13.63	84.54	93	9	9.67	9.09	9.09	
Libyan Group (8) 0 ——— 22.70	100	176	25	14.20	18.18	18.18	
Lower Intermediate Banbury (6) 4.54 —— 33.33	81.06	107	17	15.88	—	13.59	
Graduate Group Bedford (5) 9.09 —— 31.81	100	110	22	20.00	18.18	18.18	
Maritime Group Bedford (5) 13.63 —— 31.81	100	110	23	20.90	18.18	18.18	
Upper Elementary Banbury (9) 0 ——— 52.63	84.80	168	49	29.16	18.18	20.00	
Lower Elementary Banbury (16) 16.66 —— 77.77	70.17	247	105	42.51	41.66	34.84	
Lower Elementary Bedford (5) 22.70 —— 75	80.18	97	44	45.36	—	50.00	
All 0 ——— 77.77	85.36	294	1108	26.53	18.18	22.22	

TABLE 20: Overall results: U.K. groups

Inspection of the figures reveals the following:

(1)   Groups with maximum or higher completion were more vulnerable to Arabic R-L influence than linguistically comparable groups with less completion ratio.

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(2)   The mean of R-L instances ranged from 9.09% (upper
intermediate) to 45.36% (lower elementary,   Bedford) and is
significant for each and all the groups (26.53%)

(3)   The probability for a value to occur more than once
within a group was limited.   This is because many of the groups are
very   small.   The two blanks in the mode column is an indication of
that.

Table 21 below summarizes in the same way the results in all
the 22 tasks for all the 133 students of category I (subjects with
Arabic as the basic graphology):

Groups (size) R-L Range in %	Completion %	Total attempted	Directional Instances			
			R-L No.	R-L mean %	R-L mode %	R-L median %
Khartoum (44) 0 ——— 31.18	100	1628	203	12.46	11.36	13.63
U.K. (59) 0 ——— 77.77	85.36	1108	294	26.53	18.18	22.22
All (133) 0 ——— 77.77	93.50	2736	497	18.16	13.63	16.16

TABLE 21: Overall results: all groups (Category I)

As   mentioned earlier the Arabic equivalents of the first 15
of the 22 tasks had been given to category II (subject with English
as the basic graphology).   These will be considered in the next
chapter. But before that the overall results of category I in these
15 common tasks is given in Table 22:

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Groups (Size)	Completion %	Directional Instances		
		Number attempted	R-L No.	R-L mean %
Khartoum (74)	100	1110	82	7.33
U.K. (59)	89.15	789	155	19.64
All (133)	95.18	1899	237	12.48

TABLE 22: Results of tasks common to Category I and Category II

The level of R-L interference has dropped from 18.16% for all tasks (table p.144 above) to 12.48%. For the Khartoum groups, the drop is from 12.46% to 7.33%; for the U.K. groups from 26.53% to 19.64%. This significant drop is a result of the exclusion of tasks B.10-B.13 (the statement with punctuation) and B.14-B.16 (the graphs). These two sets of tasks had caused the highest level of R-L influence.

CHAPTER FIVE

L-R phenomena in Arabic graphological practices of category II compared with R-L ones of category I

Subjects

Category II (table 1 p.86) comprised 40 subjects with English as the first or basic literary language and standard Arabic as a second or foreign language. The 35 of them who participated in the non-video study had been instructed in Arabic to perform the same aforementioned 15 common tasks between March and May 1984 before these tasks plus others were later given to the first category as seen in the previous chapter.

The 35 non-video subjects comprised 20 Birmingham students of Yemeni descent and 15 British students studying Arabic at Leeds University. Now follows a description of both ethnic groups.

The Yemenis

The 20 (13-29 years) subjects were sons and relatives of Yemeni immigrants. All of them were attending an evening Arabic-medium school (described below) in Birmingham. 18 of them (13-19 years) were enrolled ·at the same time as full time students at British day schools and colleges. The remaining two were employed as workers at British Steel.

The school, known officially as the Yemeni Educational Institute, was organized in its present form in 1983/84 and is equipped and staffed by the Ministry of Education of the Yemen Arab Republic (Y.A.R. or North Yemen). The aim of the school is twofold:

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(1) To provide for Yemeni children whose parents prefer for them an Arabic-medium education according to the Yemeni system, beside the British, a chance to pursue that aim. This helps newcomers who started their education in Yemen to continue here. Similarly those who return to Yemen can be easily accommodated in the system.

(2) To provide for those children whose parents prefer for them the British system but still want them to have access to Arabic and Islamic studies a chance to do so.

The school or institute is divided into two sections according to the Y.A.R. educational system: primary and secondary. neither section was complete at the time of the study which happened to be the first year in the foundation of the institute. The boys' primary section included only the three lower classes and the Sixth (final) Year. No students were found at that time to fill the intermediate classes. The secondary section had students only in the first year. The classes, moreover (see below) were neither reflecting the optimum average age nor a reasonable age range especially the Sixth primary. These anomalies were to disappear gradually in time. They were imposed at this particular time in the early history of the school because most of the students were drawn from two categories:

1) Those with previous but ranging knowledge of literary/standard Arabic obtained through interrupted education in Yemen, private community tutition in the U.K. (at Mosques);

2) Those with very little or no experience of that kind. The latter group (7-12 years) were registered in the lower forms of the primary section. They were not included in the study. The former (13-29 years) were the 20 who participated in the study. They were divided between the Sixth Year primary and First Year secondary with 12 (13-19 years) and 8 (17-29 years) in each year respectively. 4 of the students, all from the 6th year primary, were born in Britain. The majority arrived in the U.K. between the ages of 6 and 9.

Although English is taught as a school subject in secondary Yemeni schools, it is not taught at the school. In teaching all other subjects, the Y.A.R.'s curricula and textbooks are used.

As far as literacy is concerned, most of the subjects had better literary and graphological competence in English than in literary/standard Arabic. Within the Yemeni community the students, especially the older ones, speak in Arabic (Yemeni dialect) but occasionally they switch to English when speaking with their peers. Outside the community, eg. English schools, they speak fluent English. In general most of those who participated in the study were considered to be fairly ambilingual in spoken English and Arabic.

Table 23 summarizes the information so far given about the subjects and gives an idea about their position within the British education system:

Arabic Form & size	Age		British Education		
	average	range	O level	A level	Comments
1st year secondary, Y1 (8)	20	17-29	5	1	2 (21 & 29) in employ-ment
6th year primary, Y2 (12)	16	13-19	6	3	3 too early to decide

TABLE 23: Yemeni Subjects

N.B.: The average age for 6th year primary and 1st year secondary is normally 12+ and 13+ respectively.

As will be seen later, the two classes did not execute the same number of tasks. The 1st year secondary or Y1 executed their tasks individually while the 6th year primary or Y2 carried out their tasks in a class mode. The reasons and implications of these differences in tasks number and experimental circumstances are explained later.

The British

The 15 British participants were Arabic language students from the Arabic section of the Semitic Department in the University of Leeds. They were aiming for a BA degree in Arabic. 6, 3 from either sex, were in the second year. The remaining 9, 5 males and 4 females, were in their third year.

All of them were native speakers of English with no prior university knowledge of Arabic. Unlike the Yemenis, Arabic to them

is a typical foreign language. The Yemeni subjects had a wider chance of using Arabic for communication in the real world in one of its spoken forms (Yemeni dialect) and more importantly as far as this study is concerned, in its written form, eg. personal letters. Moreover Arabic is the sole medium used in the Yemeni Institute. The British students on the other hand, encountered Arabic in its literary/standard form mainly, perhaps only, in class or when doing their private studies.

Being second and third year students, the British students' Arabic graphological competence was assumed to be less than that of the Yemenis with their longer and varied experience in dealing with Arabic materials. However both groups were expected to have a comparable English graphological competence although the general linguistic competence of the British University students was expected to be higher by virtue of their coming from English monolingual homes.

How far these assumptions of differences and similarities would affect, and be reflected in the performance of the two ethnic groups is seen in the results though the smallness of the groups is bound to affect in some cases, the overall expected patterns.

Tasks Development:

As pointed out, more than once, the non-video tasks were first presented to the non-video category II subjects following the 1983 exploratory video study (El Hassan 1984). The design of this

preliminary study had, as stated before, formed the base of future designs.

An adapted Arabic version of the English original of most of the tasks was carried out first by the first Yemeni group, Y1 (1st year secondary), late in March 1984. The table and pie charts translation were added for the first time. In all, Y1 had carried out 13 tasks (see below). The original plan was to videorecord them individually as done in the pilot study. The lack of facilities at school and the difficulty in bringing the subjects to Aston University at a time convenient to them provided that the facilities were not in use at that time, forced the researcher to record in writing the temporal L-R/R-L processes, eg. R/L entry, L-R/R-L hand movement to draw horizontal lines.

3 of the 134 tasks given to Y1: information boxes, pie charts, table translation, plus a fourth newly introduced one, Arabic date writing, were later, in mid-April 1984, presented to the 12 Y2 (6th year primary) boys. These 4 tasks were carried out as indicated earlier, in a class mode, ie. at the same time and place, also under the supervision of the researcher himself.

The 14 so far identifiable tasks plus a fifteenth. one, Arabic time writing, were then given on 1 May 1984 to the 15 British students. The 15 tasks thus reached were later translated into English and given to the first category as tasks A1-A6, and B1-B9 as seen in the previous chapter.

<u>Results</u>

As in the previous chapter, incidence of graphological residue from the basic graphological system, English in this case, and any other incompatible practices to the language of instruction, Arabic, are quantified as percentages of the total of attempted incidents in each task. Similarly the overall behaviour of each group, some or all the groups, is calculated from the average behaviour of the members of that particular grouping.

Since the results deal with largely identical tasks to those in the previous chapter the same divisions into A and B type tasks are employed here. This applies also to the use of the same codes, eg. B1-B3 for the same set of tasks. The ranking order from the least interference to the most is also followed here. Reference to and comparisons with the results obtained for category I are made during the analyses and discussion of category II results.

A1. <u>R/L entry and sequencing of data horizontally:</u> (cf. p. 102).

١- فى المستطيل الأول أكتب : 'لغة عربية ـ السنة الثانية.'

٢- فى المستطيل الثانى أكتب: 'قسم الدراسات السامية.'

٤- فى المستطيل الثالث أكتب: 'جامعة ليدز ـ انجلترا.'

٤- فى الدائرة الأولى أكتب إسمك.

٥- فى الدائرة الثانية أكتب تاريخ اليوم.

٦- فى الدائرة الثالثة أكتب الزمن.

The questions translate as follows:

1. In the first box (rectangle) write (Arabic—2nd/3rd year)

2. In the second box (rectangle) write (Semitic Department)

3. In the third box (rectangle) write (Leeds University, England)

4. In the first circle write your name

5. In the second circle write the date

6. In the third circle write the time

The above versions of A.1 were given to the British group. No information circles were given to Y1 and Y2. This is the version Y1 carried out:

(A) Write name and age in box "A" (see below).

(B) Draw 4 other boex, 2 on either side.

(C) 1. Name them B, C, D and E.

2. In B state if you are student/employee.

3. In C write school/place of work.

4. In D write your class in the Arabic school.

5. In E write you class in the English school.

أ) أكتب إسمك وعمرك فى المربع (أ) أدناه.
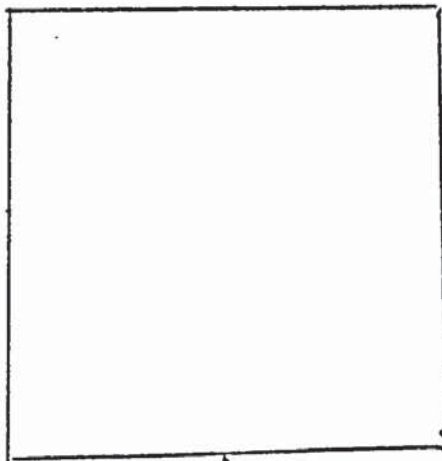
(أ)

ب) أُرسم ٤ مربعات أخرى ، ﺟ على كل جانب.

ﺟ) ١ـ سمّتها ب ، ﺟ ، د ، ﻫ.

٢ـ ﻓﻰ الربع (ب) أُكتب مهنتك : طالب / عامل

٣ـ ,, ,, ﺟ ,, إسم مدرسـة الأنجليزيـة ومكان عملك

٤ـ ,, ,, د ,, رقم الصف الدراسى ﻓﻰ المدرسة العربية

٥ـ ,, ,, ﻫ ,, ,, ,, ,, ,, ,, الأنجليزية

In the case of Y2 all the 5 boxes were provided. In the first, beside name and age, they were asked to write country of birth. They were also asked to label the other boxes from B to E and to answer similar questions but instead of writing student/employee (all of them were students) they were asked to write the date.

Although Y1 students were responding to Arabic instruction no one of them in drawing the boxes made any line from right-to-left. All their movements in that respect were from left-to-right, a tendency reflecting English graphological dominance and perhaps the natural inclination of organizing and doing things in that direction as met before in the review of directional research.

As far as the final end products are concerned, no Yemeni produced subject from either group produced a L-R order in answering the questions, ie. B-E labelling, ﻫ ــ ب

بـ) أرسم ٤ مربعات أخرى ، ـ على كل جانب.

GARETTS GREEN AE COLLEGE

طالب

'O' LEVEL

اول الاعدادي

POWLEY REGIS COLLEGE

الصف السادس الابتدائي

٨٤/٤٠/١٥

O'LEVEL COURSE

N.B. The examples from Y1, and Y2 respectively.

Similarly all the 15 British students, except for one, produced the required Arabic R-L order for all the information boxes and circles:

The only British who opted for an L-R order did that only for the first item, ie. information boxes:

He was one of the 6 Second Year students. On discovering that his choice of order of boxes was in the wrong order he avoided repeating the same mistake with the circles. In fact this particular student experienced a great difficulty in understanding the Arabic

instruction so the task was explained to him in English. This was likely to be why he opted for a left entry. His behaviour is very similar to the Arab student (p.104) to whom the English version of the same tasks was explained in Arabic. Unlike the British, the Arab repeated the mistake in the circles. This could suggest a weaker graphological awareness or a stronger fixed set in the younger Arab secondary schoolboy.

The hesitation before deciding on an R-entry on the part of beginners learning Arabic as a foreign language is best illustrated by 1st year (1984/85) Leeds students who were video-recorded carrying out similar graphological tasks (video-tape).

A.2: Arabic date writing: (Cf.p. .106)

This task was given as indicated earlier, p. 151, to all the 15 British and the 12 Y2 students. All the Yemenis and only 2 British produced the right order for writing the date, ie. starting by the day on the right followed by the month and then the year.
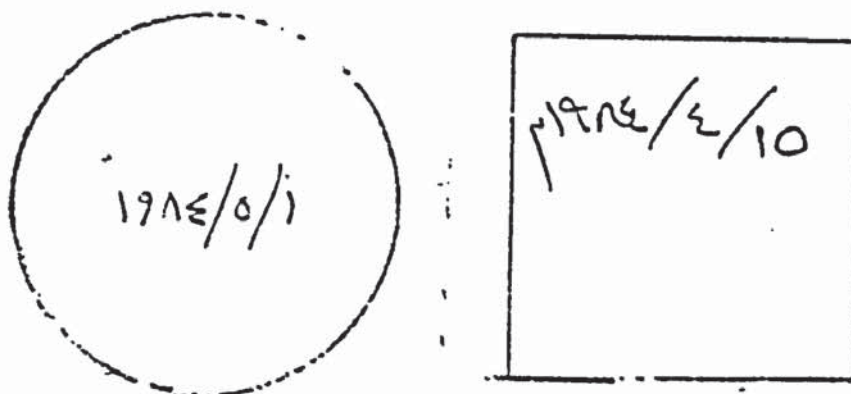
The example on the left was produced by a British student; the one on the right by a Yemeni.

The other 13 British students wrote the Arabic date in a L-R order (see below, left).

١/٥/١٤

١٧/١٠/١٩٠٠

None of the Y2 schoolboys erred in date writing. Nevertheless, a Y1 student (above, right) instead of writing his age wrote his date of birth in the reversed order. He was the eldest subject (29 years) and one of the two employed by British Steel. At the time of the experiment his stay in the U.K. was for more than 15 years.

The high incidence of reversed date-writing among the British could mean that Arabic date writing had not yet been fully established as a routine as the case with the Y2 who were used to seeing and writing it in their Arabic-medium daily schooling. It seemed that most of the British might have not contemplated before on Arabic date writing. When confronted with the task they generalized their limited knowledge of the Arabic language number system to where it does not apply. Many might have thought that since multi-digital numbers in both English and Arabic are written in the same order then there was no logic for the date to be excepted. A generalization in the opposite direction is also evident (see A.3 below):

A.3: Arabic time writing (cf. p. 106)

As explained in the previous chapter (p. 106) Arabic and English digital time writing follow the same order. The hours appear on the left and the minutes on the right.

No category I student, as seen before, faced a problem in English time writing. In the case of category II, the task was given only to the British students. 10 of them made no error. The two examples below are from a 2nd and a 3rd year student
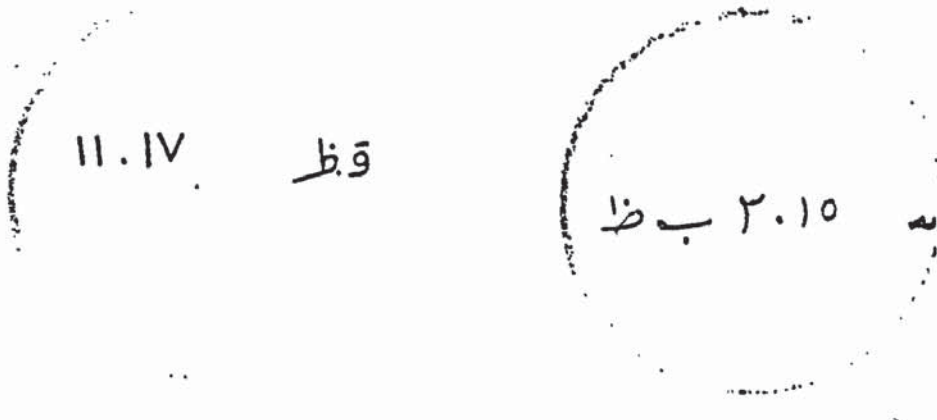
The bits قَ.ظ and ب.ظ Arabic for a.m. and p.m. were written on the board because the students were not familiar with them. Some of them, as seen in the 2nd year example (on the left) placed the Arabic equivalent for a.m. wrongly on the right. It should appear as in the other example on the left of the numbers because the numbers are read first. Also the hours and minutes are separated in the two examples by a fullstop. Usually they are separated in both languages either by a colon (:) and/or a space.

It is not certain whether all the 10 who got the overall orientation right did that because they knew it was the right thing to do or they just followed the English order. The other 5 who reversed the order for Arabic might have generalized that it would be compatible for anything Arabic to be ordered from right to left.

The time given on p.157 is reversed. It should read ١١:١٧. The student failed to produce the Arabic language 7 in (١٧). The

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confusion of the two versions of numerals is one of the problems faced by beginners with previous training mainly or exclusively in one version.

This is another example of reversed time writing:

It was meant for:

٣ : ١٥

3 : 15 p.m.

Moreover the student confused 15, Arabic ١٠ with 51, Arabic ٠١. More will be said about figures reversed at the end of the Chapter.

A.4: Point-joining and Numbering: (cf. p. 107)

صل النقاط المتشابهة في الشكل أدناه لتحصل (٣) ..
على ٩ مستطيلات .
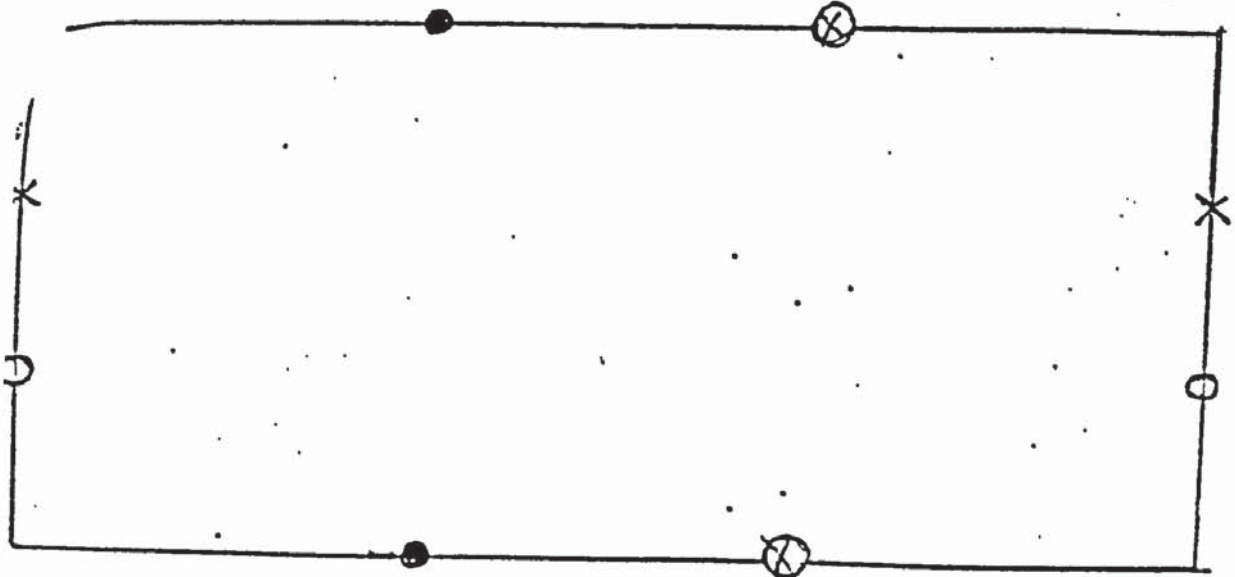
رقّم المستطيلات من ١ – ٩ ، ضع الأرقام في الأركان . (٤)

The task as its English equivalent included 3 items:

a) Joining similar points.

b) R/L entry for numbering.

c) Corner choice for number writing.

It was carried out by all the 15 British and the 8 YI students. Many of those observed by the researcher did the joining from left-to-right, reflecting a L-R dominance.

18 (78.26%) of the 23 started with a R-entry for numbering as required by Arabic:
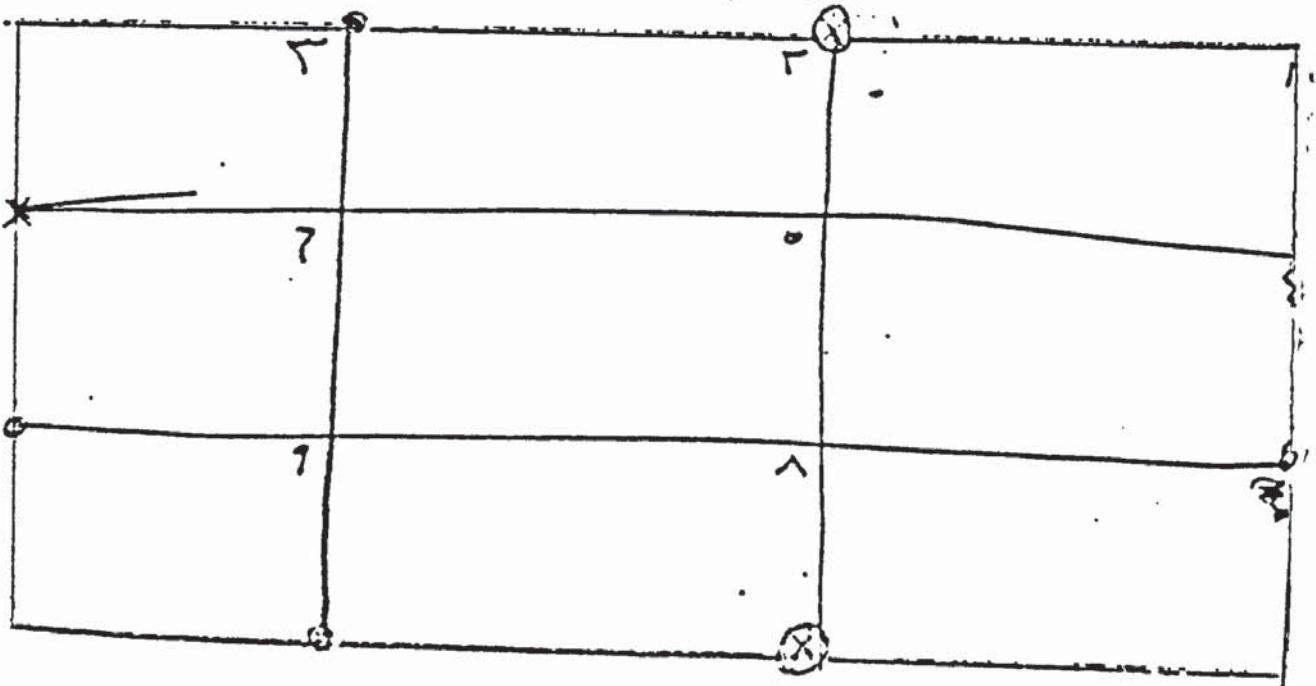
All the 18 opted for the top right corner for writing the box number, a practice compatible to Arabic graphological orientation.

5 (21.47%) of the 23 opted for a L-R strategy in both entry and corner choice:

١ | ٢ | ٣
٤ | ٥ | ٦
٧ | ٨ | ٩
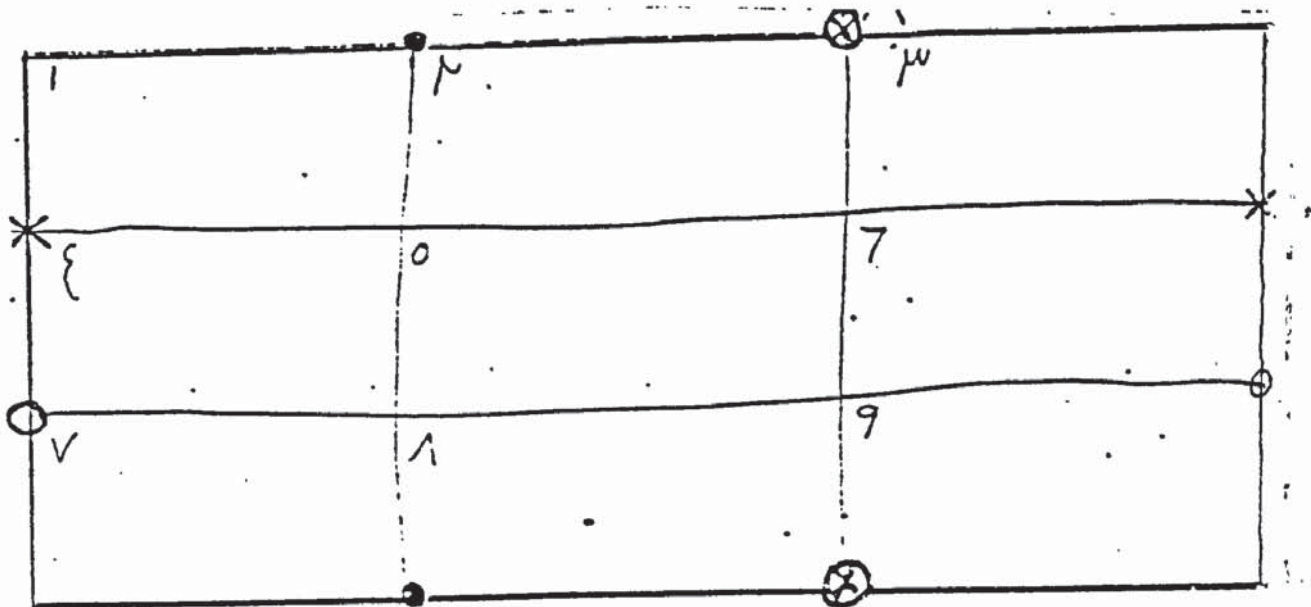
4 of them came from the British group. It is clear that the Arabic schooling of the Yemenis had offered them a far wider and intensive experience in dealing with Arabic graphological material.

The English influence on this task amounts to over 85% for the British and 12.5% for the Yemenis. The influence from Arabic in category I was very low (5.38%) for the English equivalent of the task. This is equally true also for date and time writing.

A.5: Table Translation (cf. p. .110)

أعد رسم الجدول الآتي . وترجمه إلى اللغة العربية.

No.	School	Teachers	Boys	Girls	Comments

The above simple table was the first to be tried. It was given to the 8 YI students. 5 of them (62.5%) produced the required Arabic format:

ملاحظات	البنات	الأولاد المحكمة	المدرسة المدرسين		رقم
					١.
					٢.

3 (3.75%) kept the English L-R format:

رقم	مدرسة مدرس	ولد	بنت	ملاحظات

For Y2 and the British groups a full English table was prepared for translation:

No.	Name	Age	Address
1	Musa Ahmed	21 years	Tel. 01-38245, London
2.	Mohd. Ali	19 years	P.O. Box 703, Aden
3.	Gasim Taha	30 years	unknown

Table No. 1

10 (83.33%) of the 12 Y2 and 8 (53.37%) of the British subjects succeeded in arriving at the overall R-L directionality:

	العنوان	العمر	اسم	١.
	٠١ ـ ٢٨٢٤٥٠ الطفرن لندن	١٧ سنقين	موسى احمد	١٣.
	٧٠٣ (ص.ب) عدن	١٩ سنين	مهدى علي	٢٢
	تعبير معروف	٢٠ سنين	قاسم طه ها	٣

The above example belongs to a 17-year old Yemeni, born in Britain. It is clear that he started at first by a L-R orientation but later on corrected himself. A linguistic study of his translation reveals that his competence in Arabic is less than average for a 6th-year primary pupil (average age 13+). He was not

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systematic in writing Arabic figures in Tel.,   P.O.B. in the right

order.   He got the former wrong and the latter right. The issue of

digital reversal is discussed at the end of the chapter.

The example below (also correct) was carried out by a 3rd-

year Leeds student:

رقم اسم	عمر	عنوان
١ موسى السيد	٢١ ت ـ	٠١-٣٨٢٤٥ لندن
٢ محمد علي	١٩	ص ب ٧٠٣ أدن
٣ غسم طها	٤٠	غير معروف

7, almost half, of the British kept the English layout of

the table:

عنوان	عمر	اسم	عدد
ص ط ٠١-٠٤٢٨٣٥	٧١ بسنوات	موسى احمد	١
ص.ب ٣.٧ عدن	١٩ بسنوات محمد	محمد غازي	٢
مجهول	٧٠ بسنوات غدرسم	طها	٣

Incidentally the above example, also by a 3rd-year student,

reveals the problem of figures reversed both for multi-digital

numbers: Tel, and P.O.B. and individual numbers: 2 and 3 in 21 and 30 in the age column.

Only 2 (16.665) of Y2 schoolboys produced reversed Arabic tables:

الرقم	الإسم	العمر	العنوان
١	موسى احمد	١٢ سنة	رقم التلفون ، ٤٥‹٢٨٧-١ه لندن
ح	محمد علي	١٩ سنة	ص.ب ٢.٧ ، عدن
٣	قاسم طلبة	٣٠ سنه	غير معروف

Contrary to expectations Y2 students were less vulnerable than Y1 who were, academically, a year ahead of them. It seems that the simpler table format given to Y1 without any particulars in the columns contributed to the failure of 3 of them in noticing their askew products. Some of the Y2 students who started with a L-R order corrected themselves when they started translating the particulars as seen in the example on p. 165 above.

The higher incidence of reversed tables among the British illustrates again their limited exposure to a wider range of Arabic materials. It was highly unlikely that Arabic tables constituted part of their experience, at least, to a level comparable to the Yemenis, who for sure had seen Arabic tables in some of their Arabic textbooks.

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The role of previous experience in seeing table formats in Arabic or English in the way the task was executed is supported by the lower, though significant, incidence of reversed English tables produced by category I (p.111 above). 12 (9.02%) out of the 133 kept the Arabic layout compared with 12 (34.2%) out of the 35 category II students. The likelihood for most or even all the first category students of, at least, seeing English tables in the two weeks of English instruction prior to the experiment, was very high.

Surely reversed tables, and all similar tasks, could not be solely attributed in all individual cases to the influence of the first or the more graphologically practised language, be it Arabic or English, which happened to be the source language. Certainly the source language, whether it is first, second, or foreign can create an immediate, but in most cases temporal, directional set. If such a set was not counteracted, it would prevail and produce a response in agreement to the directionality of the source language. The strength of such a set and its duration depends on many factors, mainly the individual's relative experience in either language or graphology and circumstantial factors such as stress, pressure, lack of time etc.

Unfortunately, in table translations, presented to both categories, the source language happened to be the first or main language used for graphological purposes. Luckily, pie charts translations (see below), different as they are from the table translation, offered a chance where the source langauge, in the

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version presented to the British and Y2 subjects, was Arabic
(assumed less graphologically practised) and the target was English.

A:6 <u>Pie charts-translation</u> (Cf. pr 113)

The 8 YI students were required to translate the following
pie charts into Arabic.   (They were provided with a compass to draw
the circles).

أرسم الأشكال الآتية مع ترجمتها إلى العربية :
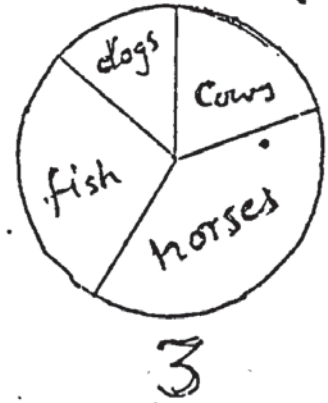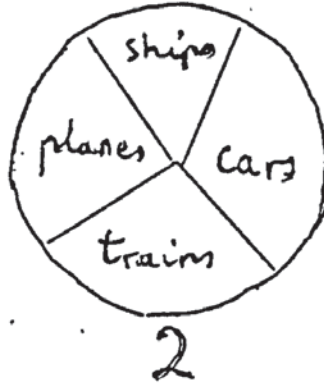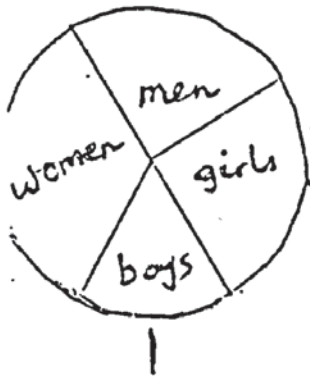
Only 2 (25%) of them managed to translate and order the charts as
required by Arabic:

75%, ie. the remaining 6 kept the source (English)
orientation:
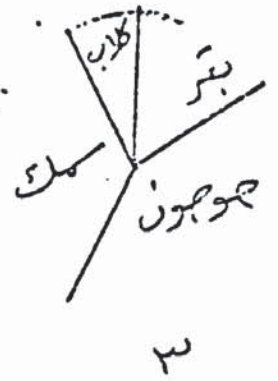
This higher adherence to the orientation of the more practised language, ie. English is comparable to that registered for category I in adopting Arabic directionality. 56%, ie. 75 out of the 133 (see p.144) kept the Arabic (source) layout.

The strong tendency to maintain the source order solely because it is the first or main language has already been questioned. As implied earlier, such a hypothesis could be tested by using the least graphologically known or practised language as the source. Instead of attributing the students' performance only to a least- versus most-used graphology dichotomy another dichotomy ought to be considered, ie. source versus target.

As indicated earlier, Y2 and Leeds (British) groups had a version of the pie charts in which translation was required from Arabic into English. In fact they had been given the same task given to category I:
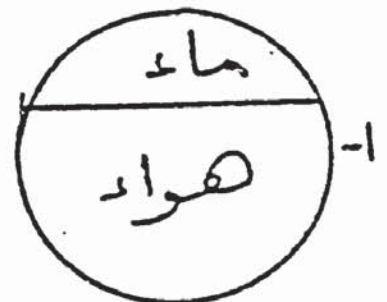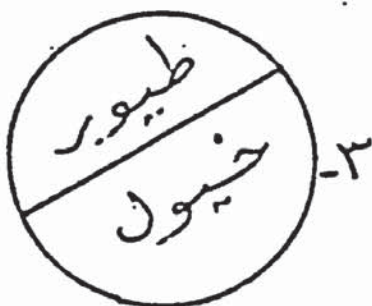
2) Study figures I—3 and translate into English in the circles provided in the space below.
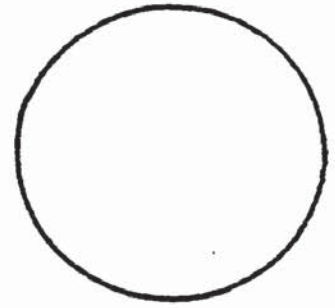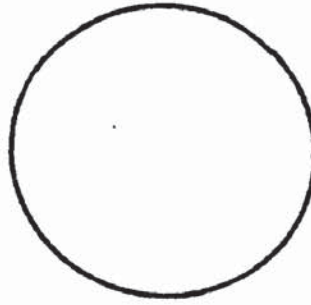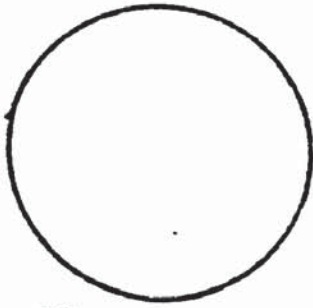
This had provided an opportunity to see how far the reversed products were or were not caused by the directional set immediately established by the source language. Contrary to expectations all of the 15 British and 11 of the 12 Y2 students translated each chart in the one below it:
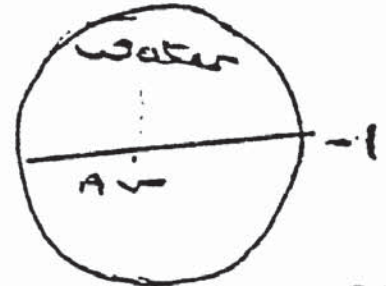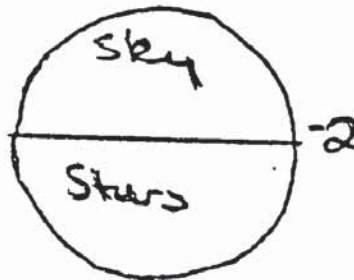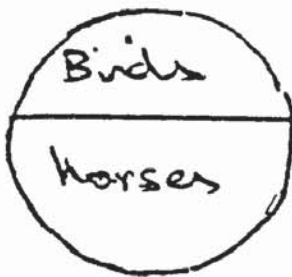
In the second example the participant changed the numbering order to suit English but at the expense of correct content translation. In the last example the participant might have deliberately avoided numbering to avoid either of two mistakes: writing "English" numbers from right to left or wrong translation if an Arabic order was adopted eg. Arabic No.1 would become English No.3 etc.

Though the high adherence or maintenance of the Arabic orientation can, in a way, be attributed to first or main system residual in this case (English is the first/main system) it still reveals graphological insensitivity to the requirement of the task. A highly developed graphological awareness is bound to reduce all directional practices irrespective of their cause: main system residue, failure to adapt to the language of instruction orientation, adherence to the source language order in format translation etc.

Table 24 below summarizes the results of part A for category II and compares them with those obtained for the same part by category I: (cf. Table 7, p.116).

TASKS	WRONG INSTANCES Category II								Category I	
	Y1 (8)		Y2 (12)		Leeds (15)		All			
	No	%	No	%	No	%	No	%	No	%
A.1 Horizontal Sequencing	00	00	00	00	1	6.66	1	2.85	3	2.25
A.2 Date	—	—	00	00	13	86.66	13	48.14	4	3.00
A.3 Time	—	—	—	—	05	33.33	05	33.33	0	0
A.4 Numbering	01	12.5	—	—	04	26.66	05	21.73	7	5.26
A.5 Tables	03	37.50	02	16.66	07	87.50	12	34.85	12	9.02
A.6 Pie charts	06	75.00	11	91.66	15	100.00	32	92.41	75	56.39
ALL Part A tasks	10	31.25	13	27.08	45	50.00	68	40.00	101	12.65

Table 24: Part A results: Category II

The overall wrong orientation of category II (40%) is more than 3 times that of category I (12.56%). This implies that the general influence of English graphology on category II is stronger than that of Arabic graphology on category I; or conversely the exerience of category II in Arabic graphology is far less than that of category I in English graphology.

Most of the students in the first category studied English for at least 6 years in general education. Many of them experienced it as the medium in higher education. This is why their general experience in English was longer and wider than that of the British students in Arabic who had studied Arabic for not more than 7 months for first year and 18 months (including vacation) for second year. This short experience in Arabic is very clear in the results of the

British students. Their orientation errors amounted to 50% as seen in the table. The middle position of the Yemenis is also reflected in their results: 31.25% for Yl nd 27.08% for Y2.

Theoretically Yl should have done better than Y2. The anomaly of their results may be partly attributed to the fact that (see the table) they shared only 3 tasks. Only one of these, A.1,was identical. The second, A.5, the table, was different. Yl had the simpler version. The source and target language in the third, A.6, were reversed. The limited number of the tasks and the small number of the groups might have also been responsible for the discrepancies.

Similar discrepancies are found also in the results of the British subjects. The wrong orientation mean for 2nd and 3rd year (not in the table) is 44.44% and 53.70% respectively. The 6 2nd year students had committed less orientation errors than the 9 3rd year students who were ahead of them by one year in learning Arabic. Again the smallness of number might be partly responsible for the unrepresentative pattern especially in the case of the 2nd year. Circumstantial factors might have contributed as well. As evident incidentally in the time writing tasks, 2nd year students carried out the tasks in the morning, about 11:15, while 3rd year students were given the same tasks at about 3:15 p.m. Consequently the former approached the tasks at a time when they were at their best while the latter were confronted with it at the end of a busy day. Their attentiveness to the subtlety of the tasks was thus much reduced compared to the fresh start of the 2nd year. The same pattern in

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the behaviour of the two classes is repeated, with a much bigger difference, in Part B tasks which required more concentration and attention.

Unfortunately there was no chance of seeing whether the peculiar pattern in the results of the two Yemeni groups will be repeated in part B. Only Y1 subjects participated in that part.

As reiterated before the English equivalents of only 9 of the 15 part B tasks (p.130) had been presented to the 15 British and 8 Yl participants. Here they are:

$$\text{ترجم الآتي إلى اللغة العربية:-} \quad \textcircled{9}$$

$$1. \quad \angle 45° + \angle 55° = \angle 100°$$

$$2. \quad \sqrt{25} > \sqrt{16}$$

$$3. \quad 2H_2 + O_2 \longrightarrow 2H_2O \qquad \begin{array}{l} H = \text{بير} \\ O = ? \end{array}$$

The students were not required to answer any written questions prior to carrying out the tasks as was the case with U.K. subjects of category I. None of them was expected to have any knowledge, or practice in the use of Arabic chemical symbols. As far as the mathematical symbols are concerned, none of the British was expected to be more familiar and competent in mathematics in English than in Arabic.

For ease of comparison between the two categories the same coding of the corresponding sets of tasks used in the previous chapter, ie. for the first category, is employed here, the coding of course reflecting the tasks ranking in order of difficulty for category I:

Statement/set	Coding
No.3	B1—B3
No.2	B4—B6
No.1	B7—B9

As will be illustrated statistically the ranking order for category II is different from the above (also from the least to the most difficult):

Rank	Coding
1. (No.3)	B1—B3
2. (No.1)	B7—B9
3. (No.2)	b4—b6

This ranking is followed in the presentation and discussion the ranks that follows:

B1—B3: The chemical equation (cf. p.124.)

$$3. \quad 2H_2 + O_2 \longrightarrow 2H_2O \qquad H = \text{بير} \qquad O = \text{م}$$

For tasks B.1, the overall orientation, 11 and 5 British and Yemeni students respectively succeeded in producing Arabic orientation:

$$\text{٢هيد} + \text{١ه} \longrightarrow \text{٢هيد م}$$

$$\text{سهد + ١ه} \longrightarrow \text{٢سهد م.}$$

(The British students as seen in the first sample were consisistent in using the non-cursive forms of Arabic language 2, ٢ . The Yemenis, the second example, were familiar with the cursive form ٢. The former form is used only in printing throughout the Arab world. Its appearance in handwritten tasks is seen as rather "bookish". The latter form on the other hand is never used in print. There are two corresponding cursive and non-cursive forms for 3 as well. Respectively they are ٣ and ٣).

4 (26.66%) and 3 (37.5%) of the British and Yemeni participants maintained the L-R orientaiton of the source:

$$\Gamma \; \text{بدل} + \text{أ} \; \Rightarrow \; \Gamma \; \text{بدل} \; \text{أ} \quad -$$

$$\text{③} \; \text{ج بد} + \text{ل ج} = \text{ج بد ١}$$

The difference in the form of "2" clearly shows to which group each example belongs. In the second example, the subject had even kept the English number of the statement - (3).

All the subjects who maintained the English directionality also kept the English position of the numbers attached to the symbols: (B.2) and (B.3) as evident in the above examples. (For the correct positioning see the correct examples above).

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2, other than the 7 who reversed the overall directionality, had problems with the right placement of the numbers in spite of the correct general orientation:

$$\rho_{\daleth} \mathfrak{z}_{\tiny L} \daleth \Leftarrow \rho_{\tiny L} + \mathfrak{z} \mathfrak{z}_{\tiny L}$$

One (above example) who belonged to the Leeds 3rd year group had problems with the correct form of 2 as well. The other was also a British student but from the 2nd year.

Table 25 gives the details of the results in B.1-B.3 and compares them with those of category I (cf. table p. 125):

Tasks	L-R instances British (Leeds) 2nd year (6)		3rd year (9)		All (15)		Y1 (8)		ctg. (23)		R-L ctg.I (120)	
	No	%	No	%	No	%	No	%	No	%	No	%
B.1 overall L-R	0	0	4	44.44	4	26.66	3	7.5	7	30.43	8	6.66
B.2 ⳵⳵	1	16.66	5	55.55	6	40.00	3	37.5	9	39.13	0	0
B.3 ⳵	1	16.66	5	55.55	6	40.00	3	37.5	9	39.13	4	3.00
B.1-B.3 (Total of instances)	2	11.11	14	51.85	16	35.55	9	37.5	25	36.23	12	3.33
	(18)		(27)		(45)		(24)		(69)		(360)	

N.B.: Total of instances = No. of participants X 3 (No. of tasks)

Table 25: Results of B1-B3

The huge difference between the two categories (3.33% for the first and 36.23% for the second) clearly shows the advantage most category I students had by virtue of their familiarity with the Latin chemical symbols. 2nd years Leeds students (11.11%) showed a

significant directional commonsense and graphological awareness compared with 3rd years (51.85%)). As seen in part A, circumstantial factors might have been largely responsible for this odd pattern which as indicated earlier is repeated throughout. The Yemenis (37.5%) occupied a middle position between the two British groups which together achieved slightly better results (35.55%) than the Yemenis. The latter, most of them O level students (p.149, table 23) in spite of the relaxed atmosphere in which they executed the tasks (individually in the evening), showed far less discretion compared with 2nd year university students.

B.7--B.9: Geometrical statements (cf. p! 127)

1. $\angle 45° + \angle 55° = \angle 100°$

10 British and 5 Yemeni participants translated the statement correctly by arriving at the R-L overall orientation (B.7).

$\,^c\, \backslash\cdots\rangle = \,^\cdot oo\, \supset\, +\, ^o\xi o\, \supset\, -\backslash$

Many of the 15 who produced the required Arabic orientation succeeded as well in laterally reversing the angle symbols (B.8) and placing the degree sign on the top left of numbers (B.9) as evident in the above example.

5 British (all 3rd year) and 3 Yemeni students preserved the English orientation (B.7):

$\angle \xi o° + \angle oo° = \angle /\cdots°$

Subsequently they failed to do the necessary changes in the angle

symbol (B.8) and degree sign (B.9). The above example is a total
reversal in all respects.

   Some, in spite of their success in the overall orientation
had specific problems with B.8 and B.9:

$$\angle \; |_{\cdot\cdot} \; ^{\circ} = \angle oo^{\circ} + \{o^{\circ}\angle$$

$$\cdot\cdot| \angle = \triangle o < + \; o\epsilon\angle$$

   Both examples came from Leeds. In the second one the
student failed to put the degree sign. The example, incidentally,
reveals the aforementioned problem of multi-digital figures
reversal. 54 was meant for 45 and 001 for 100 (see p.   below).

   A summary of the results with comparison with category I
(p.129) is given by table 26.

Tasks	L-R Instances (British (Leeds)						Y1 (18)		ctg.II (23)		R-L ctg.I (123)	
	2nd year (6)		3rd year (9)		All (15)							
	No	%	No	%	No	%	No	%	No	%	No	%
B7 overall L-R	0	0	5	55.55	5	33.33	3	37.50	8	34.78	8	6.50
B8 $\angle$. ^{o}	2	33.33	6	66.66	8	53.33	3	37.50	11	47.82	20	16.26
B9 ...	2	33.33	8	88.88	10	66.66	2	25.00	12	52.17	39	31.70
B7—B9	4 (18)	22.22	19 (27)	70.37	23 (45)	51.11	8 (24)	33.33	31 (69)	44.92	67 (369)	18.15

Table 26: Results of B7–B9

   The adaptability of the first category to the requirements
of English instruction and graphology is far greater than that of

the second to the respective requirements of Arabic. Only 18.15% of the former failed to meet such requirements while 44.92% of the latter did so. The comparable competence of the Yemenis in either graphology is reflected in their middle position between the other Arabs and the British. The gap between the performance of the two British classes is still very wide.

B.4—B.6

$$2. \quad \sqrt{25} > \sqrt{16}$$

14 students out of the 23, 10 British and 4 Yemenis, produced the required basic orientation (B.4). Some of them made no mistakes in either the square root sign (B.5) or the "more than" symbol (B.6) as in the example below:

$$\overline{\neg \overline{\lor}} < \overline{\overline{\varsigma} \circ \lor} - \varsigma$$

The remaining 9, 5 British and 4 Yemenis, maintained the English layout (B.4):

$$\sqrt{\Gamma \circ} > \sqrt{\mid \daleth}$$

All the 9 failed in adapting the form and position of the square root (B.5). Their maintenance of the orientation of the 'more/less' than sign did not affect the correctness of the content of the message: The above example, read in either language is correct. In Arabic it reads "the square root of 16 is less than the square root of 25". The content of the original message is maintained although the topical emphasis is shifted from 25 to

16. In the following example although the participant started correctly by Arabic 25, and adapted the square root symbol to Arabic orientation, he produced a wrong message in either language.

$$\widehat{\smash{\text{\textbackslash}\daleth\sqrt{}}} \;\; > \;\; \widehat{co\sqrt{}-\varsigma}$$

The 'more/less than' sign should always face the bigger numeber by its open end and the smaller number by the pointed end irrespective of the graphological orientation. The form and position of the square root symbol does not affect the content of the message:

$$\sqrt{1\pi} < \sqrt{\Gamma 0}$$

The L-R square root symbol in the above R-L (Arabic) statement renders the text very odd from a visual point of view but the linguistic message is not affected.

The results of B4-B6 are given in table 27 below with the usual comparison with category I:

Tasks	L-R Instances British (Leeds)			YI (8)		ctg.II (23)		R-L ctg.II (124)	
	2nd year (6)		3rd year (9)	All (15)					
	No.	%	No. %	No. %	No.	%	No.	%	No. %
B.4 overall L-R	1	16.16	4 44.44	5 33.33	4	50	9	39.13	12 9.67
B.5 √¯¯	4	66.66	6 66.66	10 66.66	5	50	14	60.86	29 23.38
B.6 >	2	33.33	4 44.44	6 40.00	4	50	10	43.47	16 12.90
B4-B6	7 (18)	38.88	14 51.85 (27)	21 46.66 (45)	12 (24)	50	33 (69)	47.82	57 15.32 (372)

Table 27: Results of B4-B6

The overall pattern does not differ very much from the previous results. The gap between the two British groups has substantially narrowed. B5 proved to be the most problematic task.

Strictly speaking the graphological influence of the source/main language in B4-B6 could be substantially reduced if B.6 (more/less than sign) instances not affecting the correctness of translation were excluded. Only one incident affecting the content was registered (presented and discussed, p.183 above). No similar incident was observed in category I. The inclusion of B.6 in practices imposed by maintaining the source order is also affecting the overall results of part B as they appear in the following table summarizing B1-B9 results for category II and comparing them with those of category I:

	L-R Instances					R-L
	The British (Leeds)			Y1 [24]	Ctg.II [69]	Ctg.I [380-372]
	2nd year [18]	3rd year [27]	All [45]			
	No %	No %	No %	No %	No %	
B1-B3	2 11.11	14 51.85	16 35.55	4 37.56	25 36.23	12 3.33
B7-B9	4 22.22	19 70.37	23 51.11	8 33.33	31 44.92	67 18.15
B4-B6	7 38.88	14 51.85	21 46.66	12 50.00	33 47.82	57 15.32
B1-B9	13 24.07 (54)	47 58.02 (81)	60 44.44 (135)	29 40.27 (72)	89 42.99 (207)	136 14.53 (1101)

Table 28: Results of Part B

N.B.:

1. The figures in the [   ] square brackets denote the total of

instances attempted by each class/ethnic group/category in each set
of tasks (No. of participants X 3 ie. number of tasks per set):

2. The figures in the round ( ) brackets indicate the total of
incidents attempted by each class/ethnic group/category in the three
sets of tasks. (Previous figure X 3).

By combining the results of both parts the relative
positions obtained for category II groups in part B prevail over
those obtained in part A. In the combined results (see table below)
and those of part B (above table) the three groups ranked as
follows: 2nd year, Y1 and 3rd year. The overall results in both
parts are also compared with those of the first category for the same
15 common tasks (cf. table on p.145 above):

	Part A		Part B		All parts	
	No.	%	No.	%	No.	%
U.K.	58	16.38	97	22.29	155	19.64
Kh.	43	9.68	39	5.58	82	7.38
Ctg.I (transferred below)	101	12.65	136	14.53	237	12.48
2nd year	16	44.44	13	24.07	29	32.22
3rd year	29	53.70	47	58.02	76	56.29
All British	45	50.00	60	44.44	105	46.66
Y1	10	31.25	29	40.27	39	37.50
Y2	13	27.08	—	—	13	27.08
All Yemenis	23	28.75	29	40.27	49	32.23
Ctg.II	68	40.00	89	42.99	154	40.89
Ctg.I	101	12.65	136	14.53	237	12.48

Table 29: Overall results of common tasks for both categories.

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The means obtained for each group or category indicates its respective competence and experience in either graphology. Category I students were far better acquainted and responsive to English graphology than category II students to Arabic graphology. In spite of the far smaller level of Arabic graphological practices (12.48%) compared to that of similar English practices (40.89%) such a level is high and significant enough to pose a real problem at the start of an English-medium education. The full implication of the results will be discussed later in a more coherent manner in the last chapter after integrating the specific implication of the video component of the study which can be viewed at the end of this chapter.

But before closing this chapter which also ends the non-video experimental side, a particular problem peculiar to category II students needs to be highlighted.

Numbers Reversal

As seen in some of the examples including number translation, many of the students had problems with Arabic language numbers. They tended to mix them with the European Arabic numerals. Sometimes they failed to differentiate them. These are some of the examples:

Some wrote O for Arabic language zero (.)

Some wrote 3 for Arabic language 4 (٤)

Some wrote • for Arabic language 5 (٥)

Some wrote ٢ and ٣ for Arabic language 2 and 3 (ك,ط)

The reversal of multi-digital figures was also a common problem as seen in the translation of the table: telephones and P.O.B. numbers (p.166 above).

There are more examples (3rd year Leeds students):

$$° \cdot \cdot / \lrcorner = ° 00 \lrcorner + ° \varepsilon \text{о} \lrcorner$$

$$\overline{\text{٦١}\backslash} < \overline{\text{о٢}\backslash}$$

Arabic language 45, 100, 25 and 16 are reversed and so appear as 54, 001, 52 and 61.

The problems of numbers reversal was more common among the British and the younger Yemenis (Y2). Interestingly in spite of the gap between the two British classes in the results considered so far and the often stressed better performance of 2nd year students, 3rd year students committed slightly less mistakes in number reversals than 2nd years. This could be attributed to their better linguistic competence in Arabic. Their less than expected performance in the other tasks might as well be partly attributed to the non- or semi-linguistic natures of the tasks besides the already suggested circumstantial factor.

The explanation of multidigital figures reversal as suggested earlier is that many beginners seem to over-generalize Arabic L-R order to where it does not apply. The pursuit of

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beginners learning any language to arrive at a system by generalization is a well-known phenomenon in linguistic development.

Algerians, Moroccans and Tunisians literate in Arabic, French and sometimes English and thus familiar with both orientation from an early age would not be expected to reverse Arabic figures or to mix the two versions of numerals in translating into Arabic. They are normally familiar with the European version of Arabic numerals which is common to the three languages. To test these assumptions the same set of tasks given to Y1 were carried out by 2 post-graduate Algerian students at Aston University. Consistently they used the only version of numerals they were familiar with and they made no mistakes in number writing as required by Arabic and Arabic discourse:

1st student:

As far as Arabic numerical expressions are concerned, there is no mistake in the above translation. The only mistake lies in the square root. The erasures indicate that the participant's arrival at the end product was neither automatic nor immediate.

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<u>2nd student:</u>

$$\text{١.} \quad \angle\, 100° = \angle\, 55° + \angle\, 45°.$$

$$\text{2.} \quad \overline{16V} < \overline{25V}$$

$$\text{3.} \quad \int_2 ـبـ 2 \longleftarrow {}_2\int + {}_2 ـبـ 2$$

The above translations are correct in all aspects except for the wrong L-entry for numbering. The student did, in fact, start by choosing the left side of the paper and wrote the numbers accordingly. However later on he discovered his mistake when he came to the actual translation which he carried out correctly. The choice of the left or right side in accordance to the language of instruction is also sometimes affected by the first acquired graphology as will be seen in the video section.

[The video tape may be seen now]

CHAPTER SIX

Implications for Teacher Training with Specific Reference to the Video Medium

General:

This final chapter stresses the pedagogical implications of the study. The first section reiterates the rationale behind the structure and function of the video film. The second section, critically, expands on some of the orientation-related phenomena in Arabic technical textbooks outlined in Chapter Two. These books constitute, as far as orientation is concerned, part of the students entry behaviour when they join English-medium education following an Arabic one.

The final section after summarizing the graphological transition problems as related to students, tasks, teaching materials and teachers, gives an outline of a remedial and informative approach to deal with the problems right at the start of an English-medium education.

The Video Film

The excerpts making the 60-minute video film have been carefully selected from about 6 hours of recording. It is hoped that the film has satisfactorily summarized and illustrated the graphological phenomena under consideration both as a process and an end product. Moreover, the film is meant also to establish the video as the ideal medium not only for identifying but solving graphological orientation problems encountered at the earliest stages of a transition from Arabic-medium to English-medium education and vice-versa.

as all those who participated in the study are bilingual in Arabic and English and were instructed in the language they were supposed to know less particularly as far as literacy was concerned. The tasks with few exceptions are similar or identical to the ones met before in the non-video experimental side. The non-standard temporal processes described verbally before have been materialized here.

About 42 minutes, over 70%, of the film has been devoted to graphological practices of Arab students, particularly the Kuwaiti non-graduates. The concentration on Arab students, especially the non-graduates, reflects the stated emphasis of the study as evident in the title: The Graphological Orientation of Arabic and English and its Implication. for English-medium education. The transition to English-medium education in most Arab countries normally takes place at post-secondary or tertiary levels.

The psychomotor difficulties beginners encounter in learning and adopting a different system using different graphological units, let alone an opposing directionality to the firstly acquired, have been clearly demonstrated by the English subjects. Incidentally, the film has shown interesting phenomena relating to linguistic development and competence in general, eg. spelling, case mixing etc. These of course, though important in their own right, are not directly or strongly linked to graphological orientation and so are not discussed at length in the study.

<u>L-R Features in Arabic Discourse</u>:

Arabic technical textbooks in current use in secondary and tertiary education where Arabic is the only or main medium contain, as pointed out in Chapter Two, a great deal of basically L-R subtexts. In most cases, as seen in chemical symbols and graph layout, these L-R conventions are gaining acceptability and progressively becomming part of Arabic technical discourse. Students with limited previous access to such L-R forms and formats as evident in the Khartoum Engineering group face lesser problems as far as orientation is concerned, when they come to learn exclusively through the medium of English.

In Syria for example, where Arabic is used in teaching all subjects up to post-graduate levels, European technical symbols, formulae and laws are maintained in all Arabic technical texts in post-secondary education. It is assumed that the accommodation of such restricted and internationally accepted specialized codes in Arabic technical discourse will facilitate access to work done in European languages (namely English and French) known to the students.

Both examples on page 193 come from Syrian University texts. The first is taken from a book on the principle of Chemical

عبد الحليم منصور ونذير نزير قون (١٩٧٠)
مبادئ التوازن الكيميائي في "سوريا"

وباستعمال المعادلة 10.10 نحصل على :

$$RT \ln \frac{1000}{M_0} = \mu^* - \mu^{**} \qquad 10.19$$

تعين هذه المعادلة العلاقة بين μ^* و μ^{**} . وبما أن هاتين الكميتين مستقلتان عن التكوين ، فإن الفرق بينهما المعطى بالعلاقة 10.19 له تماماً القيمة العددية ذاتها المعطاة بالمعادلة 10.18 . لذلك نحصل من هاتين المعادلتين على :

$$RT \ln \frac{\gamma''' m}{\gamma'' x} = RT \ln \frac{1000}{M_0}$$

$$\frac{\gamma'''}{\gamma''} = \frac{1000 \, x}{M_0 \, m} \qquad 10.20$$

تعين هذه المعادلة العلاقة بين γ''' و γ'' لمحلول غير ممدد بالضرورة . وتمثل المعادلة 10.9 العلاقة العامة بين x و m حيث يمكن أن نستنتج من هذه المعادلة والمعادلة 10.20 أن γ''' لا تساوي γ'' إلا في حالة المحلول الممدد جداً . وهكذا بالرغم

فخري كتكوت (١٩٧٦/٧٥) : الميكانيك النظري في "سوريا"

$$X = X' + Vt$$
$$Y = Y' \qquad (3-1)$$
$$Z = Z'$$

حيث أن : 0

$$\vec{F_\rho} = \frac{d}{dt} \vec{P_\rho} = \frac{d}{dt} (m_\rho \vec{r_\rho}) \qquad (4-1)$$

حيث : $\rho = 1, 2, 3 \cdots \cdots N$

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equilibrium; the second is from a handwritten book on physical mechanics prepared by the subject's teacher. In both examples as in the whole text, all the technical formulae and equations are given in European symbols including Arabic numerals (A.N.) in which the successive equations are numbered. In the first source the numbering is always on the right, eg. 10.19. However in the second source there is no consistency in numbering the equation in either Arabic or English or in using the side compatible with language of discourse or numerals used, ie. A.N. or A.L.N. Paging is from right to left in both sources as required by Arabic but it is in A.N. in the second source.

Similar discrepancies and inconsistencies do occasionally occur in Arabic sources throughout the Arab World. The three examples on p.195 come from an Egyptian college book on physical metallurgy in which only A.N. are used for paging, diagram numbering etc. In the first example the two figures are labelled and referred to in the text in a R-L order. However Arabic ‎ا‎ and ‎ب‎ are used instead of A and B. The other two examples are tables. The first can make sense only if read from left-to-right although it is labelled in Arabic. This could be a result of automatic translation. On the other hand the other table although largely in A.N. is meant to be processed from right to left as required by Arabic. It is interesting to notice that both Arabic (or French) and English decimal points are used interchangeably in many places in the book. This is very clear in the second table (The bottom figures in the first and sixth columns from the right).

وتعتبر عازلا لكون حزم طاقاته مشغولة كلها بالالكترونات ولا يوجد فيها
مستويات خالية لترتفع اليها الالكترونات عند تطبيق الجهد الكهربى .
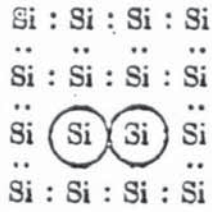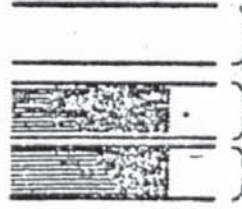
ولكن باضــافة آثار ضـئيلة
جدا من الفوسفور أو الانتيمون
أو الزرنيخ (يذوب كل منها
بالازاحة مع السيليكون) .
ومن المعروف أن سعة الفوسفور
هو خمسة الكترونات فى مداره
الخارجى بينما السيليكون ٤
أنظر شكل (1a — 230)
(1b — 230) فالالكترون الزائد
فى الفسفور (فائض الكترونى)

Si : Si : Si : Si

Si : Si : Si : Si

Si (Si)(Si) Si

Si : Si : Si : Si

- ٢ -

سيكترونى نقى
(راكتغاز والكترونى)

شكل (1 — 230)   شكل (1b — 230)   (1 — 230)

وشكل (1 — 177) يوضع رسما تخطيطيا لطبيعة الكسر بالتعب حسب
طبيعة الاجهادات المتكررة الموضحة . وشكل (1 — 178) يعطى مثالا لمقطع
كسر بالتعب فى محور والذى يتصف بشكل خطوط منحنية متحدة المركز
Shore marks

نوع الجهد	الجهد الاساسى مرتفع		الجهد الاساسى منخفض	
	بدون هزة	بهزة	بدون هزة	بهزة
شد				
انحناء من جهة واحدة				

F (N) = X . D²(mm)						قوة الضغط (نيوتن)	قطر الكرة Dmm
5 D²	12,5 D²	25 D²	50 D²	100 D²	300 D²		
500	1250	2500	5000	10000	30000		10
125	312	625	1250	2500	7500		5
31	78,1	156	312	625	1875		2.5

195

The rest of the examples, page 197 come from two biological sources, the first an American College zoology book translated into Arabic for use in Egyptian universities. The other three are taken from a Sudanese secondary biology book. In the zoology book the translators have largely kept the original figures as they are as indicated by the maintenance of English orientation apparent in labelling the creatures using A, B, C etc. In the text they have been referred to in the same order but by using Arabic labels, أ, ب, ج etc. Throughout the whole book pages and figures are numbered in A.L.N.

The first example from the Sudanese biology book figure 49 (in Arabic) shows the position of cilia on different kinds of bacteria. The different kinds are ordered from right-to-left as indicated by A.L.N. On the same page and just under them, figure 50, other kinds of bacteria are illustrated but not numbered. However the reference made to them in the text is from left-to-right. The final example comes from a different place in the book; it shows sexual reproduction in yeast. The different phases of the process are ordered and numbered from left-to-right as is the case in any European source. In fact all diagrammatic representations of natural processes or transformations proceed from left-to-right, eg. preparation of oxygen, distillation etc. These as many other L-R features are bound to make L-R directionality more acceptable in technical Arabic discourse and train the students in its use when they come to learn exclusively through English or French as mentioned before. The orientation inconsistencies referred to in the examples indicate that translators, editors and textbook writers
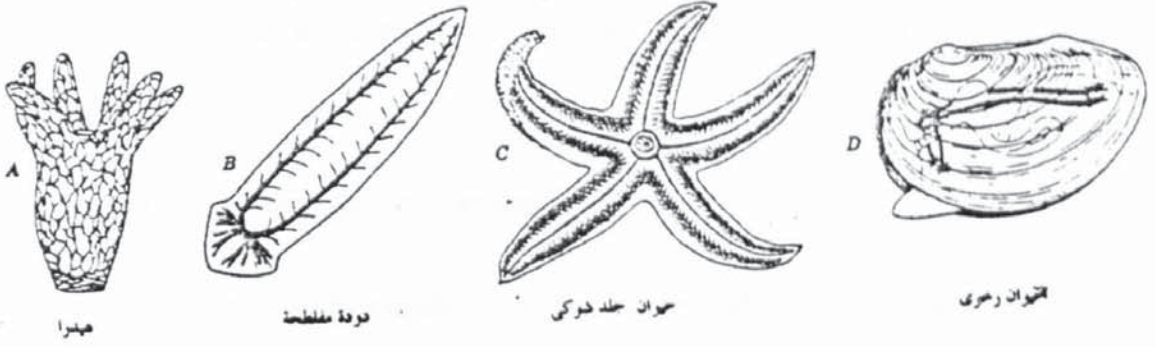
شكل ٩ - ١ : الأجهزة العصبية فى الحيوانات (أسود داكن) . (أ) حيوان هيدرى ، شبكة عصبية خلال الجسم . (ب) دودة مفلطحة ، عقد عصبية فى منطقة ، الرأس ، ، حبلان عصبيان . (جـ) حيوان جلد شوكى حلقة عصبية حول الفم ، عصب وسطى فى كل ذراع . (د) حيوان رخوى ذو مصراعين ، ثلاثة أزواج من العقد والوصلات العصبية . (هـ) دودة حلقية ، ، مح ، من عقد عصبية فى الطرف الأمامى ، حبل عصبى بطنى مصمت

| ٤ | ٣ | ٢ | ١ |
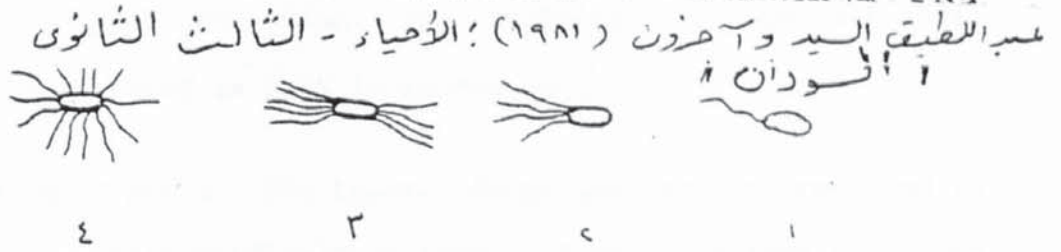
موضع الأسواط فى الخلية البكتيرية
شكل (٤٩)

كروية   عضوية   لولبية

طرق انتظام الخلايا البكتيرية
شكل (٥٠)

| ١ | ٢ | ٣ |

| ٤ | ٥ | ٦ | ٧ |

197
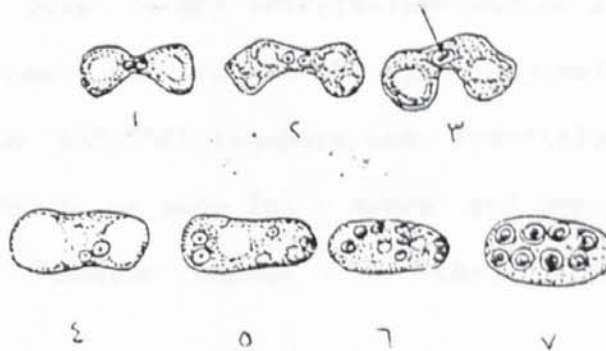
do need to pay more attention to the implications of graphological orientation.

The Design of an Orientation Package

Although the experimental side of the study has established that graphological adaptation generally poses problems to a level which cannot be ignored, not all the subjects necessarily share the problems equally. Individual or group differences may be attributed to various past experiences and different expectations. These, as seen, include past education, eg. technical or non-technical, knowledge and training in both languages etc.

Similarly not all the tasks, forms and formats presented to subjects are equally difficult or easy. They range from the very obvious to the very subtle and from those which may affect only correctness of the content to those which only appear visually or organizationally incompatible to the orientation of language of discourse.

The lack of full appreciation of the implications of graphological differences has been pointed out in the previous section in the context of Arabic discourse. ESP/TEFL materials at intermediate and advanced levels as mentioned in the first chapter do not address or point to any orientation-related matters. It can be assumed on reasonable grounds that the responsibility of this neglect rests on ESP/TEFL teachers and practitioners and their trainers. They are to be made fully aware and appreciative of the implications of medium change to their students. They,

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complacently, believe that once the basic mechanics of literacy and numeracy of English are taught, uncertainties about orientation can be removed once and for all. The later occasional occurrences of R-L practices as shown in the study proves that not to be the case. Insufficient practice in English graphology is largely responsible as well as the novelty of many orientation-specific forms. Errors in punctuation for example are more likely to arise from a lack of enough practice rather than ignorance of them as seen in Category I. The incorrect positioning of mathematical signs by many Category II students (video - Leeds) is an example of something yet to be learned.

As suggested earlier, the full recognition of the phenomena should start during teacher craining. Video excerpts of the type used in this study can be used to stimulate discussion about observing or prompting similar situations in the classroom. Ideally the video can also be used in the classroom to draw the students' attention to the kind of practices they are warned against. Teachers can work out their own designs and video record some of their own students if they can afford the time and find the recording facilities. Otherwise they can use previously prepared recordings to prompt interest, create and promote a higher awareness. However the lack of video facilities should not discourage teachers from preparing exclusively non-video packages. Each package if it is video-based or not, has to contain a practical part which requires the students' involvement in actual writing tasks using pen and paper. Ideally these must be related to the students' actual needs. The orientation package can also include an

information   list or sheet of the most important forms and   formats
affected by graphological orientation.   In other words, the package
can be remedial as well as informative.   Moreover it need not   be
long but it must be presented in ESP/TEFL class in the first days of
the students' arrival to the English-medium institute.   It also
could be part of a comprehensive orientation or induction   programme
for newcomers if such a programme is run in the institute.

The study has clearly concentrated on the implications of
graphological orientation   in   the   educational . context   and
particularly in relation to Arabic-speaking students using English
as medium for the first time.   The implication can of course be of
use to all users of R-L language, eg. Farsi, Urdu in similar
circumstances as well as teachers of these languages and Arabic to
speakers of L-R languages.

The implications do extend as well to bear on important
activities,   outside the classroom.   This includes the ever-
increasing use of many modern gadgets, eg. calculators, cash
dispensers which require an automatic L-entry and L-R dominance for
their successful operation.

APPENDIX I

1983 PRELIMINARY VIDEO STUDY

A. a) Write the name of your country in this box.
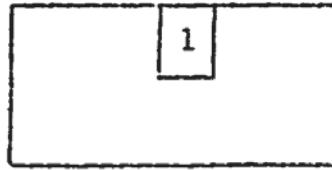
b) Draw six other boxes, three on each side of the paper, and number A, B, C, D, E and F.

(i)   In box A write your first language.
(ii)   In box B write your second language.
(iii)   In box C write the date of your arrival in the UK.
(iv)   In box D write your field of study, ie your course.
(v)   In box E write the length of your course.
(vi)   In box F write the length of your English course.

B. a) Join the similar points in order to obtain 8 boxes.
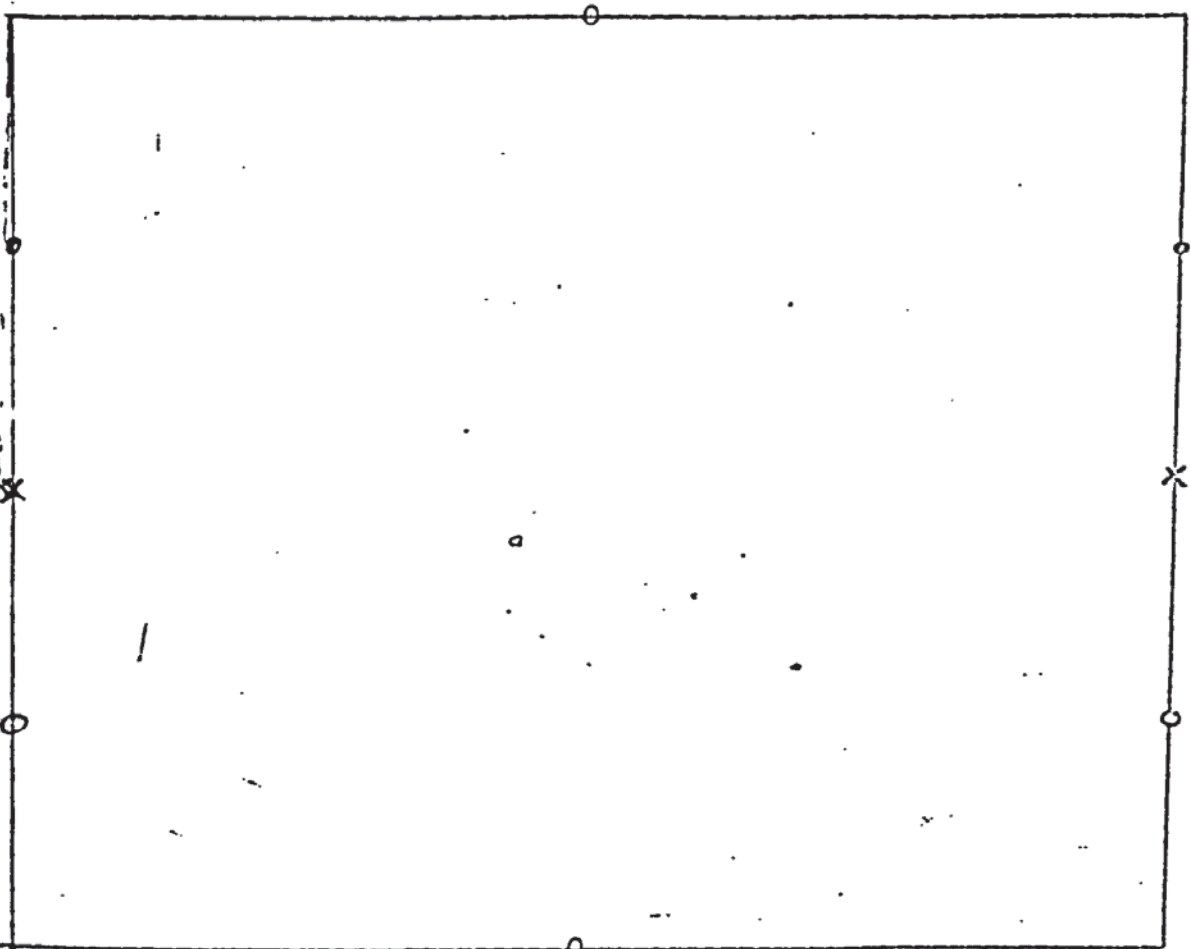
b) Number them 1-8; put the number of each box in its corner.

C. Here are the 12 months of the year mixed up:

October, March, December, July, April, February, November, August, January, May, September, June

a) Write them in chronological order ie 1-12, in the provided 12 boxes:

b) Now write them in alphabetical order on the sheet provided:

D. a) Each of the marks . below lies at the centre of a circle. A number of X's lie on the circumference of each circle. Join the X's in order to have 3 circles.
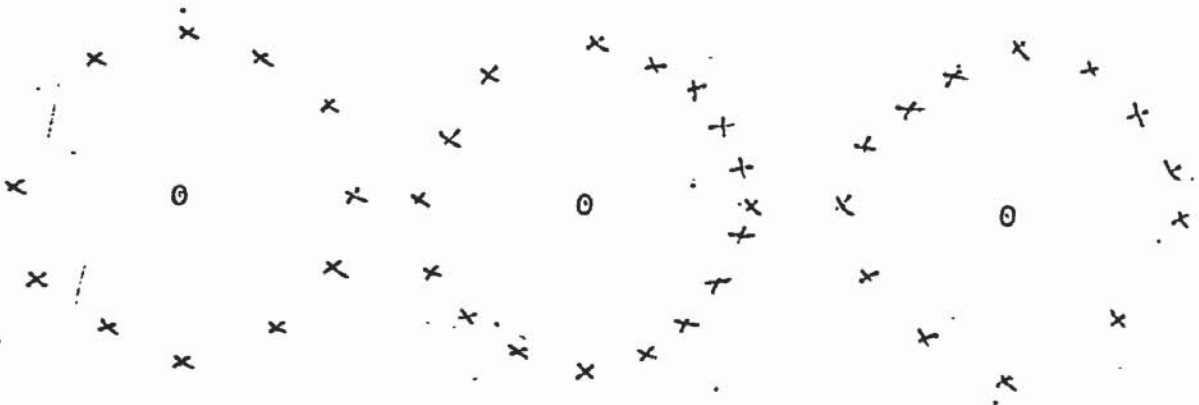
Label them A, B and C.

b) Draw three other circles in the space below and label them.

$$\text{(1)} \quad \frac{(\text{ص}^4 - \text{س})(\text{س}^4 + \text{ص})}{(\text{س} + \text{ص})\text{ن}} = ك \quad \left\{ \begin{array}{c} \text{٥ و١٤} \\ \hline \text{ص} \end{array} \right.$$

(٢) المثلث ١ ب جـ د (أدناه) متساوى الأضلاع ،
< جـ د ب قائمة (٩٠°) ، برهن أن ١ د = د ب.

204
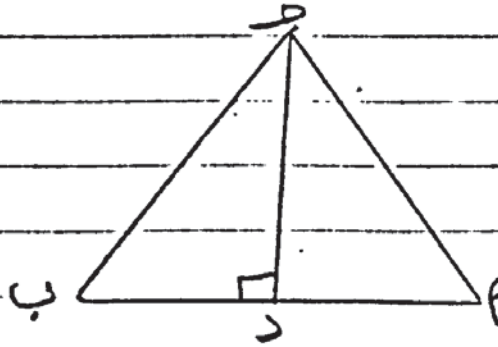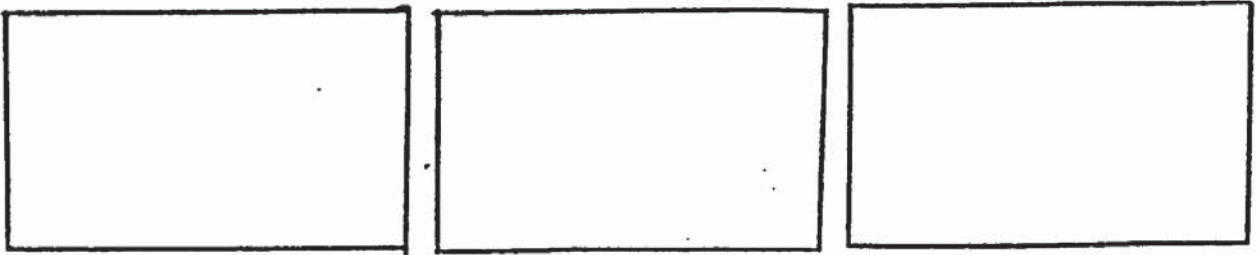
APPENDIX II

NON-VIDEO DESIGNS — CATEGORY I
U.K. AND KHARTOUM

<u>U.K. version</u>

I) a) In the first box write the name of your country and your age.

   b) In the second box write the date of your arrival in the U.K.

   c) In the third box write your field of study, ie. your course.

2) a) In the first circle write the date.

   b) In the second circle write the time.

   c) In the last circle write the name of this town, ie. ......
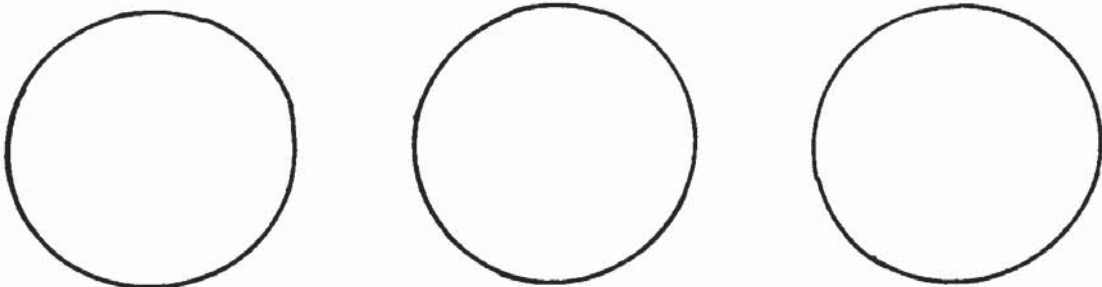
3) a) Join the similar points in order to obtain 6 boxes.
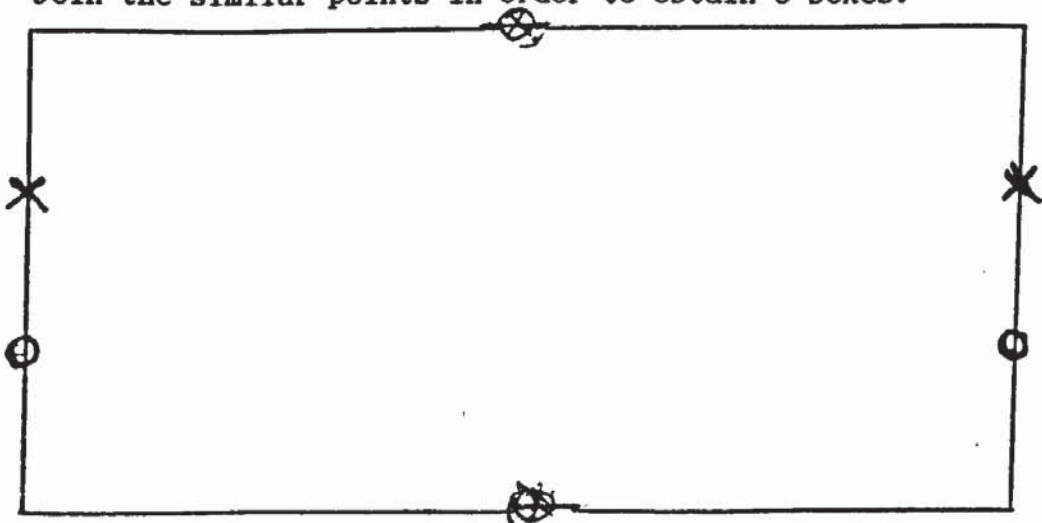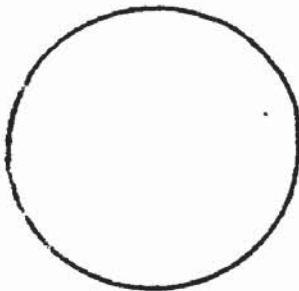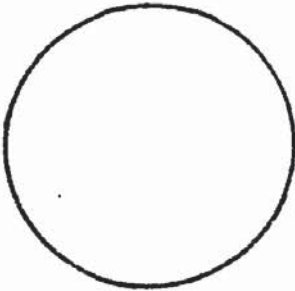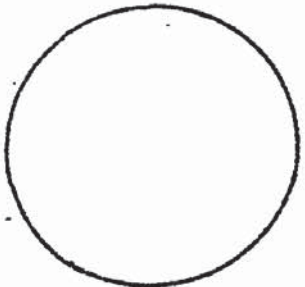
   b) Number them 1-6, put the number of each box in its corner.

Khartoum version

1) a) In the first box write your age and sex (Male/Female).

b) In the middle box write the name of your secondary school.

c) In the last box write your "boxing".

2) a) In the first circle write the date of today.

b) In the second circle write the time now.

c) In the last circle write the name of your faculty.

3) The following table contains 6 divisions. Number them 1-6. Put the number of each division in the corner.

رقم	الأسم	العمر	العنـوان
١	سالم مالك	اية سنة	ت - ٥٤٨٨ لندن
٢	كامل موسى	١٩ سنة	ص.ب. ٢٠٤ القاهرة
٣	هدى علي	٢٤ سنة	ص.ب. ٢٦ طرابلس/لبنان

1)   Translate the Arabic table into English in the provided space (complete the drawing).

2)   Study figures 1-3 and translate into English in the circles provided in the space below.

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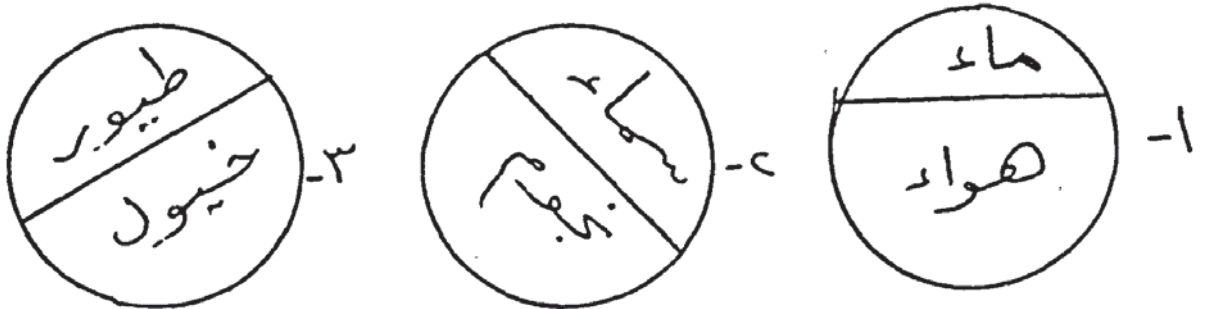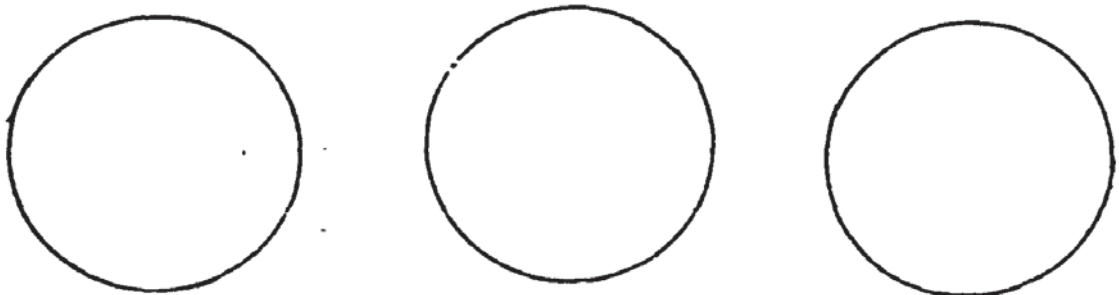
١ـ ما هي آخر مرحلة دراسيةٍ وصلتها ؟ بلادك ؟

٢ـ هل سبق لك أن درست الرياضيات أ والعلوم الطبيعيةأو غيرها بلغةٍ غيرِ العربية (كالأنجليزيـة أو الفرنسية) إذا كانت الأجابة " نعم " أذكر اللغة و المرحلة الدراسية.

٣ـ هل كل معرفةٍ بالرموز الكيميائية باللغة الأنجليزية أم العربية أم الأثنين معاً ؟

1) <u>Translate the following into English:</u>

١) ٤٥° + ٥٥° = ١٠٠°

٢) ٥٦ > ١٦

٣) متوسط ٢٠٪، ٢٠٪، ١٠٪ = ٥٥٪
∴ ٢٠٪ = ٥٠٪

٤) يد + م = يد (ماء) ملاحظة:
يد = H
م = O

Write the names of the objects shown in the pictures:-

1) ....   4) ....

2) ....   5) ....

3) ....6) ....

Common version:

تُرجم الآن إلى اللغة الإنجليزية (المطلوب الترجمة وليس الحل) .

$$1) \; ٥٤° + ٥٥° = ١٠٠°$$

$$2) \; ١٥٥ < ١٦١ .$$

$$3) \; متوسط ٢٠٪ ، ١٠٪ ، ٢٥٪ = ٥٥٪ ∴ ٣ ÷ ٥٥٪ = ٢٠٪$$

$$4) \; ٢م + أ ← ٢يد أ (ماء).$$

ملحوظة : متوسط = mean <u>أو</u> average

يد = H ، أ = O

2) Translate the two graphs below into English by completing the two provided diagrams.

(ب) (أ)

المسافة (كلم) — الزمن بالساعات

صفر ١ ٢ ٣ ٤ ٥ ٦ ٧   ٢٠ ٤٠ ٦٠ ٨٠

الدرجات الحرارة — الأحداث السيني

ص = -س

صفر ١ ٢ ٣ ٤ ٥ ٦ ٧

الحوصلة: س = x ، ص = y

الأحداث السيني = x axis
الأحداث الصادي = y axis
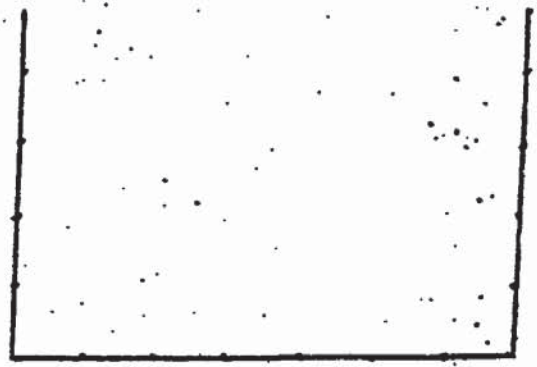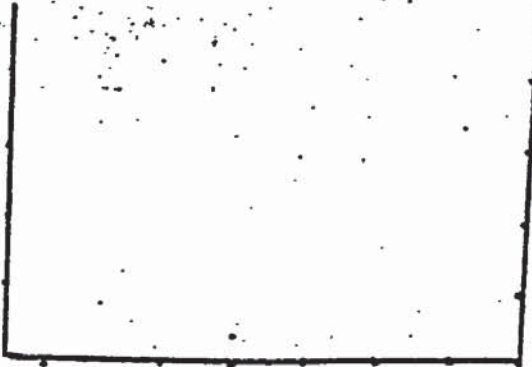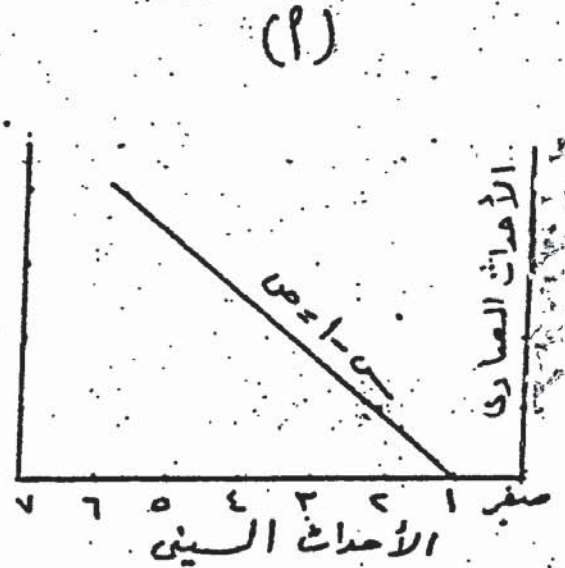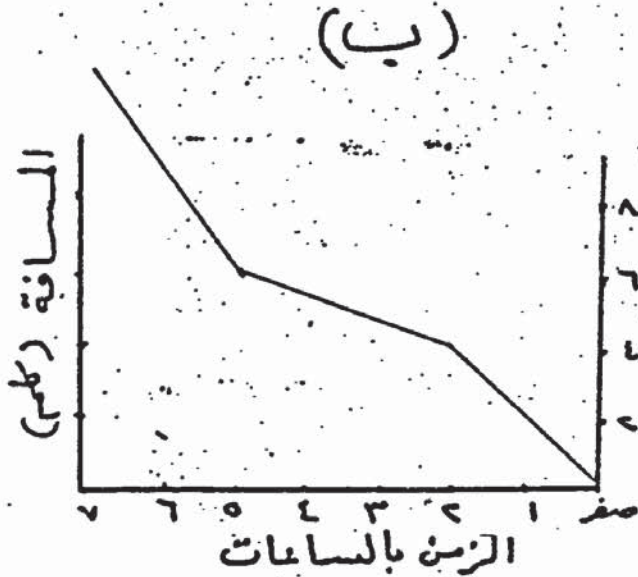
هام: إذا كانت لديك أي ملاحظات أو تعليقات على الرسومات البيانية أو غيرها أكتبها باللغة العربية (إن شئت) على ظاهر هذه الصفحة.

Khartoum only

APPENDIX III

NON-VIDEO DESIGNS — CATEGORY II
YEMENI AND LEEDS STUDENTS

١- فى المستطيل الأول أكتب : ' لغة عربية ـ السنة الثانية ، '

٢- فى المستطيل الثانى أكتب : ' قسم الدراسات السامية . '

٣- فى المستطيل الثالث أكتب ؛ ' جامعة ليدز ـ انجلترا . '

٤- فى الدائرة الأولى أكتب إسمك .

٥- فى الدائرة الثانية أكتب تاريخ اليوم .

٦- فى الدائرة الثالثة أكتب الزمن .

No.	Name	Age	Address
1	Musa Ahmed	21 years	Tel. 01-38245, London
2.	Mohd. Ali	19 years	P.O. Box 703, Aden
3.	Gasim Taha	30 years	Unknown

Table No. 1

اقرأ <u>Table No. 1</u> أعلاه وترجمه إلى اللغة العربية في المستطيل أدناه:
(وأكمل الرسم)

١-
ج-
٢-
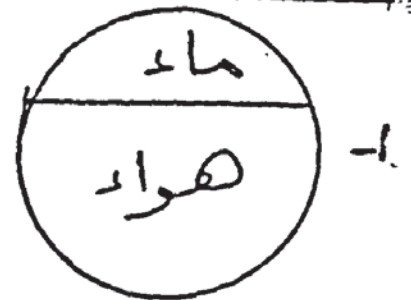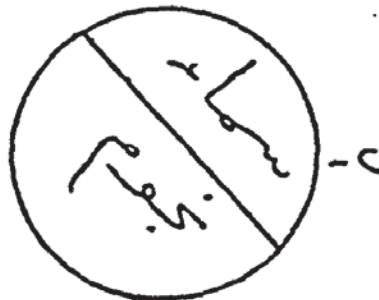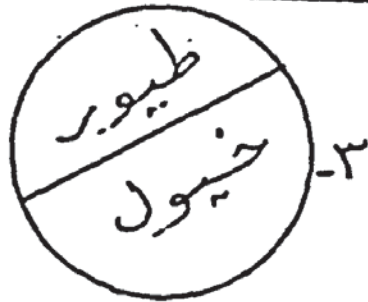
٨- أقرأ الأشكال ١—٣ وترجمها إلى الإنجليزية أدناه.
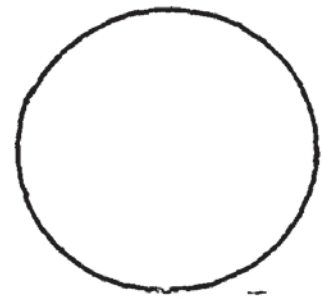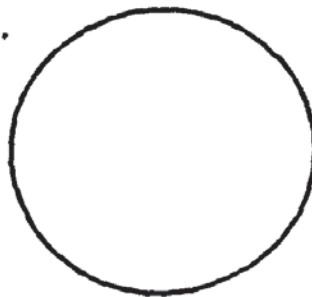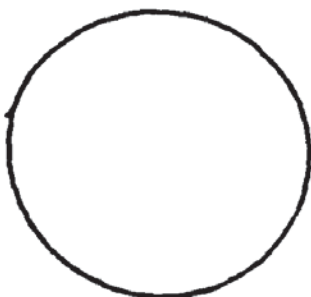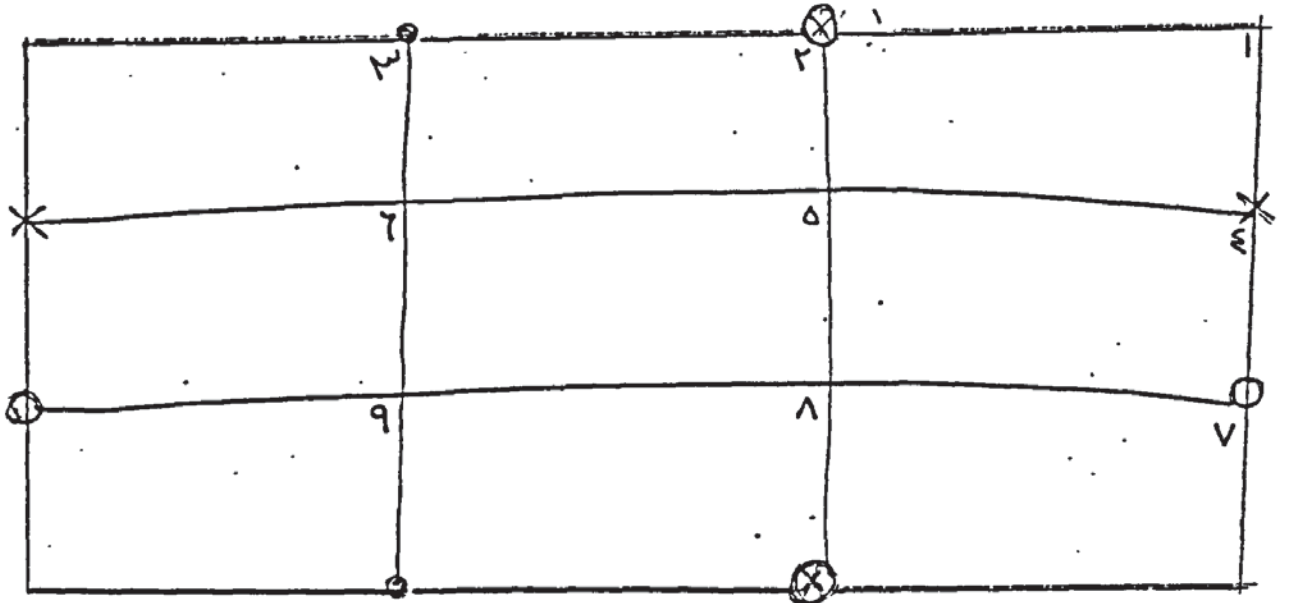
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④ وصّل النقاط المتشابهة في الشكل أدناه لتصل
على ٩ مستطيلات .

⑤ رقّم المستطيلات من ١ – ٩ ، ضع الأرقام في الأركان .

⑥ ترجم الآتى إلى اللغة العربية :-

1. $\angle 45° + \angle 55° = \angle 100°$

2. $\sqrt{25} > \sqrt{16}$

3. $2H_2 + O_2 \longrightarrow 2H_2O$ يبر = H
                                                          أ = O
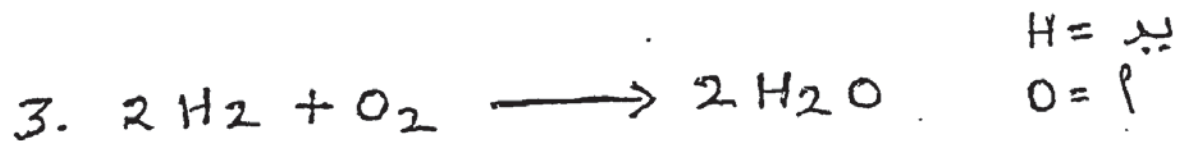
٢)أ) اكتب إسمك وعمرك في المربع (١) أدناه.
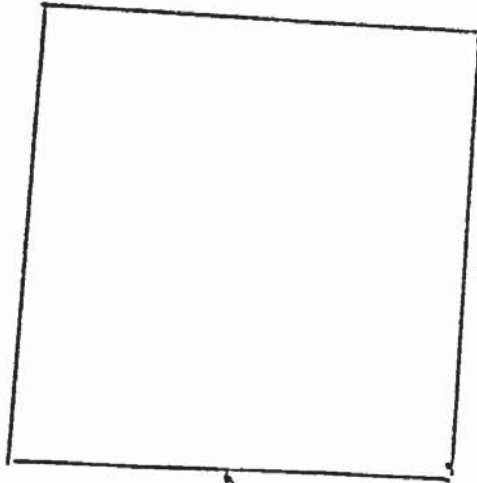
(١)

ب) أرسم ٤ مربعات أخرى ، ، على كل جانب.

ج) سمّها ب ، ج ، د ، هـ

١- في المربع (ب) أكتب مهنتك أو مهنة طالب/ عامل
٢- "   "   "   (ج) "   مدرستك الإنجليزية أوعنوان عملك
٣- "   "   "   (د) "   الصف الدراسي في المدرسة العربية
٤- "   "   "   (هـ) "   الصف الدراسي في المدرسة الإنجليزية

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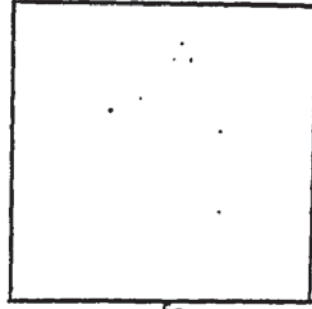
(أ)

١- في المربع (أ) أعلاه أكتب أسمك وعمرك .

سمّ المربعات التالية ب،ج،د ، هـ
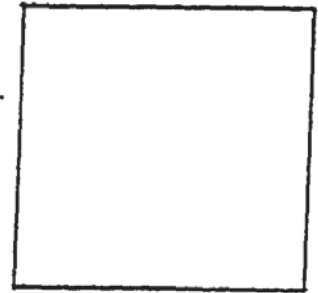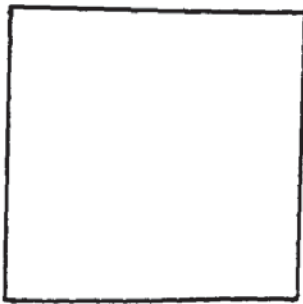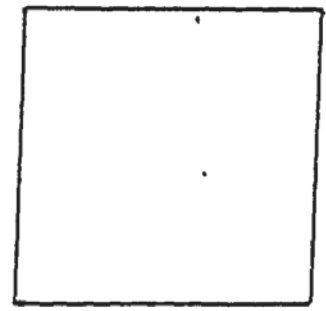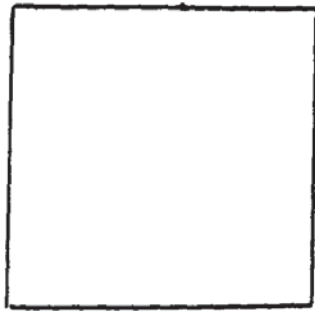
٣- في المربع (ب) ، أكتب الصف والمرحلة الدراسية بالمدرسة العربية .

٤- في المربع (جـ) أكتب باللغة الإنجليزية إسم المدرسة الصباحية التي تدرس فيها .

٥- في المربع (د) أكتب الصف الدراسي بالمدرسة الإنجليزية .

٦- في المربع (هـ) أكتب تاريخ اليوم بالأرقام (اليوم - الشهر السنة)

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أعِد رسم الجدول الآتٍ وترجمه إلى اللغة العربية.

No.	School	Teachers	Boys	Girls	Comments

أرسم الأشكال الآتية مع ترجمتها إلى العربية :

1 — men, girls, boys, women

2 — ships, cars, trains, planes

3 — dogs, Caos, horses, fish
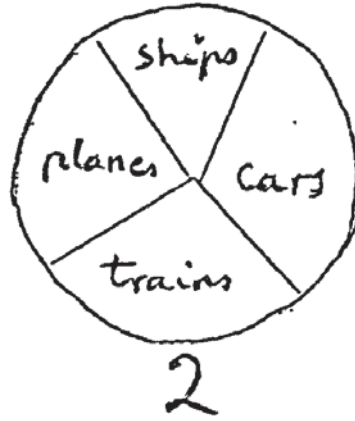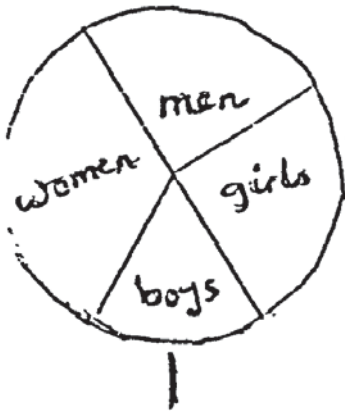
APPENDIX IV

VIDEO DESIGNS
KUWAITI AND LEEDS STUDENTS

(١)

جامعة ليدز ـ قسم اللغة العربية

الأسم : .... السَّنة

التاريخ : ....

١ ـ اكتب أسماء الأشياء الآتية باللغة العربية :ـ

- - - - - - -   - - - - - - -   - - - - - - -

٢ ـ ترجم إلى العربية :

B   S   0.371   −56

- - - - - - -   - - - - - - -

boy   9 > 8   man

- - - - - - -   - - - - - - -

٣ ـ انقل الآتي :

القاهرة   ليدز

لندن   لندن

- - - - - - -   - - - - - - -

1. (Wednesday)　　2. (5.12.1984)　　3. (3:30 p.m.)

٤- <u>تَرْجِم إلى اللغة العربية:</u>

( )　　( )　　( )
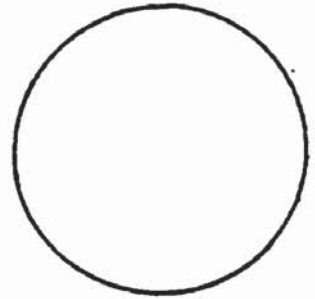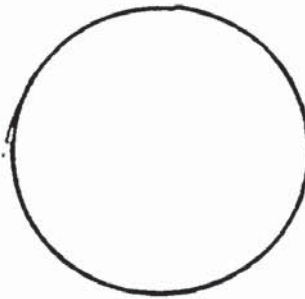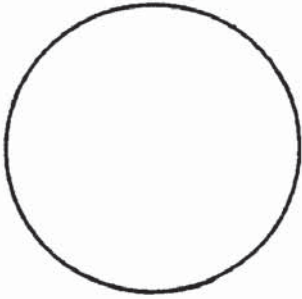
٥ - <u>أنقل الآتى فى الدوائر أدناه؟</u>
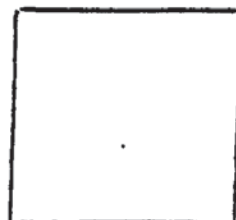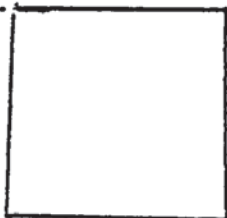
(نافذة)　　(شارع)　　(باب)
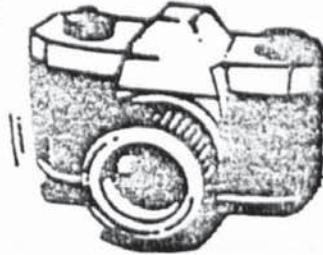
( )　　( )　　( )

221
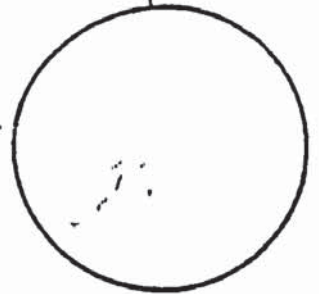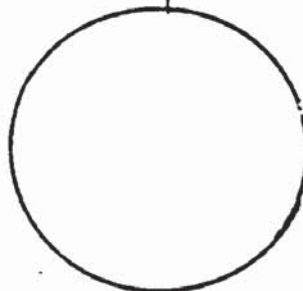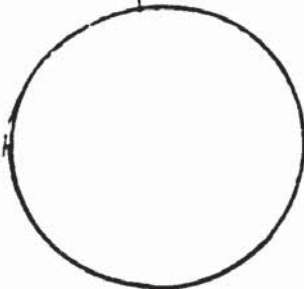
Kuwaiti video group:

A 1. Write the name of your country in the first box.

2. In the second box write the date.

3. In the last box write your first language.

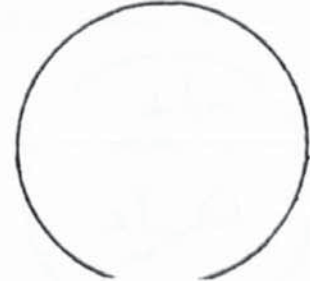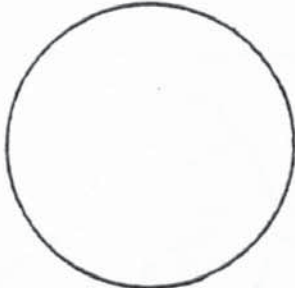B Join the two boxes below and name them A and B (write the names inside them).
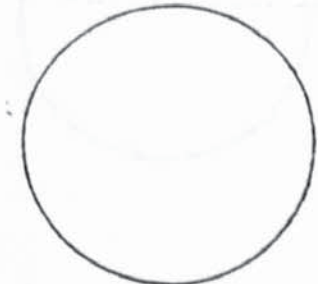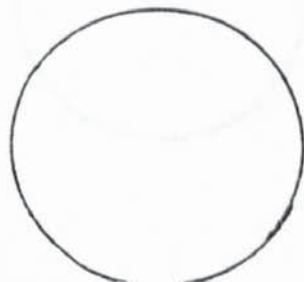
a) Translate into Arabic:

Books

numbers

pens

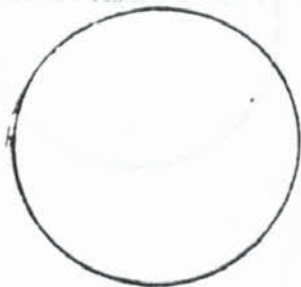b) Translate into English:

نافذة

شارع

باب

Kuwaiti video group:

رقم	الأسم	العمر	العنوان
١	سالم مالك	٤٥ سنة	ت. ٥٤٠-٨٨ لندن
٢	كامل موسى	١٩ سنة	ص.ب. ٢٠٤ القاهرة
٣	هدى علي	٤٢ سنة	ص.ب. ٤٦ طرابلس/البنان

1) Translate the Arabic table into English in the provided space (complete the drawing)

٣- طيور / حيوان

٢- سمك / نجوم

١- ماء / هواء

2) Study figures 1-3 and translate into English in the circles provided in the space below.

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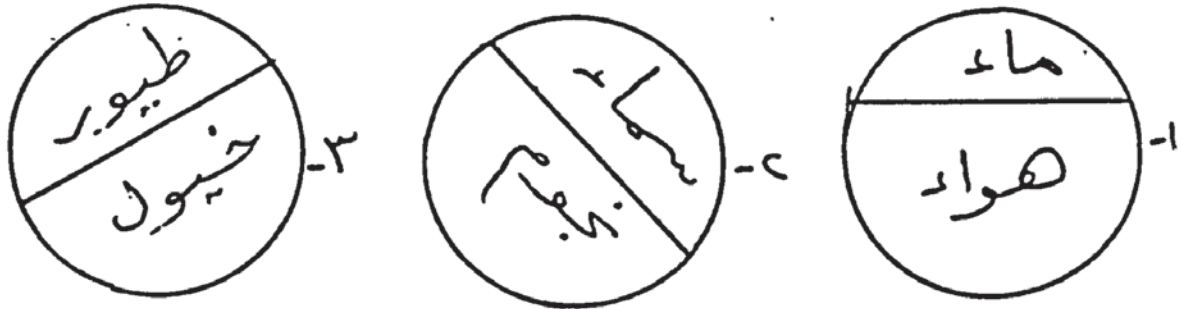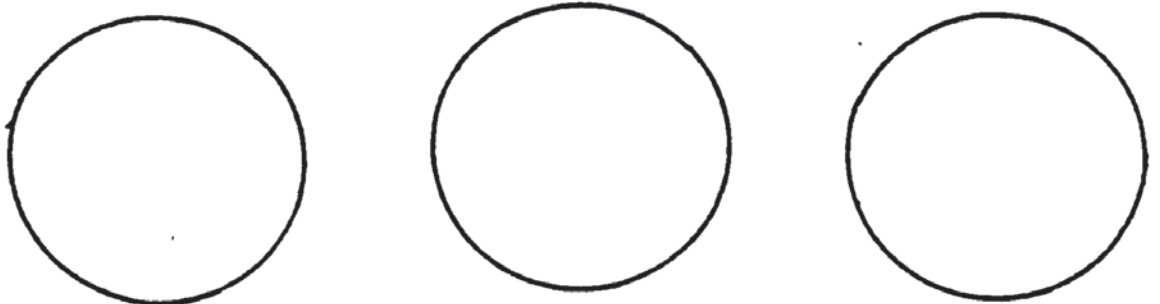
Kuwaiti video group:

A) Write the following in capital letters and underline them:

1) The United States   2) University of Aston

B) Write the following in small letters:

1) FINANCIAL   2) INSTITUTE

C) Translate into English

$$\varepsilon \pm = \overline{171} \, , \, \varepsilon \equiv \, ? \, \therefore \, \langle \sigma = \text{Ṣ}\sqrt{1..} \quad , \, 45^\circ \, - \, 1)$$

$$\text{r.} > \langle \sigma \, , \, 11 < 17 \, , \, .\text{و}\text{rvo} \, - \, 7)$$

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