Bangor University

DOCTOR OF PHILOSOPHY

# A pictographic method for teaching Greek spelling to dyslexic children

Mavrommati, Theodora D

*Award date:*
1999

*Awarding institution:*
University of Wales, Bangor

Link to publication

**General rights**
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

**Take down policy**
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 30. Jun. 2023

# A PICTOGRAPHIC METHOD FOR TEACHING GREEK SPELLING TO DYSLEXIC CHILDREN

*By*

*Theodora D. Mavrommati*

1999

I'W DDEFNYDDIO YN Y LLYFRGELL YN UNIG

TO BE CONSULTED IN THE LIBRARY ONLY

Ph.D

**SCHOOL OF PSYCHOLOGY**

**UNIVERSITY OF WALES - BANGOR**

P.C.B. LLYFRGELL U.W.B LIBRARY

# A PICTOGRAPHIC METHOD FOR TEACHING GREEK SPELLING TO DYSLEXIC CHILDREN

*By*

***Theodora D. Mavrommati***

A dissertation presented to the University of Wales -Bangor in fulfilment of the requirements for the degree of Ph.D

# ABSTRACT

Two methods for teaching spelling to Greek dyslexic children are described. The first method, termed PICTO (from the word 'pictographic'), involved the use of pictograms (pictures of familiar objects): a number of phonically irregular letters (that is, letters where alternative representations of the same sound are possible) were turned into pictograms and superimposed on the irregular part of the written word. The second method, termed TRAD (from the word 'traditional'), was in effect a combination of traditional methods. It involved the traditional multisensory techniques commonly used in teaching spelling to English-speaking dyslexic children, along with methods derived from linguistics in which the children were taught the derivations of words and were shown how the same root morphemes, derivative morphemes, etc. were consistently represented by the same spelling pattern.

There were seventy-two participants in the study, aged between nine and eleven years. Four different teachers, each using both PICTO and TRAD, took part in the teaching sessions. Fifty words were selected for teaching purposes, all of which had been spelled incorrectly by all the children. Twenty-five words were assigned to SET A and twenty-five to SET B. Twenty four children were taught SET A by PICTO and SET B by TRAD; twenty-four other children were taught SET A by TRAD and SET B by PICTO. A further twenty four children received no instruction other than that given in the normal classroom. When the two groups of taught children were given a spelling test after 14 weeks at the end of the teaching period it was found that PICTO was very much more effective than TRAD; this result held up a month later, when it was also found that in the case of the words taught by PICTO there was less forgetting. The untreated group was also tested at this point, and it was found that they spelled fewer words correctly than either of the other two groups. Further analysis showed that age of teaching and gender had no effect on the results, and that the advantages of the PICTO method were consistent across teachers. Issues arising out of these findings are briefly discussed.

# CONTENTS

I'W DDEFNYDDIO YN Y LLYFRGELL YN UNIG
TO BE CONSULTED IN THE LIBRARY ONLY

| | PAGE |
|---|---|
| List of tables | 9 |
| List of figures | 11 |
| List of Appendices | 12 |
| Declaration | 18 |
| Certification | 19 |
| Acknowledgments | 20 |
| Plan of the thesis | 21 |

## PART I

## THE BACKGROUND TO THE RESEARCH

### CHAPTER 1

### THE NOTION OF DEVELOPMENTAL DYSLEXIA

| | | |
|---|---|---|
| | | 24 |
| 1.1 | Towards the understanding of dyslexics' deficits | 24 |
| 1.1.1 | The biological level of explanation | 25 |
| 1.1.2 | Cognitive deficits in dyslexia | 27 |
| 1.1.3 | Behavioural aspects of dyslexia | 34 |
| 1.1.4 | The influence of the environment | 38 |
| 1.2 | The problem of defining developmental dyslexia | 39 |

**CHAPTER 2**

**TEACHING READING AND SPELLING IN THE ENGLISH LANGUAGE** 42

2.1 Implications of research findings 42

2.1.1 The development of children's phonological skills 42

2.1.2 The concept of a phonic-multisensory teaching method 43

2.2 Methods used for teaching English spelling to dyslexics 44

2.2.1 The *Gillingham and Stillman* teaching programme 45

2.2.2 *Alpha to Omega* 46

2.2.3 *A Language Training Course for Teachers and Learners* 48

2.2.4 *The Bangor Dyslexia Teaching System* 49

2.2.5 The *Simultaneous Oral Spelling (SOS)* technique 52

2.2.6 The *Edith Norrie Letter Case* 52

2.2.7 The *Fernald Tracing* technique 53

2.3 The *Lyn Wendon* pictorial method 54

2.4 Evidence regarding the efficiency of phonic-multisensory methods 55

**CHAPTER 3**

**DYSLEXIA AND THE GREEK LANGUAGE** 57

3.1 The orthography of the Greek language 57

3.2 Phonological and visual factors in children's reading and spelling of Greek 59

3.3. Greek methods for teaching reading and spelling to dyslexics 61

**CHAPTER 4**

**THE THEORETICAL BACKGROUND OF THE PICTOGRAPHIC METHOD** 67

**CHAPTER 5**

**THE EXPLORATORY STUDIES (1989-1995)** 71

5.1 Introduction 71

5.2 The creation of the first pictograms. 72

5.3 Exploratory studies A 73

5.3.1 The first exploratory study 73

5.3.2 The second exploratory study 76

5.3.3 The third exploratory study 77

5.3.4 New targets for the next exploratory studies 77

5.3.5 The fourth exploratory study 78

5.3.6 The fifth exploratory study 80

5.4 Exploratory studies B 82

5.4.1 The sixth exploratory study 82

5.4.2 The seventh exploratory study 84

5.4.3 The eighth and final exploratory study 86

5.5 Conclusions from the exploratory studies 87

**CHAPTER 6**

**THE FINAL VERSION OF THE PICTOGRAPHIC METHOD** 89

6.1 Introduction 89

6.2 Specification of rules 90
6.2.1 The first rule 90
6.2.2 The second rule 90
i The depiction of the letter υ /i/ 90
ii The depiction of the letter η /i/ 92
iii The depiction of the digraph ει /i/ 92
iv The depiction of the letter ω /o/ 94
v The depiction of the digraph αι /e/ 94
vi The depiction of the 'combinations' αυ /av/ or /af/, and ευ /ev/ or /ef/ 96
vii The depiction of the digraph οι /i/ 96
viii The depiction of the two identical consonants 98
6.2.3 The third rule. 103
6.2.4 The fourth rule 103

## PART II
## THE RESEARCH

**CHAPTER 7**
**AIMS OF THE RESEARCH AND SELECTION OF PARTICIPANTS** 108

**CHAPTER 8**

**WORDS TO BE TAUGHT, TEACHERS, ORDER OF TEACHING METHODS AND TEACHING TIME** 115

8.1 The selection of the words to be taught 115

8.2 The teachers who taught the participants 119

8.3 The order of the teaching methods 120

8.4 The teaching time 121

**CHAPTER 9**

**THE CARRYING OUT OF THE RESEARCH** 122

9.1 The four spelling tests 122

9.2 The activities followed 122

**CHAPTER 10**

**THE RESULTS OF THE RESEARCH** 126

**CHAPTER 11**

**DISCUSSION OF THE RESULTS AND SUGGESTIONS FOR FURTHER RESEARCH** 136

**REFERENCES** 140

**APPENDICES** 153

# LIST OF TABLES


**CHAPTER 7**

**AIMS OF THE MAIN RESEARCH AND SELECTION OF PARTICIPANTS**

7.1 Means and standard deviations in respect of age in months, IQ and number of positive indicators on the BDT, broken down by group. 113

7.2 Means and standard deviations of the number of the correctly spelled words on TEST 1 broken down by group. 114

**CHAPTER 8**

**WORDS TO BE TAUGHT, TEACHERS, ORDER OF TEACHING METHODS AND TEACHING TIME**

8.1 The words of SET A with their ambiguous letters and English translation 116

8.2 The words of SET B with their ambiguous letters and English translation 117

8.3 Number of words according to word-set and to the sound of their ambiguous letters 118

8.4 Number of ambiguous letters in the two sets of words 118

8.5 Means and standard deviations of the number of the ambiguous letters contained in the words of SET A and SET B 119

8.6 Order of teaching methods 120

8.7 Teaching time in weeks according to group of participants and method 121

**CHAPTER 10**

**THE RESULTS OF THE RESEARCH**


| | | |
|---|---|---|
| 10.1 | Means and standard deviations of the number of the correctly spelled words on the first spelling test by each group of participants for each set of words and for each teaching method | 126 |
| 10.2 | Means and standard deviations of the number of the correctly spelled words on the second spelling test by each group of participants for each set of words and for each teaching method | 127 |
| 10.3 | Means and standard deviations of the number of the correctly spelled words on PICTO 1 and PICTO 2 | 128 |
| 10.4 | Means and standard deviations of the number of the correctly spelled words on TRAD 1 and TRAD 2 | 129 |
| 10.5 | Means and standard deviations of the number of the correctly spelled words on PICTO 1 for the three grades | 130 |
| 10.6 | Means and standard deviations of the number of the correctly spelled words on PICTO 2 for the three grades | 130 |
| 10.7 | Means and standard deviations of the number of the correctly spelled words on TRAD 1 for the three grades | 131 |
| 10.8 | Means and standard deviations of the number of the correctly spelled words on TRAD 2 for the three grades | 131 |
| 10.9 | Means and standard deviations of the number of the correctly spelled words on PICTO 1 for boys and girls | 132 |
| 10.10 | Means and standard deviations of the number of the correctly spelled words on PICTO 2 for boys and girls | 132 |
| 10.11 | Means and standard deviations of the number of the correctly spelled words on TRAD 1 for boys and girls | 132 |

10.12 Means and standard deviations of the number of the correctly spelled words on TRAD 2 for boys and girls 133
10.13 Means and standard deviations of the number of the correctly spelled words on PICTO 1 broken down by teachers 133
10.14 Means and standard deviations of the number of the correctly spelled words on PICTO 2 broken down by teachers 134
10.15 Means and standard deviations of the number of the correctly spelled words on TRAD 1 broken down by teachers 134
10.16 Means and standard deviations of the number of the correctly spelled words on TRAD 2 broken down by teachers 134

## LIST OF FIGURES

1 Grouped frequencies of children who obtained a given score on TEST 1 112

# LIST OF APPENDICES


| | | PAGE |
|---|---|---|
| 1 | *First exploratory study*: the twenty Greek words taught to the children of the first exploratory study with their 'difficult' letters and their English translation | 154 |
| 2 | Table 2.1<br>*First exploratory study, first group of children*: age in months and number of correctly spelled words on the first and the second spelling test for each child (percentages in brackets) | 155 |
| | Table 2.2<br>*First exploratory study, second group of children*: age in months and number of correctly spelled words in the first and the second spelling test (percentages in brackets) | 156 |
| 3 | *Second exploratory study*: number of correctly spelled words out of the 100 derivatives and compounds of the twenty original words (which had been taught in the first exploratory study) for each child | 157 |
| 4 | *Fourth exploratory study*: the 105 words which were taught to the children with their 'difficult' letters and English translation | 158 |
| 5 | Table 5.1<br>*Fourth exploratory study*: number of words for which pictograms had been created broken down by letter and sound (percentages in brackets) | 162 |
| | Table 5.2<br>*Fourth exploratory study*: number of words for which pictograms had been created broken down by grammatical type (percentages in brackets) | 162 |

6 Table 6.1
*Fourth exploratory study, children taught in a group*: age in months, number of words taught, number of correctly spelled words in the spelling test and number of correctly spelled words in the ten dictated sentences (percentages in brackets) 163
Table 6.2
*Fourth exploratory study, children taught individually*: age in months, number of taught words, number of correctly spelled words in the spelling test and number of correctly spelled words in the ten dictated sentences (percentages in brackets) 164
7 *Fifth exploratory study*: the seventy words dictated to the children with their 'difficult' letters and English translation 165
8 Table 8.1
*Fifth exploratory study*: numbers of words taught to the children broken down by letter and sound (percentages in brackets) 168
Table 8.2
*Fifth exploratory study*: numbers of words taught to the participants broken down by grammatical type (percentages in brackets) 168
9 Table 9.1
*Fifth exploratory study, children taught in a group*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 169
Table 9.2
*Fifth exploratory study, children taught individually*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 170

10 Table 10.1 171

*Sixth exploratory study, children taught in a group*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets)

Table 10.2

*Sixth exploratory study, children taught individually*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 172

11 Table 11.1

*Seventh exploratory study, students of Primary School taught in group*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 173

Table 11.2

*Seventh exploratory study, students of Primary School taught individually*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 175

Table 11.3

*Seventh exploratory study, students of Primary School with low intelligence level taught individually*: age in months, IQ, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 179

Table 11.4

*Seventh exploratory study, students of High School taught individually*: age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets) 180

12 Table 12.1

*Eighth exploratory study, Group A - taught by the pictographic method*: age in months and number of correctly spelled words in the first and the second spelling test out of a possible 60 for each child 182

Table 12.2

*Eighth exploratory study, Group B - taught by the traditional methods*: age in months and number of correctly spelled words in the first and the second spelling test out of a possible 60 for each child 183

13 *Main research*: the 100 words which were dictated to the participants with their irregular letters and their English translation 184

14 *Main research*: distribution of the numbers of the correctly spelled words for the 748 pupils with grouped frequencies (1-3, 4-6 etc) 188

15 Table 15.1

*Main research, first group*: number of positive indicators ('pluses') on the BDT for each participant 190

Table 15.2

*Main research, second group*: number of positive indicators ('pluses') on the BDT for each participant 191

Table 15.3

*Main research, untreated group*: number of positive indicators ('pluses') on the BDT for each participant 192

16 *Main research*: details of one-way ANOVA of table 7.2 193

17 Table 17.1
*Main research*: details of one-way ANOVA for table 10.2(a) 194
Table 17.2
*Main research*: details of one-way ANOVA for table 10.2(b) 194
Table 17.3
*Main research:*post hoc comparisons (*Scheffé*) between the means of the number of the correctly spelled words of the 1st group, the 2nd group and the untreated group for the words in SET A 195
Table 17.4
*Main research*:post hoc comparisons (*Scheffé*) between the means of the number of the correctly spelled words of the 1st group, the 2nd group and the untreated group for the words in SET B 195
18 Table 18.1
*Main research* : one-way ANOVA for table 10.5 196
Table 18.2
*Main research* : one-way ANOVA for table 10.6 196
Table 18.3
*Main research* : one-way ANOVA for table 10.7 196
Table 18.4
*Main research* : one-way ANOVA for table 10.8 197
Table 18.5
*Main research* : one-way ANOVA for table 10.13 197
Table 18.6
*Main research* : one-way ANOVA for table 10.14 197
Table 18.7
*Main research* : one-way ANOVA for table 10.15 198
Table 18.8
*Main research* : one-way ANOVA for table 10.16 198

19 Table 19.1

*First exploratory study*: The pictographic representations of the twenty words which were taught to the participants with the Greek words and their English translation 199

Table 19.2

*Fourth exploratory study:* The pictographic representations of the 105 words which were taught to the participants with the Greek words and their English translation 201

Table 19.3

*Sixth exploratory study:* the pictographic representations of the seventy words which were taught to the participants with the Greek words and their English translation 210

20 *Main research:* the pictographic representations of the fifty words which were taught to the participants with the Greek words and their English translation 217

21 *The 703 words:* the pictographic representations of the Greek words with their English translation 223

# ACKNOWLEDGMENTS

I would like to thank Professor Miles and Professor Everatt for their great support and guidance.

I am especially grateful to Professor Miles who offered to me his invaluable help and his extensive experience in the construction and organisation of the present thesis.

I am also very grateful to Mrs E. Miles who helped me in organising the second chapter which refers to the methods of teaching the English language.

I am thankful to the teachers who helped me with this research; I particularly appreciate their willingness, without payment, to undertake the hard work involved.

My thanks are also due to the parents for giving their permission to work with their children.

# PLAN OF THE THESIS

This thesis deals with the particular difficulties which arise for Greek dyslexic children as a result of the irregularities of the Greek language.

PART I (Chapters 1-5) describes the background of the research.

Since the study relates to children who were dyslexic *Chapter 1* is devoted to the issue of dyslexia. Use is made of the model proposed by Frith (1997) which distinguishes three levels of explanation - biological, cognitive and behavioural - and emphasises the part played by the environment at all three levels. Relevant literature is reviewed in the light of this model. Since there is clearly a multiplicity of factors at work it is argued that the search for a single 'correct' definition of dyslexia is misguided.

*Chapter 2* contains a review of some of the main teaching methods which have been found to be effective in the remediation of English-speaking dyslexic children.

*Chapter 3* deals with the difficulties experienced by Greek-speaking dyslexic children and the peculiarities of the Greek language which give rise to these difficulties. It is suggested that a teaching method is needed which is not simply an adaptation of the methods used for teaching spelling in English but is expressly designed for teaching the irregularities of the Greek language. Reference is then made to the teaching programme devised by the present author (Mavrommati, 1995). This involved the use of pictograms (that is, representation of letters by means of pictures) in teaching Greek spelling; it also involved instruction in how to analyse words into their component morphemes and how to form derivatives and compounds.

*Chapter 4* presents the links between recent theories and research findings about the nature of developmental dyslexia and the theoretical background of the pictographic method.

*Chapter 5* describes how the author's ideas about the use of pictograms as a method for teaching spelling were tried out in a series of exploratory studies which

were conducted over a period of six years (1989-1995).

*Chapter 6* describes the final version of the pictographic teaching method which was used in the main research.

In PART II (Chapters 7-10) the main research is reported.

*Chapter 7* describes the aims of the research and the selection criteria for dyslexic participants.

*Chapter 8* describes the words to be taught, the teachers, the order of teaching and the teaching time.

*Chapter 9* describes how the research was carried out.

*Chapter 10* reports its results.

*Chapter 11* contains a discussion of some further issues in the interpretation of the results and makes some suggestions for future research.

# PART I

# THE BACKGROUND TO THE RESEARCH

# CHAPTER 1

# THE NOTION OF DEVELOPMENTAL DYSLEXIA

## *1.1 Towards the understanding of dyslexics' deficits*

A useful way of classifying the phenomena of dyslexia has been suggested by Frith (1997). This model proposes three possible levels of explanation.

An explanation at the *biological* level accounts for the phenomena of dyslexia in terms of abnormalities of the brain and the central nervous system. Some of these abnormalities may be genetically transmitted.

An explanation at the *cognitive* level accounts for the phenomena of dyslexia in terms of cognitive deficiencies. These include deficiencies at the phonological level (that is, difficulties in the remembering and organisation of speech sounds); they also include difficulties in temporal ordering and impaired motor skills. These cognitive deficiencies are assumed to be the consequence of malfunctioning at the biological level.

Explanation at the *behavioural* level describes the phenomena of dyslexia as they manifest themselves in behaviour. Some of the main manifestations are difficulties with reading and spelling, with rapid naming, with certain kinds of memory task, with balance, with motor and time estimation.

It is possible on Frith's model for the same behavioural manifestation, e.g. poor reading, to occur in the absence of brain abnormality or genetic transmission, and for possible effects of biological limitations to be compensate for by suitable stimulation from the environment. Environmental factors can, of course, operate both within the womb and after birth.

### 1.1.1 The biological level of explanation

The biological bases of dyslexia merit mention as being part of the total picture of dyslexia, but since they are not of direct relevance to this thesis no attempt will be made to review the evidence in detail.

Direct *post mortem* examination of the brains of dyslexic individuals has now been supplemented by the use of techniques of Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) which have been used in studies with living dyslexic people (Steinmetz and Galaburda, 1991; Galaburda, 1993; Hynd and Hiemenz, 1997).

Positron Emission Tomography (PET) is a technique of using radioactive isotopes in order to map the metabolic activity of the brain. It is used, for example, to measure blood flow and glucose utilisation during the time when the individual is carrying out a particular task. As a striking example of the use of PET-scan in the study of dyslexic brains may be mentioned the research of Paulesu *et al.* (1996) in which five right-handed dyslexic adults were compared with five matched controls. The participants were given tests of reading, spelling, memory for digit sequences presented auditorily, memory for confusable letters, and various tests involving phonological awareness[1]. It was confirmed that on all these measures the participants who had been identified as dyslexic performed worse than the controls. During the course of the PET scan the participants were required to carry out a variety of simple tasks (e.g. to make judgments whether the names of two letters rhymed or not and to produce words beginning with given letters); in these tasks neither dyslexics nor controls made any significant errors. With regard to brain activation, however, dyslexics were found to be different in some respect from controls. Although many parts of the brains of the non-

---

[1] For an explanation of the term 'phonological awareness' see section 1.1.2. Basically it refers to the ability to recognise phonemes - that is, the individual speech sounds which go to make up spoken language. A phoneme is the simplest unit of sound and a grapheme is the written representation of a phoneme.

dyslexics were activated concurrently, in the case of dyslexics fewer areas were activated at any one trial. In addition, one area, the insula, was not activated at all in the case of dyslexics although it was always activated in the case of the controls. The authors suggest that these findings may be indicative of a disassociation between certain areas of the brain - as though in the case of dyslexics it was not possible for all these areas to be activated simultaneously.

Investigations have also been carried out on the visual systems of dyslexics and controls. A distinction has been drawn between the *magnocellular* pathway, which processes fast-moving, low-contrast information, and the *parvocellular* pathway which processes slow-moving, high-contrast information. Evidence both from the testing of living dyslexics and post mortem examination of dyslexic brains has confirmed that dyslexics show abnormalities in the magnocellular system but not in the parvocellular system (Livingstone *et al*, 1991; Hogben, 1997).

Abnormalities have also been found in the auditory magnocellular system of dyslexics (Galaburda and Livingstone, 1993; Stein, 1999). Although research is at its early stages in this area the above finding suggests a possible relationship between abnormalities of the auditory magnocellular system and the phonological difficulties experienced by dyslexics which on this view could result from their difficulty in processing auditory information at high speeds (see also Tallal *et al.*, 1996, and Merzenich *et al.,* 1996).

There is also the possibility that a minor cerebellar deficit may account for dyslexics' poor motor control, poor sense of time and lack of automaticity (Nicolson and Fawcett, 1995; Nicolson *et al.*, 1997). It is also possible that dyslexics may suffer from a general deficit which affects balance and thus motor and timing aspects of speech production (Nicolson and Fawcett, 1999).

Striking evidence about the presence of cerebellar deficits in dyslexia comes from studies in which PET-scan techniques have been used (Nicolson *et al.*, 1997). According to their findings severe reductions in the level of activation of the cerebellum were found in their dyslexic participants in comparison with controls, and it is possible

that there is a link between 'timing' deficits in dyslexics and their deficits in phonological processing. It has also been suggested that dyslexics are unable adequately to process fast incoming information in any sensory domain (Stein and Walsh, 1997; Frith and Frith,1996).

There is also evidence of chromosomal abnormalities in dyslexia, particularly with reference to chromosome 15 and chromosome 6 (Smith, Kimberling and Pennington, 1991). Research in these areas, however, is ongoing, and definitive conclusions have not yet been reached.

### 1.1.2 Cognitive deficits in dyslexia

On Frith's (1997) model the brain abnormalities result in deficiencies at the cognitive level. These deficiencies are important for the present thesis because of their consequences for remediation. In the first place, however, consideration will be given to the normal processes of development.

Gradually preschool non-dyslexic children acquire more and more knowledge of the sound structure of spoken language and thus develop their phonological skills. They finally become aware not only that sentences are composed of individual words but that single words can be segmented into smaller units, that is, into their component syllables and ultimately into phonemes. In addition, they begin to develop their rhyme knowledge through nursery rhymes and songs (Stackhouse and Wells, 1997; see also Catts, 1989, for further relevant evidence).

They also become aware of rimes. The word 'rime' may be explained as follows: 'researchers have proposed an intermediate stage that children go through after they have become aware of syllable division but still cannot analyse words into phonemes. Children find it easier to divide a one-syllable word into two segments: the beginning consonant or consonants on the one hand, and the rest, consisting of vowel plus any final consonants on the other. These segments have been termed the *onset* and *rime*

respectively' (Miles, E. 1997b, p. 157) (For a discussion of the teaching of onset and rime see chapter 2).

In addition, children become able to replace one phoneme with another so as to delete sounds from existing words or non-words or create new combinations. This competence, which relates to the structure of the spoken words, has been called 'phonological awareness'. One consequence of such awareness is that children learn to read and spell by using their knowledge of letter-sound correspondences. There is evidence that children trained in the analysis of words into their phonemes and in synthesising these phonemes make better progress in reading and spelling during their early school years than do untrained children (Treiman and Baron, 1983; Fox and Routh, 1984). It has also been found that training in the categorisation of sounds results in improved reading and spelling (Bradley and Bryant, 1983). However, it seems that formal reading and spelling instruction itself contributes to the further development of children's phonological awareness; there is evidence that experience of language in its written form, that is in the learning of letters, results in increased phonological skills (Bradley and Bryant, 1983; Bryant and Bradley, 1988).

The normal development of children's reading and spelling skills has been described by Frith (1985) in terms of a three-stage model. According to this model, non-dyslexic children, long before they enter school, are able to memorise the salient characteristics of the printed words which they often see in their environment (e.g. the double 'll' in the word 'jelly') and they are thus able to recognise such words when they see them. Frith (1985) calls this early stage of reading and spelling development the *logographic* stage. During this phase, accurate reading and spelling are not possible. Thereafter, however, children enter a new phase which Frith calls the *alphabetic* stage. They learn the letters in relation to their sounds and thus gradually acquire grapheme-phoneme and phoneme-grapheme conversion skills. In addition they become aware that the words can be analysed into separate phonemes and that independent phonemes can be blended to form words. Thus, *meeting* can be analysed into the syllables *meet-* and *-ing*, while the phonemes /m/ /i/ /t/ /I/ /ŋ/ can be blended to form the word *meeting*.

According to the same model (Frith, 1985), children after the alphabetic stage enter another phase of development which she calls the *orthographic* stage. During this phase they develop further their reading and spelling skills and memorise the spelling patterns of words in such a way that they finally become able to recognise irregular words in reading and to spell irregular words by choosing the correct letters. When they have to deal with unknown words they can use a grapheme-phoneme translation strategy as well as their knowledge of the memorised spelling patterns.

Additionally to Frith (1985), Marsh and Desberg (1983) and Ehri (1985) viewed reading and spelling development in a similar way to hers and described literacy development as following similar stages. Details about their models and their similarities and differences with the Frith's model will be found in Frith (1989).

According to Frith, dyslexic children are held up at the *alphabetic phase* of their reading and spelling development; this hinders their progress to the *orthographic* phase. It is now well established that dyslexics experience difficulties in many tasks which require phonological awareness. Thus in a series of experiments Bradley and Bryant (1978) found that pre-reading children who were weak in picking the 'odd one out' from a group of three-letter words (e.g. 'Which end-sound is the odd one out from the *cap, map, bag, rap*?') later turned out to be poor readers. This suggests that they are less sensitive to rhyme and alliteration than normal readers.

Dyslexics also have difficulties in other tasks which test phonological awareness. Thus Olson *et al.,* (1989) required children to move the initial phoneme of a word to the end of that word and to add an 'ay' after it (*pig*, therefore becomes 'ig-pay'), and on this task dyslexics were worse than reading-age-matched normal readers. In another study referred to by Rack (1994), dyslexics were found to be worse than reading-age-matched normal readers on a phoneme deletion task in which the participants had to remove a phoneme from a non-word in order to produce a real word (e.g. *glamp* without /g/).

Their phonological difficulties are also demonstrated in their problems with the articulation of complex polysyllabic words (e.g. *preliminary*, *philosophical*)

(Miles, T. R., 1997). A similar difficulty is also found when they are required to repeat phonologically complex names (e.g. *thermometer*) or to repeat phonologically complex phrases (e.g. *The priest blessed the bread*); on these tasks they have been found to be slower and to make significantly more speech production errors than normal readers (Catts, 1989).

Apart from the above, dyslexics have verbal memory problems which are often demonstrated when they are given tasks which require processing and memorisation of linguistic material. For example, they have difficulty over rapid naming of stimuli (e.g. objects, letters, pictures). This has been found to be true even when the material is very familiar to them (e.g. colours) (Spring and Capps, 1974; Denkla and Rudel, 1976; Done and Miles, 1978).

Done and Miles, (1988) also found that in both dyslexic and control children the response latencies when they were presented with pictures and asked to name them were related to the age of acquisition of the words representing the picture; and on the basis of the longer response times of the dyslexics they argue that on average dyslexics acquire words ten months later than non-dyslexics.

Dyslexics also have difficulty with short-term memorisation of verbal material. Their difficulty in recalling auditorily presented digits has been documented on numerous occasions (for sources, see Miles and Ellis, 1981); and it has been found that there is a similar limitation when digits are presented visually (Miles, T. R., 1993). There is evidence (Baddeley *et al.*, 1975; Ellis and Hennelly, 1980) that memory span for words is limited by the time needed for saying them; this gives rise to the so-called 'word-length effect' according to which the memory span for short words, e.g. *dog, cat, fox,* is greater than the memory span for long words, e.g. *hippopotamus, rhinocerous, armadillo.* It is therefore possible that because dyslexics tend to be slower than non-dyslexics at processing verbal material a consequence is that they have a shorter memory span.

Dyslexics have also been found to be less aware than the normal readers of how long a word is and may not always be able to say if two words have a similar number

of syllables. In a study by Katz (1986) in which they were required to determine if the names of pictured objects had a similar number of syllables or not, they obtained lower scores than normal readers.

They have also word finding problems in speech. These problems include the substitution of the correct word with another, the use of descriptive definitions (e.g. '*that thing ... you can cut with it*'), or gestures and the overuse of imprecise words and phrases (e.g. '*... um ...*', '*... er ...* ', '*... you know ...*') (Johnson and Myklebust, 1967; see also Stirling and Miles, 1988).

In general, dyslexics show problems over tasks in which visual or auditory material is associated with labels or names. In contrast, in tasks which involve visual matching without verbalisation they have been found to perform on a level with controls (Vellutino, 1979). The investigations conducted by Vellutino and his associates are of particular interest: they used various types of verbal and nonverbal stimuli which were presented in various ways to poor and normal readers, and they found that poor readers had particular difficulty in any learning tasks that involved a verbal component. For example, in one of these studies poor and normal readers of the fourth, the fifth and the sixth grade were assigned to either a visual-auditory nonverbal learning condition or to a visual-verbal learning condition employing a sub-test which required the association of nonsense syllables and novel cartoons and a second one which involved the association of those same syllables with novel script. According to the results, the nonverbal condition did not differentiate the groups but the poor readers performed worse than the normal readers on both the picture-naming and the script-naming task (Vellutino, 1979).

In addition (Vellutino, 1979, p. 238-244), it was found that when poor readers were required to learn to associate visual stimuli with nonsense syllables they produced more word substitutions (e.g. *fog* for *mog*) than did the normal readers. It was found that the normal readers made more errors in the form of novel combinations of individual phonemes (e.g. *mag* and *yog* for *mog* and *yag*). This finding suggests that the normal readers were more likely than the poor readers to code the nonsense syllables

phonetically; this is consistent with the view that poor readers may have a difficulty in the phonetic coding of both visual and aural linguistic information.

In addition there are many other experiments which point in the same direction. For example, Ellis and Miles (1978) found that when dyslexic children were required to judge whether two letters of the same case (OO, OB) were the same or different they were no slower than age-matched controls; however, when they had to judge if two letters of different case were the same or different (Gg, Gw) the dyslexic children required more time than the controls. In addition, they were not found to be slower than the controls even when the letters, though different, were visually confusable (QO, RP, EF, CG). These findings suggest that dyslexics do not have difficulty in dealing with the visual characteristics of the letters as such.

Additional confirmation that dyslexics have verbal memory problems comes from Bakker (1967, 1972). Bakker showed that when good and poor readers were presented with temporal sequences of meaningless figures, meaningful figures, letters and digits, the good readers were better than the poor readers at remembering the meaningful figures and letters but that the two groups did not differ when the stimuli were nonverbal. Done and Miles, (1978), in a similar memorisation task, showed that dyslexics scored considerably lower than age-matched controls when the stimuli were nameable (digits), but that when nonsense shapes were used as stimuli in place of the digits the difference was minimal. However, when both groups were given a paired associate learning task where names where learned for the nonsense shapes, the performance of the controls again became significantly superior. In another study (Katz, Shankweiler and Liberman, 1981) good and poor readers were presented with nonsense drawings which could not easily be named along with line drawings of common objects; afterwards they were required to rearrange copies of the figures in the same order on a table. It was found that the performance of good and poor readers did not differ significantly in the case of the nonsense drawings but that good readers were significantly better than poor readers in the case of the object-drawing task, i.e. in the case of the nameable stimuli.

It can be concluded that dyslexic children do not differ from controls in remembering and comparing items according to their visual features, but that when naming is involved their memory span is more limited. This would make sense of their difficulty in memorising the shapes of letters in relation to their sound and memorising irregular spelling patterns.

Dyslexics' reading and spelling problems can sometimes be compounded by the writing system of the language which has to be learned. Thus difficulties are raised for dyslexic children from the 'non-transparency' which characterises some alphabetic languages such as English and French. This means that there are many words which when written do not show grapheme-to-phoneme regularities and many words whose pronunciation can be represented by alternative spellings. In contrast in more transparent languages there is evidence which suggests that dyslexics can master the grapheme-to-phoneme correspondence rules on a level nearly equal to that of their schoolmates (Wimmer, 1993; Porpodas, 1989).

German is a highly transparent language for both reading and spelling. It has been found that although German-speaking dyslexics present similar problems to those of their English counterparts in some tasks involving phonological awareness (e.g. detection of the 'odd one out' in a rhyming task, vowel substitution, and rapid naming) these difficulties do not particularly affect their accuracy in reading which has been found to be almost near the normal level. German-speaking dyslexics have been found to be able to read and spell correctly both words and non-words and to differ from controls only in respect of speed (Wimmer, 1993).

Czech is also a transparent language. According to Matějček (1998), most Czech children can read accurately without any difficulties over either words or non-words; again the only difference between poor and good readers again seems to be in terms of speed.

Chinese and Japanese fall into a different category because they are based on both syllabic and logographic writing systems. The visual appearance of the words in these languages is characterised by the presence of logograms which are patterns (or

characters) composed of various lines and which represent meanings (Yamada, 1995). Japanese written language is in fact a mixture of two writing systems, kana and kanji: kana is a highly transparent writing system the characters of which represent syllables which cannot be analysed into phonemes; kanji is a writing system with a logographic appearance. Both of them are used in the Japanese written language. The situation, therefore, in both Chinese and Japanese writing systems is different from that in the writing systems mentioned so far. The difficulties of dyslexics are therefore different in these languages (Miles and Miles, 1999) - a fact which challenges the assumption that there could be a single remediation programme for dyslexia irrespective of the language being used. The special problems arising from the writing system of the Greek language will be discussed in Chapter 3.

What can be concluded from all the above is that dyslexics' cognitive deficits prevent them from taking full advantage of their experience either with spoken or with written language. They enter school without having the necessary prerequisites for learning to read, being deficient, for instance, in phonological awareness and in memory for verbal material. As a result they perform worse than normal readers in a whole range of tasks related to reading and spelling.

All this has important implications as far as remediation is concerned. In particular the teaching methods and programmes in common use in English speaking countries place special emphasis on explicit learning of grapheme-phoneme correspondences, taught in a multisensory way. These methods and programmes will be discussed in Chapter 2.

### 1.1.3 Behavioural aspects of dyslexia

Although the manifestations of dyslexia are particularly clear when the child reaches school age there are many signs which can be detected before this time. The British Dyslexia Association (Scott, 1995) has suggested certain signs and which show

that a child may be at risk. 'These include the later than expected clear speech and a persistent tendency to jumble words and phrases, persistent difficulty with tasks such as dressing efficiently, doing up buttons, tying up shoelaces, unusual clumsiness and difficulty with co-ordinated activities such as hopping and skipping, and catching or kicking balls, poor concentration and family history of similar difficulties' (Scott, 1995, p.3).

When English-speaking dyslexic children reach school age their reading difficulties take many different forms. For example, according to Miles, T. R. (1993, chapter 8) they are likely to remain slow readers, to dislike reading aloud, and to have difficulty in holding in mind any large amount of material. Examples of their spelling errors will be found in Miles, T. R., (1993, chapter 9). Among those which he cites are misrepresentation of the sounds of the words (e.g. 'jop' instead of *job*), doubling the wrong letters (e.g. 'eeg' instead of *egg*), omissions of one or more of the sounds contained in the words (e.g. 'Angsea' instead of *Anglesey*) and duplication of one of them (e.g.'Cheshshire' instead of *Cheshire*). He reports also that sometimes dyslexics spell words incorrectly in such a way that the resultant word contains a different number of syllables from the target word (for instance, 'egeg' instead of *edge*); also they sometimes make mistakes over the boundaries between words, as when *eiderdown* is written 'i dodown' or when *another* is written as 'a nother'.

A comprehensive list of areas in which dyslexics were shown to be different from controls will be found in Nicolson and Fawcett (1995). These authors cite 23 different tests in 21 of which dyslexics scored differently from controls. They performed no differently only on two tasks of simple reaction time. The 21 other tasks included tests of phonological skills - discrimination of phonologically confusable stimuli (e.g. *fuse* and *views*), rhyme/sound categorisation tasks (e.g. 'Does *cat* rhyme with *map*?' and 'Do *map* and *man* start with the same sound?') and segmentation tasks (e.g. 'Say *cowboy* without the *cow*', and 'Say *smack* without the /m/'). There were also tests of working memory (e.g. non-word repetition and memory span for words), naming tasks (i.e. tests of speed and accuracy of naming simple outline pictures,

colours, digits and letters), word recognition tasks (where words were flashed on a screen - a task which the authors called 'word flash') and also balance tasks (e.g. standing on one foot or both feet while blindfolded).

On the great majority of the tasks dyslexics, though obtaining lower scores than the chronological age matched controls, were on a level with the reading age matched controls. However, on certain tasks, viz. spelling, rhyme detection, segmentation, word flash, picture naming speed, letter naming accuracy, bead threading, balance, one foot blindfold and dual task balance, they scored lower even than the reading age matched controls. This finding indicates that dyslexics' difficulties cannot be caused entirely by their reading problems and that 'maturational lag' cannot be a full explanation of these difficulties.

In addition, Miles, T. R., (1993) (pp. 41-52 and 229) has presented a table which record how many children and adults produced typically 'dyslexic' responses on a series of items such as distinguishing left and right, saying the months of the year in forwards and reverse order, etc.. He argues that in dyslexia there is a distinctive *pattern* of difficulties: any one difficulty on its own may be of little significance, but if several occur in conjunction then the total picture becomes meaningful in a new way.

It is widely agreed (Scott, 1995) that dyslexics need extra time over written work and that they have difficulty in organisation both at home and at school. In addition, according to Scott, they may continue to face difficulties with tying shoelaces, with ball-catching, skipping etc. and may also show poor concentration and lack of attention. Finally, their feelings of frustration increase and there is a growing lack of self-esteem which may lead to behavioural problems.

Moreover, they sometimes show lack of competence in oral language skills. For example, in a study of dyslexic boys aged between 11 and 18 (Stirling and Miles, 1988) it was found that, although the dyslexic participants performed on a level with controls on vocabulary and definitional skills, they nevertheless produced some ungrammatical sentences, e.g. 'a pier is what people walk along and fishing off' and sometimes misconstrued words, e.g. (in response to the word *pier*) 'appear in the door'.

By the age of 16 it seems that many dyslexics have found ways of coping with the majority of their difficulties but that some still persist, for instance slowness at reading, slowness at locating a word in a dictionary or at finding the right place in a mathematical table (Gilroy and Miles, 1996). In addition, planning and structuring of written work may cause problems not because they have too little to say but because of a limitation of the amount of material that they can hold in mind without writing it down (Gilroy and Miles, 1996).

They also have difficulties in mathematics (e.g. learning the multiplication tables) (Miles, T. R.,1993), and sometimes the language of mathematics may confuse them. Miles, E. (1992) cites a number of expressions which have a special sense in mathematics but which to a child unaware of this special sense might suggest something quite different. Two of her examples are *take away* - which might be having association with a Chinese take-away - and *dividend* - which might be mistaken for something which one wins on the pools.

In addition, dyslexics may have problems with some aspects of music - particularly with rhythm and with musical notation (Ganschow *et al.*, 1994). They may also become confused over words which in music are used in an unfamiliar way such as *treble, note,* and *key* (Hubicki and Miles, 1991).

It is sometimes said that dyslexics possess special creative talents. This has ben argued for in particular by West (1997) who presents a series of case studies of creative thinkers, including Faraday, Einstein, and the poet, William Butler Yeats. Similarly, Gilroy and Miles, (1996) assert that 'they may have special gifts in engineering, computer programming, art or modelling. Many of them have very high reasoning powers, and some of them show a sensitive appreciation of literature and drama'. However, this is an area where it is perhaps wise to be somewhat cautious. The claim of Gilroy and Miles, is based on personal impressions rather than on hard research evidence, and although a research paper on the topic has recently been published (Everatt *et al.* 1999) there is not the abundance of confirmatory evidence which might be expected if this were a firmly established fact. Everatt *et al.* used tasks such as

asking the participants to give alternative uses for objects (e.g. a coke can) and to produce drawn objects from a series of 5 shapes presented to them on a piece of A4 sized paper. They report that dyslexic adults showed greater creativity than the controls but that dyslexic primary and secondary school children performed only at the same level as their peers. More research is needed in this area before firm conclusions can be drawn.

### 1.1.4 The influence of the environment

An important characteristic of Frith's (1997) model is that at all levels the influence of the environment plays a major part. For example brain development may be affected by anoxia (lack of oxygen), particularly if it occurs just before or during birth, and there may be effects resulting from medication or unusual nutrition. Cognitive functioning may be affected by the kinds of tasks to which the child is exposed - for example, whether these are verbal or nonverbal in character and what is the writing system of the language into which the child is born. As far as behaviour is concerned, there are all kinds of ways in which the environment plays a part - the opportunities which the child has for learning, the kind of teaching he or she receives, the encouragement given by parents and teachers, and so on.

In view of the varied consequences of all these factors, coupled with the fact that the initial severity of the condition may vary from one individual to another, it is perhaps not surprising that an agreed definition of dyslexia should have proved so elusive. It is this problem which will now be considered.

## *1.2 The problem of defining developmental dyslexia*

Dyslexia is described as *developmental* because it relates to certain aspects of children's development. These have turned out to centre primarily on the learning to process language, and on the acquisition of skills related to this (Stanovich, 1994; Catts, 1989). The contrasting expression is *acquired dyslexia*. This is usually understood to mean poor reading as a result of brain injury (see, e.g. Coltheart *et al.*, 1986; Ellis, A. W., 1994). Issues connected with acquired dyslexia will not be discussed in this thesis.

The World Federation of Neurology (1968) defines developmental dyslexia as:

> 'A disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence and socio-cultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin.'

Critchley and Critchley (1978) qualified this definition by saying that dyslexia is:

> 'A learning-disability which initially shows itself by difficulty in learning to read, and later by erratic spelling and by lack of facility in manipulating written as opposed to spoken words. The condition is cognitive in essence, and usually genetically determined. It is not due to intellectual inadequacy or to lack of socio-cultural opportunity, or to faults in the technique of teaching, or to emotional factors, or to any known structural brain-defect. It probably represents a specific maturational defect which tends to lessen as the child grows older, and is capable of considerable improvement, especially when appropriate remedial help is afforded at the earliest opportunity'.

The British Dyslexia Association (Augur, 1993) suggested a quite different definition which was practically and educationally oriented. It described symptoms and

difficulties of dyslexics without reference either to neurological findings or to specific cognitive deficits. This definition was:

> 'Dyslexia is a specific difficulty in learning, in one or more of reading, spelling and written language which may be accompanied by difficulty in number work, short-term memory, sequencing, auditory and/or visual perception, and motor skills. It is particularly related to mastering and using written language - alphabetic, numeric and musical notation. In addition, oral language is often affected to some degree.'

Recently (1994), the Research Committee of the Orton Dyslexia Society (now the International Dyslexia Society) produced the following definition.

> 'Dyslexia is one of several distinct learning disabilities. It is a specific language-based disorder of constitutional origin characterised by difficulties in single word coding, usually reflecting insufficient phonological processing abilities. These difficulties in single word decoding are often unexpected in relation to age and other cognitive and academic abilities; they are not the result of generalised developmental disability or sensory impairment. Dyslexia is manifested by variable difficulty with different forms of language, often including, in addition to problems reading, a conspicuous problem with acquiring proficiency in writing and spelling.'
>
> Orton Dyslexia Society, 1994

There has been particular controversy over so-called 'discrepancy definitions' of dyslexia. The key notion here is that dyslexics' literacy difficulties are unexpected - unexpected, that is, in relation to their other abilities, including in particular those tapped by traditional intelligence tests. Closely related to this is the notion of 'exclusionary definition': a child is dyslexic, it has been suggested, if no other reason for its literacy difficulties can be found, - such as poor schooling, lack of intelligence or opportunity, or gross physical or sensory deficits. The objection commonly raised

against all such definitions is that they do not tell us what dyslexia *is*, only what it is not.

There is the further difficulty that if dyslexic children receive suitable training the discrepancy tends to disappear.

A discrepancy definition is also problematic in the case of dyslexic children who are taught reading and spelling in transparent languages. As has already been noted (Wimmer, 1993; Porpodas, 1990; Matějček, 1997) children may be adequate readers and yet may be dyslexic in the sense of having other difficulties characteristic of dyslexia.

A further complication is that children's IQ scores have been shown to be related to the socio-economic status of the parents (Siegel and Himel, 1998). This means that children coming from unfavourable socio-economic backgrounds or from adverse environments are less likely to be classed as discrepant and thus less likely to receive help on the grounds that they are 'dyslexic'. A possible consequence is the so-called 'Matthew effect' as a result of which those who are already poor at reading fall even further behind as a result of lack of adequate provision (Stanovich, 1986).

In view of these complexities any simple formula is likely to be inadequate , not only because of the large variations and differences between one dyslexic individual to another but because different definitions may be necessary for different purposes; for example a definition which specifies how dyslexics were picked out in a research investigation may be different from one which specifies what entitles someone to qualify a remediation or computer support. (For further discussion of this point, see Miles, E., 1995).

As far as the present thesis is concerned no single comprehensive definition is necessary. The only requirement is to specify the criteria by which the dyslexic participants were picked out and to ensure that these criteria are compatible with the meaning of the word 'dyslexia' as it is commonly understood. Issues connected with the choice of such criteria will be discussed in chapter 7.

# CHAPTER 2

# TEACHING READING AND SPELLING IN THE ENGLISH LANGUAGE

## *2.1 Implications of research findings*

### 2.1.1 The development of children's phonological skills

In the previous chapter evidence was presented which suggests that dyslexic children tend to experience a variety of difficulties with the processing of verbal material. This finding has important implications for teaching them reading and spelling.

First of all, in view of their phonological difficulties and the great importance of phonological awareness in facilitating the development of literacy, it seems obvious that phonological skills need to be developed in the preschool years so that children, whether dyslexic or not, will be able to make connections between the sounds which they hear and the appropriate spelling patterns.

These skills can be acquired by means of activities such as rhyme recognition, rhyme generation and rime categorisation as well as by activities which require the child to delete, add or transpose either syllables or phonemes in order to form new words.

In the case of dyslexic children there is evidence that if such activities are combined with the teaching of reading then both reading and spelling improve (Hatcher, 1994; Goulandris, 1994; Bradley and Huxford, 1994).

### 2.1.2 The concept of a phonic - multisensory teaching method

During the early school years children learn the shape of the letters in relation to their sounds and thus develop grapheme-phoneme and phoneme-grapheme translation strategies. Children who have well developed phonological skills learn to read and spell in a way which is phonetically accurate. This means that those words which follow the phoneme-grapheme translation rules are spelled correctly and that those which do not are at least spelled with the correct representations of their sounds and in the right order, although the choice of letters out of the many alternatives which represent the same sound may be incorrect.

In view of dyslexics' phonological difficulties, it is widely agreed that in English speaking countries phonetically accurate spelling can be achieved when a basically *phonic* method is adopted - that is, the systematic teaching of letter-sound correspondences. When this method is used, the children have to learn that words are composed of separate sounds (phonemes). It is necessary for them to analyse spoken language into these sounds and also to blend them together. Teaching the associations between letters and sounds is considered to be essential both for reading and for phonetically accurate spelling. The method has to be

> '*structured*, *sequential*, *cumulative*, and *thorough* .... The skills are to be learned through all the avenues of learning open to the student - *visual, auditory* and *tactile-kinesthetic* - in interaction ... (our familiar multisensory approach).'
> (Rawson, 1970, p118).

The method has to be *structured* in the sense that it has to present the written language system, with its rules, regularities and spelling patterns, in an organized and coherent way. This should include basic sound /symbol correspondences, through consonant and vowel digraphs, to prefix and suffix rules. The sounds and letter combinations are presented *sequentially* - that is, in an ordered sequence rather than in a varied or unplanned way; for example, consonant blends should not be taught before single consonants and the prefix *dis* should not be taught until the child is familiar with

the short '*i*' sound. The teaching needs to be *cumulative* in that the teacher does not move on to more complex letter-sound correspondences until the less complex ones have been mastered. Finally it needs to be *thorough* in that there is continual revision and the opportunity for over-learning. It will be seen that the programmes referred to in section 2.2 satisfy these criteria.

Mention should be made at this point of a recent modification to the traditional teaching of letter-sound correspondences. Instead of treating each phoneme as an individual unit it has been suggested that words can usefully be divided into onset and rime (Miles, E., 1997b, p.157). In this paper, the author does not dispute the value of teaching individual phonemes but suggests that alongside this teaching 'the constructive use of onset and rime divisions .... would involve, for instance, collecting words containing the rime "-ack" and "-ake" and later on longer words containing common patterns, e.g. "-arrow" and "-oping" '. For further information on the development of ideas on onset and rime the reader is referred to Treiman (1985) and Goswami (1988).

The methods which have been advocated for teaching dyslexics in English speaking countries are almost all *multisensory* in that they involve all the different senses: thus children are encouraged to look carefully, to listen carefully, and to pay attention to their mouth movements in saying the word and to their hand movements in writing it.

## *2.2 Methods used for teaching English spelling to dyslexics*

The best-known programmes for teaching reading and spelling to dyslexics in the English language are the following: *Gillingham and Stillman* (1969), *Alpha to Omega* (Hornsby and Shear, 1993), *A Language Training Course for Teachers and Learners* (Augur and Briggs, 1992), *The Bangor Dyslexia Teaching System* (Miles, E., 3rd ed., 1997a).

In addition, there are several techniques and learning aids which have been found to be useful in teaching dyslexics. The best known of these are the *Simultaneous Oral Spelling (SOS)* teaching technique, the *Fernald Tracing* technique, and the *Edith Norrie Letter Case*.

It is worth while reviewing these programmes, techniques and learning aids in some detail, since they form the basis for remediation in English speaking countries, and although, as it will be seen in chapter 3, there are important differences between Greek and English an understanding of the ways in which English speaking dyslexic children are taught is a necessary part of the background to the present thesis.

### 2.2.1 The *Gillingham and Stillman* teaching programme

This is a highly structured phonic programme which sets out in detail the precise methods which are to be used. The teacher begins with individual letters which, as they are learned, are used to build words. Each new letter is learned by means of 'linkages' between visual input (V), auditory input (A), and kinesthetic input (K). (Kinesthesis means literally perception of movement; the child is taught to be aware both of the movements of his hand in writing the word and of the movements of his mouth in saying it.) These linkages are planned so as to link the letter, its spoken name and its sound together in paired association; this combination is called a 'phonograph'. The linkages are described in the manual as follows:

*Linkage 1*: A letter is presented in a card. The teacher gives the name of the letter. The pupil looks at it and then repeats it orally (VA linkage and AK linkage). Once the name is known, the procedure is repeated for the sound of the letter to be learned. As a result of these activities a linkage is made between visual-auditory and auditory-kinesthetic modalities.

*Linkage 2:* The letter is written by the teacher. Its orientation, the starting point of its writing and the direction of movement are discussed; then the pupil traces over

the letter, copies it, writes it from memory and then does so with eyes averted (VK and KV linkages).

*Linkage 3:* The letter is shown and the pupil names it. The teacher moves the pupil's hand passively to form the letter (VA and KA linkages).

*Linkage 4:* The teacher dictates the letter name and the pupil writes it (AK and AV linkages).

*Linkage 5:* The letter is presented and the pupil gives its sound (VA linkage). This is the important linkage for reading.

*Linkage 6:* The teacher gives the name of the letter and the child gives its sound Since the child hears the teacher's voice and also his own voice, this is a AA linkage.

*Linkage 7*: The teacher provides the sound and the child gives the name of the letter (AA linkage).

*Linkage 8:* The teacher provides the sound of the letter; the child writes it (sometimes with eyes averted) and gives its name (AK and AV linkages) This is an important linkage for spelling.

The manual supplies a wealth of valuable teaching points, and although critics have accused the procedures of being too rigid and inflexible, it is argued in their defence that a dyslexic child who has been struggling may well find it a relief that the lesson is conducted in a consistent and orderly way.

### 2.2.2 *Alpha to Omega*

*Alpha to Omega* is a phonic, linguistic approach to the teaching of reading writing and spelling. It is a highly structured programme in which multisensory learning techniques are used and which, as the authors claim, closely follow the normal pattern of language acquisition.

It begins with the teaching of associations between single letters and sounds and it gradually presents all the possible combinations of letters required to translate the 44

phonemes of spoken language into graphemes, using the 26 letters from which all English words are constructed.

Letter-sound correspondences are taught by means of cards with letters printed on them. On the reverse side of the card a picture is drawn for each individual letter or digraph. The picture represents a 'keyword' - that is, a word the initial sound of which is the sound of the letter or digraph which is written on the other side of the card. For example, the picture of a snake is drawn on the reverse side of the card on which the letter *s* is written. The pictures are used to remind the children of the sounds of the letters or digraphs. The method used is multisensory in that the children are required to say the letter's name, to repeat the keyword and its sounds after their teacher, to write the letter as they say it, and to write it with their eyes closed so as to get the feel of it.

After the sounds of the single letters have been introduced, consonant blends and digraphs follow, and then, gradually, the whole range of spelling patterns and rules is covered (e.g. the rule relating to the letter *w*: in most circumstances this letter changes the sound of most of the vowels that follow it - as in *was* and *worm*).

Monosyllabic words are introduced at the start, and thereafter polysyllabic words and prefixes and suffixes. As soon as the children are able to synthesise sounds into words and analyse words into their component sounds, these words are used in sentences. The sentences are taught in a particular order depending on their complexity. The following is a summary of the teaching procedure (taken from the manual itself).

*Stage 1:* This stage deals with words of one syllable, except where prefixes and suffixes can be added without changing the spelling of the root word. The vowels are mostly short vowels, or words of one and two phonemes ending in a vowel. Where a syllable ends in a vowel, it is described as an 'open' syllable; in such cases the vowel sound is always long as in *a, be, he, me, she, the, we, no, so, go, to, do, I, by, my*. A 'closed' syllable is one ending in a consonant (e.g. *man, hat*). Also used is the *e* vowel which turns a short vowel sound to a long vowel sound (e.g. *cake, these, ripe, hope, tune*).

*Stage 2*: This stage also deals with one-syllable words with the addition of

prefixes and suffixes and also with other ways of writing long vowel sounds.

*Stage 3*: This stage deals with polysyllabic words, with the characteristics of final syllables, and again with open and closed syllables which are now covered more thoroughly.

The prefixes and the suffixes which need to be initially mastered are the following:

Prefixes: *a-, be-, de-, en-, mis-, in-, re-, to-, un-, ad-, dis-, pre-*

Suffixes: *-ed, -er, -est , -ing, -ous, -able, -ly, -s, -ment, -y, -age, -ful*

More advanced prefixes and suffixes are introduced later, or form part of some rule being taught. Games and exercises can be devised to help the pupils to become familiar with what the concepts of 'prefix' and 'suffix' involve.

In accordance with the authors' policy of following the normal pattern of language acquisition content words appear first - nouns, verbs and adjectives - while function words (e.g. prepositions etc.) appear later.

This programme has been widely used both in Britain and in other countries where English is the first language.

### 2.2.3 *A Language Training Course for Teachers and Learners*

*A Language Training Course for Teachers and Learners* (Augur and Briggs, 1992) provides another structured phonic-multisensory approach. It is based on the *Hickey Multisensory Language Course* which in its turn was a British adaptation of the Gillingham and Stillman programme.

The sound-symbol patterns are taught in a systematic way. The spelling pack of this programme consists of 50 cards whose purpose is to present the written sounds so that the learner can listen to them, repeat them, spell them and name the letters. The programme also uses a multisensory technique: the children listen to the sounds, speak them aloud, linking the sounds to the names of the letters, use movement to write

correctly the spelling alternatives, naming each before writing, see the spellings they have written and learn the different positions in which they occur in words. For further details about the teaching procedures as well as the organisation of the programme the reader is referred in Augur and Briggs (1992).

### 2.2.4 *The Bangor Dyslexia Teaching System*

*The Bangor Dyslexia Teaching System* is a flexible teaching programme which is also based on a phonic approach in the sense that the children's attention is concentrated on the alphabetic code. The sounds of the language are taught in a systematic way within a structure, and the teacher has to proceed in a carefully ordered sequence of small steps, with plenty of cumulative and thorough revision and over-learning. The emphasis of this programme is on 'patterns' rather than on 'rules' (where 'rule' is understood to mean the learning by heart of some formula prescribed by the teacher). The programme is divided into two parts.

The first part is organised into six sections, described in the programme as follows:

*Section 1*: This section is concerned with the sounds of the single letters and the structure of single-syllable words; as a result it necessarily involves words containing short vowels and the spelling practices associated with them.

At the start the sounds of all the consonants are taught, including *y, qu*, and the hard sounds of *c* and *g*, and afterwards the five short vowels ă, ĕ, ĭ, ŏ, ŭ,. Once the children are familiar with the consonants and the short vowels, three letter words which contain two consonants and a short vowel in the middle (e.g. *cat, bat*) are introduced and the children are required to read, copy and spell them to dictation. Whole sentences containing words with short vowels only (plus *a* and *the*) can be given for children to read or can be dictated to them for spelling (e.g. *The cat bit the dog*. and *Tom and Meg had a pet rat*.)

The programme continues with the introduction of consonant digraphs *(th, sh, ch)*, plus *wh* for the word *when* and combination *qu*. Consonant blends of two and three consonants (e.g. *st, spl*) and also digraph and blend (e.g. *thr*) follow and need to be practised over a long period, on the ground that dyslexics are inclined to omit a consonant in a consonant cluster.

After the above, one-syllable words which double their last letter are introduced (e.g. *full, miss*) and also polysyllabic words in which a letter is doubled (e.g. *hopping, little*).

These are followed by plurals (e.g. *clocks, boxes, horses*); *'w'* words, that is, words beginning with *w*, where the vowel which follows (an *a* or *o*) has a different pronunciation from the usual short vowel sound (e.g. *was, want, what*); *'l'* words, that is, words with a single vowel in them but with an *l* immediately after it which again leads to an unusual pronunciation of the vowels (e.g. as in: *all, wall, old, cold, talk, walk*); long single vowels (e.g. *find, child, most, post*); broader *a*, *o* and *u* sounds (e.g. *pass, glass, bath, task, father*), and finally *ar, or* and *er* - including the *-ve* endings- (e.g. *car, farm, form, pork, herd, serve*).

*Section 2:* This section shifts to the commonest long vowel patterns, including the final *e* pattern, vowel digraphs, and combinations of a vowel and *w* or *y* serving a similar function.

*Section 3*: The third section supplies a basic checklist of irregular words which will be taught gradually, with suggestions on how to group them.

*Section 4*: This section continues from Section Two with more patterns (e.g. *-ight, -ir, -ur*) and some less regular ones involving silent consonants (e.g. *-ought, -aught, and -ough*).

*Section 5*: The fifth section deals with silent consonant patterns and with the less common sound correspondences of some two-consonant combinations (e.g. *wh, ch*=/k/, *ch*=/ʃ/, *sh* etc.).

*Section 6*: This section is concerned with word endings, including common grammatical endings (e.g. -ing, -ed), and the changes to root words that sometimes have

to be made when these are added.

The second part of the programme is called *The Secondary School Approach* and is intended for children aged 11 and over. This part includes both the patterns taught in Part I though rather in polysyllabic than in single words, and also the more difficult or confusing spelling patterns. A syllabus which is suggested by the author for teaching older dyslexics might comprise: consolidation of basic work in Part 1 of the syllabus with polysyllabic vocabulary as provided in the programme; alternative single-letter and two-letter spellings of consonant sounds (*s, ce*, etc.); plurals; clear enunciation of words in speech and recognition of their grammatical function before anything is written down; doubling (e.g. *hopping, hoping*); function of an *e* - when to keep an *e* and when to drop it when adding suffixes; syllabification and stress; open and closed syllables; word-building and roots, prefixes, suffixes and also more complex spelling patterns, for instance, similar sounding endings - (e.g. *-ind, -ined* and *-st, -ssed*), suffixes which are easily confused (e.g.*-ery, -ary, -ory* ; *-ent, -ant* ; *-able, -ible* ) and negative prefixes (*in-, il-, im-, ir-, un-* ).

It should be noted that there is no set order for teaching this programme and that the vocabulary which is introduced can vary according to the needs of individual pupils. Consequently, much of the section is intended as a resource for teachers to draw on.

To summarise what has been written so far, the English teaching programmes for dyslexics put the emphasis on the learning of letter-sound associations (grapheme-to-phoneme correspondence rules) in the first place. They train children to recognise individual letters accurately, and then train them to read syllables and whole words. Thereafter the spelling rules and the regularities and irregularities of the writing system are taught systematically and in small steps.

### 2.2.5 The *Simultaneous Oral Spelling (SOS)* technique

A teaching technique which is sometimes used in multisensory programmes is that of *Simultaneous Oral Spelling (SOS)*. This technique was invented by Gillingham and Stillman and is presented in an improved version by Bradley who also provided research evidence about the effectiveness of this method in teaching English spelling (Bradley, 1981, see also Bryant and Bradley, 1988).

According to this technique, the teacher says the word and the child repeats the sound; then the child names the letters, writes the word naming each letter as he writes, and then repeats the word.

### 2.2.6 The *Edith Norrie Letter Case*

The *Edith Norrie Case* (obtainable from the Helen Arkell Centre[2]) is a box which contains cards on which are printed separate letters of the alphabet, digraphs and punctuation marks. It also contains a small mirror in which children can watch their own mouth movements.

The letters are categorised in relation to articulation rather than alphabetically; there is colour-coding for voiced and non-voiced sounds and for vowels; for example the letters which represent vowel sounds are coloured red. Children learn that there must be at least one vowel (red letter) in every word or syllable. Consonants are divided into three groups, dental, labial and palatal, each occupying a separate section of the box.

Children are shown how to produce each sound and can see by watching their mouths into which group a sound falls. The mirror helps them to learn whether a sound is produced by the lips, the tip of the tongue or the back of the throat. Thus there need be no confusion between *b* and *d* since the former is labial and the latter is dental. The

---

[2] Helen Arkell Dyslexia Centre, Frensham, Surrey, GU10 3BN.

overall aim is to make the children consciously aware of their own speech processes.

In a typical training programme, for instance that described by Thomson and Watkins (1990), the children start with phonetically regular words and short sentences. They spell out the sentences by taking letters from the box; the teacher helps them and corrects their errors by encouraging them to say the mistaken words again while looking at their lips in the mirror in order to find out whether the particular sounds are dentals, labials etc.. It is also possible to ask them questions about the type and the number of the sounds and syllables - for example: 'How many red letters (vowels) or green letters (voiced consonants), or black letters (unvoiced consonants) do you hear in that word?' or 'How many syllables are there in that word?'

Further details about the Edith Norrie Letter Case will be found in Naidoo (1981) and in Thomson and Watkins (1990). It is not a 'programme' in the strict sense but rather a tool which can be used for a number of different purposes.

### 2.2.7 The *Fernald tracing technique*

Another technique which is used in English speaking countries is the *Fernald tracing technique.* This technique emphasizes the importance in spelling of calling attention to writing movements. Children, as they write the word, trace the letters so as to develop a kind of 'motor' or 'kinaesthetic' memory for them.

The description which follows is taken from Thomson and Watkins (1990).

*Stage 1:* The word is written with a wax crayon. The child traces over the word saying each part of the word aloud. He repeats this many times until he is able to write the word without looking at it. The same procedure is followed until the child has been taught many words and has made his own book - a word file - which will contain all the taught words.

*Stage 2*: This is the same as Stage 1 but tracing is no longer necessary. The children stop tracing when it appears that they are able to learn without it - it should be

dropped gradually. They learn new words by looking at them, saying them over to themselves as they look, and writing them without looking at the copy, again saying each part of the word as they write it.

*Stage 3*: At this stage the children learn directly from the printed words without having them written for them. They merely look at them and say them to themselves before writing them.

Although the *Fernald tracing technique* involves a multisensory approach because of the use of the visual, auditory, tactile and kinesthetic modalities in teaching spelling, it differs from the programmes described earlier in this chapter in that it is in effect a 'whole-word' teaching method. That is to say, it helps the children to remember the spelling of whole words without requiring them to produce a phonological analysis of the word.

## 2.3 The *Lyn Wendon* pictorial method

Another way of introducing the letters is that devised by Lyn Wendon (undated; see also Naidoo, 1991). She developed a technique of creating a picture from the shape of the letter, and this is used in her programme as an aid for introducing the phonemes which go to make up English words. For example, she draws the picture of a duck on the shape of the letter *d* because the initial sound of the word *duck* is a /d/. Similarly, she has created a picture for the regular sound of every English letter. The picture may represent a person (e.g. *king* for letter *k*) or an animal (e.g. *snake* for letter *s*), the name of which begin with that particular phoneme of the depicted letter. This helps children to link the shape of a particular letter with its sound. For example, dyslexic children who usually confuse the sound of the letter *d* with the sound of the letter *b* can be helped to remember its sound by recalling the picture of the duck when they see it in words such as *dad, bad, bed, red, read, bread*, etc. This helps them to read these words correctly. In addition, when they hear the sound /d/ in a dictated word they remember that /d/ is the initial sound of the word *duck* and thus they recall the letter *d* as being a part of the presented picture

of a duck.

Superficially, the *Lyn Wendon* method, since it involves the use of pictures, may seem to bear some resemblance to the 'pictographic' method used in the present study. However, as will be seen in chapter 11, the two methods are different in a number of important ways.

## 2.4 Evidence regarding the efficiency of phonic-multisensory methods

Although practising teachers of dyslexics in English-speaking countries have been convinced over many decades that phonic multisensory techniques are effective, there is a relative dearth of research studies which present hard evidence. However, a few such studies exist and they will be reviewed briefly.

Hornsby and Miles, (1980) presented results for 107 children with reading and spelling problems who were taught by methods which the authors describe as 'dyslexia-centered' since they were devised specifically with the needs of dyslexic children in mind. Research was carried out at three different centres. At Centre A (which was a clinic attached to a hospital) the book which formed the basis of the teaching programme was Hornsby and Shear (1977); at Centre B (which was a unit attached to a university department) a syllabus was used which involved extensions and adaptations of Miles, T. R. (1970) and Miles and Miles (1975), while at Centre C (which was a centre organised on a private basis) the teaching was based primarily on Hickey (1977). Also in use were the Gill Cotterell (1969) *Check List of Basic Sounds* and the *Edith Norrie Letter Case*. Comparisons were made in the case of each child between the rate of gain *before teaching* and the rate of gain *during teaching*. Whatever the child's age the *during teaching* rate of gain came out in almost all cases as much higher than the *before teaching* rate of gain.

There is also evidence on the effectiveness of the *Simultaneous Oral Spelling (SOS)* method and on the necessity of teaching by all its three different components

which are: 1) the activity of seeing and repeating the word 2) the activity of spelling out the letters and 3) the writing activity. It was found that the effectiveness of the SOS method when it is applied by using all its three components is significantly better than teaching by omitting either the activity of spelling out the letters as they are written, or the activity of writing the word (Bradley, 1981; see also Bryant and Bradley, 1988).

In addition, evidence for the effectiveness of the multisensory method comes from a single-case study reported by Goulandris, (1994) in which the multisensory approach was compared with a 'visual' approach. The study lasted over a 14-week period, phase 1 comprising 3 weeks' multisensory training followed by 3 weeks' 'visual' training, and phase 2, after a 2 week gap, comprising 3 weeks' 'visual' training followed by 3 weeks' multisensory training. When the visual approach was used words were taught simply as single entities to be memorised, without the pupil being shown anything about how they might be segmented into their components. In the multisensory approach he was required to divide the words into phonological units, such as syllables, onset and rime, or phonemes, and to carry out single tracing of the separate letters. Although the authors are cautious in generalising from this study they are in no doubt that, in EB's case at least, the multisensory procedure 'was particularly effective'. (Goulandris, 1994, p.621).

These systematic studies suggest that the methods commonly used by practising teachers are along the right lines.

.

# CHAPTER 3

# DYSLEXIA AND THE GREEK LANGUAGE

The programmes discussed in the last chapter were devised for children who were English-speaking. It by no means follows, however, that such programmes can simply be taken over and applied to the Greek language. It has already been noted that dyslexia takes different forms in different countries according to the kind of writing system used and according to the transparency or otherwise of the language. This chapter will be concerned with the Greek writing system and with the ways in which reading and spelling are taught to Greek children.

## *3.1 The orthography of the Greek language*

The Greek alphabet has twenty-five letters. During the first two months of the first grade of Primary School, Greek children are taught the twenty-five letters in association with their regular sounds. These letters with their regular sounds are as follows.[3]

| | | | | | |
|---|---|---|---|---|---|
| α /a/ | β /v/ | γ /γ/ | δ /ð/ | ε /e/ | ζ /z/ |
| η /i/ | θ /θ/ | ι /i/ | κ /k/ | λ /l/ | μ /m/ |
| ν /n/ | ξ /ks/ | ο /o/ | π /p/ | ρ /r/ | σ /s/ |
| ς /s/ | τ /t/ | υ /i/ | φ /f/ | χ /x/ | ψ /ps/ |
| ω /o/ | | | | | |

In addition, some of the Greek letters are combined to form *digraphs* or

[3] No attempt will be made in this thesis to set out the sound system of the Greek language. This is complicated and since it is easily 'picked up' by Greek children, it is irrelevant to the teaching of spelling.

*combinations*. 'Digraphs' are graphemes which consist of two vowel-letters which when combined correspond to only one vowel-sound; the word 'combination' refers to a sound make up of a vowel and a consonant but written as either *αυ* /af/ /av/ or *ευ* /ef/ /ev/. The digraphs and the combinations of the Greek language are the following:

Digraphs: *αι* /e/, *ει* /i/, *οι* /i/, *ου* /u/

Combinations: *αυ* /af/ /av/, *ευ* /ef/ /ev/

In general there is a regular grapheme-to-phoneme correspondence. However, as can be seen from the above list there are some sounds which can be represented by more than one letter or digraph.

The sounds which are represented by more than one grapheme (letter or digraph) are the following:

- /i/ is represented by five graphemes: *ι, η, υ, ει οι.*
- /o/ is represented by two graphemes: *ο, ω*.
- /e/ is represented by two graphemes: *ε, αι.*
- consonant sounds are represented by either one or two consonants (e.g. *μ* or *μμ*). Double consonants are normally pronounced as if they were single; an exception is *γγ* which is pronounced /g/ instead of /ɣ/ which is the normal sound of the letter *γ*.

The alternative letters which represent the same sounds will be referred to in what follows as 'ambiguous' letters. Similarly, the Greek words whose phonemes can be represented by more than one letter will be called 'ambiguous' words.

'Ambiguous' was chosen in place of the word 'irregular' since the relationship between a letter or a digraph of the Greek alphabet and its sound is, indeed, regular, whereas 'ambiguous' is intended to imply uncertainty as to the choice of letter. These ambiguous letters cause problems to Greek children because it is difficult to decide which of them should be chosen in a particular word. That is why they need to be taught by a special method.

The inconsistencies occur because through the centuries the pronunciation of some phonemes has changed while the letters which represent them remained the same. Thus

modern Greek spelling has lost some of its phonetic character, and is represented by a system of 'historic orthography' that reflects the etymology of words rather than their phonetic components. Since each letter is consistent in its pronunciation - for example the letter η /i/ is always pronounced in the same way - it follows that modern Greek is easier to read than to spell. For Greek dyslexic pupils in particular the problem is not that of reading but of spelling.

## *3.2 Phonological and visual factors in children's reading and spelling of Greek.*

Although there are few studies which deal with the cognitive analysis of reading and spelling aspects of the Greek language, there are some studies by Porpodas (1989, 1990) which have shown the role of phonological and visual factors in children's reading and spelling of Greek.

The first of these studies explored the role of phonology in early reading. Good and poor readers were required to read four different stories. There were four experimental conditions. In the first condition the text was typed in a mixture of upper and lower case letters, with the result that it was distorted but phonetically correct. In the second condition all the words of the text were written in lower case and phonetically correct but misspelled because of the use of alternative representations of the sounds contained in the words. In the third condition the words were again written in lower case but were phonetically incorrect and also misspelled because of the replacement of some of the letters with others which were visually similar to the correct ones. In addition there was another condition, the 'normal' one, in which the correct versions of the texts were typed. Each child was required to read aloud the four texts, the time taken being measured in seconds.

It was found that both the good and the poor readers had more difficulty with the

distorted texts than the normal text. It was also found that beginner readers, irrespective of their achievement, needed less time to read the distorted texts which were phonetically correct (although they were written either in a mixture of upper and lower case letters or with the wrong representations of the correct sounds), than to read the phonetically incorrect text which was written in letters visually similar to the correct ones. These findings may indicate that Greek children depend more on phonological cues in their early stages of learning to read than on orthographic cues.

However, this reliance seems to change over time so that good readers of the 4th Primary grade are likely to recognize words not only on the basis of phonological but also of visual information. This claim is based on a study of Porpodas (1990) in which Greek children of Primary-4th grade were required to read and spell a list of words and a list of non-words so as to make possible a qualitative analysis of their errors. Specifically the children were subdivided into three groups of 12 (1st group: good readers-good spellers, 2nd group: good readers-poor spellers, 3rd group: poor readers-poor spellers). The word list contained 24 orthographically regular and 24 orthographically ambiguous words. The non-word list contained 48 pronounceable non-words which were derived from the regular and ambiguous words by changing the initial consonant.

It was found that the great majority of the spelling errors which were made in the ambiguous words were phonetically accurate. Specifically, the percentage of the phonetically accurate misspellings for the group of the good readers good spellers was 100%; for the good readers poor spellers it was 98%, and for the poor readers poor spellers it was 84%. This may indicate that all the 4th grade good readers, and also the majority of the poor spellers, have reached a good enough level of phonological awareness to enable them to spell words phonetically accurately.

It was also found that the good readers (either the good readers good spellers or the good readers poor spellers) were able to read both the regular and the ambiguous words equally well. This result is in line with those reported by Backman and colleagues

(cited in Porpodas, 1989)[4] according to which good readers of English recognize words on a visual basis by 4th grade. In contrast, the Greek poor readers were found to read the regular words better than the ambiguous ones.

It could be suggested, therefore, that by the 4th grade of Primary School the Greek good readers may have overcome their dependence on phonological information and may have reached a stage of equal efficiency in the use of visual and phonological strategies in reading.

As for the poor readers it could be suggested that they overcome the most serious of their phonological difficulties by the time they get to the 4th grade - since they can spell in a way which is phonetically accurate - but that they still rely mainly on a knowledge of letter-sound correspondence. It is incorrect, however, to assume that no Greek children aged 9 or over have phonological problems. Porpodas' (1990) figure of 84% implies that 16% still make phonological errors. More research is needed to check what percentage of Greek children at different ages continue to make such errors.

Thus it seems that Greek poor spellers of the 4th Primary grade may need a special teaching method for spelling because their cognitive deficits in verbal memory prevent them from using the ordinary teaching methods which are followed by their teachers. It is possible that a phonic approach alone which helps children to acquire grapheme-phoneme translation skills may not be important or necessary in the development of spelling skills after the 4th Primary grade. What they need instead is a way of helping them to memorise ambiguous spelling patterns.

## *3.3 Greek methods for teaching reading and spelling to dyslexics*

The method which is widely followed in teaching early reading and spelling in the first grade of the Greek Primary School, and which is officially introduced by the Greek

[4] It has not been possible to consult the original article.

National Curriculum, is actually a phonic one. It is based in the first place on the teaching of the individual letters and their sounds, and afterwards on the introduction of all the possible syllabic patterns.

The Greek letters are taught one by one. Immediately after the teaching of each letter, the syllables of the type consonant-vowel (CV) (e.g. *βα* /va/, *βι* /vi/) are introduced. Afterwards words of any length, sentences and small pieces of text which contain the taught syllables are given to the children either for reading or for spelling. When they are able to recognise all the letters in relation to their sounds and to read and spell words of the CV type all the consonant strings (e.g. CCV like *βρα* /vra/, and CCCV like *στρο* /stro/) and all the rest of the syllabic patterns as well, are taught to them by the use of specially constructed texts. In addition, a whole-word approach is used, although not very often, in teaching some very common words which contain vowel digraphs (e.g. *και* /ke/ = *and*, *είναι* /ine/ = *is*).

For the purpose of teaching early reading and spelling, especially to the dyslexic children, because of the lack of studies of the effectiveness of different approaches, the methods are based on the teachers' initiative and inventive attitude. They have adopted the phonic teaching methods and the multisensory techniques which are used successfully in English-speaking countries, although with certain modifications which have been suggested by the present author. Examples of such modifications will be found in Mavrommati (1995).

The details are as follows. When the sounds of the separate letters have been learned, the children are taught to synthesize two letters, viz. a consonant and a vowel (CV), into one syllable (e.g. *β* + *α* = *βα* /v/ + /a/ = /va/ ). All spelling patterns of this kind are systematically presented and taught one by one.

Next, the words comprising two syllables of this kind , that is words of the type CV-CV[5] (e.g. *μή* - *λο* = *μήλο* /mi/ - /lo/ = /milo/ : apple) are taught. The children are given cards with the words written on them and are required to read them aloud many

[5] In the pages which follow dashes are used in words of more than one syllable to mark the division between the syllables.

times. This enables them to become familiar with the spelling pattern and to acquire automaticity in reading them. Texts and sentences are not given to the children until the words of this particular type can be read fluently.

When children have achieved accuracy and speed in reading and spelling the CV-CV words, they are taught three-syllable words of the CV-CV-CV pattern and then four-syllable words of the type CV-CV-CV-CV (e.g. *κα-ρά-βι* = *καράβι* /ka/-/ra/-/vi/ = /karavi/: ship, and *πα-ρά-θυ-ρο* = *παράθυρο* /pa/-/ra/-/θi/-/ro/ = /paraθiro/: window).

After words of the above type have been taught, a new spelling pattern is introduced, comprising two consonant sounds and one vowel sound (CCV such as *βρα* /vra/). In the same way as was done for the CV syllabic pattern, all the spelling patterns of the CCV kind are systematically presented and taught. The two-syllable words which contain the new spelling pattern and the already learned CV pattern are then taught. These are divided into two groups which are introduced separately. The first group consists of words of the type CCV-CV (*βρο-χή* = *βροχή* /vro.-/xi/ = /vroxi/ : rain) which contain the new pattern in the first syllable of the word; the second group consists of words of the type CV-CCV (*πά-στα* = *πάστα* /pa/-/sta/ = /pasta/: sweet) which contain the new pattern in the last syllable of the word.

Afterwards, the three-syllable words which contain the new spelling pattern (CCV) are taught. These words are divided into three groups according to the position of the syllabic pattern and they are presented to the children separately. The first group consists of words which contain the new pattern in their first syllable; the second group consists of words which contain the new pattern in their second (middle) syllable, and the third group consists of words which contain the pattern in their third (last) syllable. All the other syllables of the words are of the type CV which was learned before the presentation of the CCV words; and four-syllable words containing the CCV syllabic pattern are taught in the same way. The same procedure is followed until gradually all types of syllabic patterns and the words containing them have been systematically taught (Mavrommati, 1995).

According to their teachers' reports the dyslexic children of the first and the

second Primary grade who are taught by the above method become able to apply grapheme-phoneme conversion rules correctly and achieve an adequate level of reading both regular and ambiguous words, i.e. words which can be represented by many alternatives. They also develop their spelling skills and become able to spell words in a phonetically correct way.

The above teaching programme, however, cannot cope with the teaching of spelling of ambiguous words. This is because there are many alternatives for representing the vowel sounds, and some words in which a single consonant sound is represented by two identical consonants. As a result, learning by a phonic approach is by no means easy.

The present practice is that ambiguous words are taught by multisensory methods. Various activities are used for this purpose; for instance the children are required to write the words using different colours of pen, to draw the appropriate letters on the blackboard or on the floor with pieces of chalk, to trace the letters with their finger, to 'write' them on a surface covered with rice or sand, or to say them aloud one by one.

In addition to the multisensory method there are two additional methods. These are the pictographic and the linguistic methods. They were both introduced by the present author (Mavrommati, 1995). The pictographic method is based on teaching spelling by representing the ambiguous letters in a word by means of pictograms (pictures) (see chapter 4 for details); each pictogram is made to fit to the shape of the letter and the meaning of the word. In the case of the linguistic method (so named because of its basis in modern linguistics) the words are analysed not into syllables or phonemes but into their component morphemes. In the first place there is the root morpheme, for example the morpheme *μαθ-* which provides the root for a number of other words - *μάθημα* (lesson), *μαθηματικά* (mathematics), etc.. Secondary there are derivational morphemes. The derivational morphemes form the derivatives of the original words and are always in the part of the word between the root morpheme and the grammatical ending/morpheme of the word. They are shared by different root morphemes: for example the derivational morpheme *-ημ-* occur not only in *μάθ-ημ-α* and *μαθ-ημ-ατ-ικ-ά* but in many other word families too, e.g. *ερώτ-ημ-α* (question), *φύσ-ημ-α*

(blowing), *πήδ-ημ-α* (jump), etc.. They are called 'derivational morphemes' because they form the derivatives of the root morphemes; thus *μαθ-ημ-ατικά* and *μάθ-ημ-α* derive from the root morpheme *-μάθ-* . Since the orthography not only of the root morphemes but also of the derivational morphemes is consistent, learning how to analyse the words into their morphemes helps the child to learn the associations between the meaning of the morphemes and their spelling. If the children are aware of these relationships they will be helped in the spelling of unknown words by analogy with familiar ones. They are not required to remember the linguistic terms 'morpheme', 'root-morpheme', 'derivational morpheme' and 'grammatical morpheme'; their meaning is explained by providing many examples and the children are expected only to be able to recognise their presence in words. They are first taught how to identify and separate the root-morpheme of the word from the remaining part. When they acquire fluency at this task, they learn how to analyse the remaining part into its component morphemes, namely the derivational morpheme and the grammatical morpheme.

Use of the pictographic and linguistic methods in conjunction has the following aims:

I) that of helping children to memorise the spelling of the root and derivational morphemes of the words by depicting their ambiguous letters (pictographic method)

II) that of teaching the spelling rules for the grammatical morphemes (grammatical endings) of the words (linguistic method)

III) that of teaching meaning-spelling associations. This can help children to think of and produce derivatives and compounds of the words which were taught by the use of pictograms. It can also help them to understand the semantic relationship between the words of a word family (linguistic method).

IV) that of teaching how to analyse the words into their component morphemes. This can help children to understand the etymological origin of the words and thus to spell correctly the root and the derivational morphemes which have been learned by the use of pictograms (linguistic method).

The personal observations of the present author and those of her colleagues who

have specialised in the teaching of dyslexic children suggested that this combination of the pictographic and the linguistic method is very effective.

However, it seemed possible that their apparent effectiveness in conjunction was in fact dependent largely on the effectiveness of the pictographic method. The linguistic method might, indeed, enable the children to learn that members of the same word family were all spelled in the same way; what it could not do was help the children remember which letters had to be used from the possible alternatives. What was necessary, therefore, was to check on the effectiveness of the pictographic method on its own in isolation from the linguistic method. As will be seen in the next chapter, this was the basic idea which gave rise to the present study.

# CHAPTER 4

# THE THEORETICAL BACKGROUND OF THE PICTOGRAPHIC METHOD

As has been pointed out, because of the special nature of the Greek writing system Greek children need not only to acquire phonological skills but also to be able to memorise the visual characteristics of the spelling patterns. Only when they have achieved the latter they will be able to spell ambiguous words. However, dyslexics have difficulty in memorising spelling patterns because of their verbal memory deficits.

Now there is striking research evidence which suggests that verbal recall is significantly higher when the items are presented as pictures rather than as printed words (Paivio, 1991). Paivio's studies have provided confirmation that the use of pictures functions as an alternative or supplementary way of remembering which enhances the probability of correct recall of words and thus can be very effective when the number of words to be recalled is large. This conclusion has been supported by his experiments in which the functions of non-verbal and verbal memory representations in the free recall of pictures and printed words (nouns) were investigated under several different conditions. Paivio's special interest was in the study of mental imagery. Additionally, however, some of his findings are relevant to the present thesis since many of his experiments involved the memorisation of pictorial material in comparison with verbal material. Although his research was carried out in English there is no reason to think that generalisation to other languages is inappropriate.

The following experiment (one of a series in which he was systematically studying memory mechanisms) illustrates the kind of way in which his conclusions were reached. The participants in this study were 142 undergraduates who were attending a university

summer school. The stimuli were 72 written words representing concrete objects, 72 abstract words, also in written form, and 72 pictures. Words and pictures were presented for one sixteenth of a second, the remainder of a 5-second interval before the next presentation being available for them to write the word or the label for the picture in a booklet. These booklets were then removed and fresh booklets were issued in which they were asked to record in writing as many of the words or picture-labels as they could. Three different types of recall procedure were used: in the first place there was the traditional 'free recall' condition in which the participants were free to write down the words in any order; secondly there was the 'intentional' condition in which other participants were warned that they would be asked to recall items at a later date, and thirdly there was the 'incidental' condition in which a third group of participants were given no additional instructions. There was thus a 3 x 3 design - three different types of stimulus and three different conditions; each of the 142 participants was allocated to one of the 9 cells, the numbers in each cell varying between 9 and 16.

Recall increased systematically from abstract words to concrete words to pictures, and this result held up in the 'free recall', 'intentional' and 'incidental' conditions. In another experiment it was found that there was good recall when pictures were presented and the participants were required to draw them or write the name, and that there was also good recall when they were presented with a word and had to draw a picture of the object named by the word. In contrast, when they were presented with a word and had simply to write it down recall was much worse.

In another experiment it was found that the number of written words recalled was about one-half of the number of words corresponding to pictures. From this result Paivio concludes that 'one exposure to a picture is generally worth two to a word' (Paivio, 1991, pp. 85-88).

In general, Paivio's research provides strong confirmation that recall of individual items is greater if they are expressed in the form of pictures than if they are expressed in the form of words.

The research findings about picture superiority in free recall, combined with the

findings about dyslexics' different responses to verbal and non-verbal information, raised the question of whether the presence of pictures could help children - and dyslexic children in particular - to memorise not only the words but also the visual characteristics of them, that is, their spelling. If such pictures were to be used, they would need to be specially designed so as to remind the children of the shape of the ambiguous letters and thus the correct letters from the possible alternatives.

It was important, however, to take into account the possibility that dyslexics' naming difficulties might affect not only their memorisation of words but also their memorisation of pictures, since in some context pictures have to be named. It was therefore necessary to devise a technique which would circumvent problems caused by dyslexics' naming difficulties. To achieve this it was necessary for the ambiguous letters to be depicted either as the object which is described by the meaning of the word - so that the word itself would remind the children of the drawn pictogram - or as a very familiar object.

In addition, to circumvent possible difficulties which the children might have in remembering the pictograms when a large number of them had been taught, these pictograms had to remain constant; that is, one specific pictogram had to be created for each ambiguous letter.

It seemed to the present researcher that because of the difficulty of organising the pictograms into a system which would accord with all the above requirements what was needed was that the pictures should replace, not *all* the letters of the word but only the *ambiguous* letters. Thus each word would have to be written as a mixture of pictograms and alphabetic symbols. The sounds which are represented consistently by only one letter would be written alphabetically whereas the sounds which can be represented by more than one letter would be converted into pictograms and the pictograms would then take the place of the letters in the word's visual appearance. The Greek writing system would not therefore look like a purely alphabetic one, as it really is, but rather as what may be called a 'pictographic-alphabetic' system - a combination of pictograms and alphabetic letters.

The central idea behind the pictographic method was that the lack of transparency in the Greek spelling system could be compensated for if ambiguous letters in a word were replaced by pictograms. Instead of there being alternative ways of representing the same sound, there would be only one such representation - that appearing in the pictogram. In addition the pictogram would replace the alphabetic symbols by pictures, which are easier to remember.

Once this idea had been thought up, the next task was to invent suitable pictograms. As most of the spelling problems in Greek arise from the various vowel representations, the double consonants and the vowel-consonant combinations, such a conversion from letters to pictograms needed to be carried out only for these. It was also necessary for the pictograms to be very specific, that is, without the possibility of any alternatives. For this purpose pictograms had to be closely related both to the meaning of the words and to the shape of the depicted letters. The two following chapters will describe the most important phases in the development of the pictographic method as well as the rules according to which the letters were converted into pictograms. This development will be illustrated by means of examples.

# CHAPTER 5

# THE EXPLORATORY STUDIES (1989-1995)

## *5.1 Introduction*

The pictographic method was based partly on the author's experience as a teacher over fifteen years and partly on her theoretical knowledge about the difficulties of dyslexics in processing alphabetical symbols. The idea that a system for teaching spelling based on pictures might be particularly helpful for teaching the irregularities of Greek spelling to dyslexics was tried out in many exploratory studies which were conducted from 1989 to 1995.

Not all these exploratory studies are described in the present chapter. Eight of them, however, will be referred to. Although it is not suggested that any of them on their own lead to firm conclusions, each made a special contribution to the development of the pictographic method which was used in the main research. In addition it is hoped that the present chapter will convey some of the excitement experienced by the researcher as the pictographic method was gradually modified and refined.

From the experimental design of view the exploratory studies had many shortcomings: the children did not all start at the same spelling level; their numbers were mostly very small; each child was taught different words, and there were no adequate control procedures. At this stage however, the researcher was attempting to refine the materials rather than make any systematic comparison between the teaching methods.

The first five out of the eight exploratory studies which will be described in this chapter led to the final version of the pictographic method. This final version was based on the specification of rules according to which each ambiguous letter had to be

converted into a specific pictogram. As a result it was possible to create pictograms for 703 words. These words were afterwards tested in three more exploratory studies (the sixth, seventh, and eighth). The studies which were conducted before the final development of the method will be referred to as 'exploratory studies A' while the last three studies which tried out the final version of the pictographic method - which was also used in the main research- will be referred to as 'exploratory studies B'.

## *5.2 The creation of the first pictograms*

Taking into consideration the fact that the letters *ι, ο*, and **ε** are the most frequent and familiar vowel representations for the sounds /i/, /o/ and /e/ respectively (Zachos, 1991), it was decided to describe these as 'easy' letters and *not* to transform them into pictograms. It has been noted by teachers that because of the high frequency of *ι, ο*, and *ε* children find them familiar and therefore tend to choose them when the sounds /i/, /e/, /o/ have to be represented.

All the other letters or digraphs, that is, the rest of the ambiguous and irregular graphemes, were termed 'difficult', and these were the letters which had to be converted into pictograms.. The letters or digraphs which were finally decided on for depiction were as follows: *η, υ, ει, οι, αι* and *ω*. Also depicted were the pairs of identical consonants which carry the sound of a single consonant, viz. *ββ, γγ, κκ, λλ, μμ, νν, ππ, ρρ, σσ* and *ττ* and the combinations *αυ* and *ευ*.

The pictograms had to be closely related both to the meanings of the words and in particular to the shape of the letters which had to be depicted.

The visual appearance of the words had to become a mixture of pictograms and alphabetic symbols (the letters). This mixture of pictograms and letters which represents the meaning of the words will be referred to in what follows as a 'pictographic-alphabetic' representation of the words.

The method involves the conversion of the visual shape of the 'difficult' parts of

the words into pictographic-alphabetic representations. For convenience the word 'pictographic' (instead of the whole expression 'pictographic - alphabetic') will be used in what follows to describe both the representations of the 'difficult' words and the resultant method for teaching Greek spelling.

Twenty words, most of them concrete nouns, each containing one 'difficult' letter in its root-morpheme, made up the first list of words whose 'difficult' letters were to be converted into pictograms. The 'difficult' letters of these twenty words were depicted as objects which fitted the words' meaning. The list of these twenty words with their 'difficult' letters and their English translation will be found in Appendix 1. Their pictographic representations will be found in Appendix 19[6], table 19.1.

## *5.3 Exploratory studies A*

### 5.3.1 The first exploratory study

The aim of the first exploratory study was to investigate the effectiveness of learning by the pictographic method in comparison with learning by a combination of the more traditional teaching methods. These methods were the multisensory and linguistic methods (for details see chapter 3).

Two groups of pupils participated in the first exploratory study. The first group, taught by the pictographic method, consisted of nine children (mean age:130.1 months, sd 6.45). The second group, taught by the traditional methods, consisted of six children (mean age: 127.6 months, sd 5.49).

The list of the twenty words for which pictographic representations had been created was used with both groups as a spelling test. Most of these words were concrete nouns and all of them contained 'difficult' vowel representations that could be

[6] Presentation of all pictograms is deferred until Appendix 19.

transformed into the object referred to by the word-to-be-spelled.

The children of the first group were taught according to the following procedure. They were given the words one at a time, written in large letters on pieces of A4 sized white paper. They discussed their meanings and they looked at the 'difficult' letters contained in them; they were introduced to the idea of changing the ambiguous letters into pictograms and the rules of how to do so were explained to them (viz. that the pictograms had to be closely related both to the meaning of the words and to the shape of the 'difficult' letters). The researcher wrote the words on the blackboard and drew the pictograms on top of their 'difficult' letters. She also explained how to draw the pictograms. Afterwards she distributed to them pieces of A4 paper on which she had written the words with large and clear black letters. The children drew the same pictograms on the 'difficult' letters of the distributed words.

The children of the second group, taught by the traditional methods, had to carry out many activities that would help them to remember how the words were spelled. Specifically, the children of this group were taught in accordance with the following procedure. They were given the words one at a time written in large letters on pieces of A4 sized white paper. They were asked to write each word in letters of different colours and to trace them in the air with their fingers. They walked on the floor, following the direction in which the letters were written. They were asked to look at the words, to cover them, to write them out and then to uncover them and check their writing. They discussed the meaning of the words; they analysed them into their component morphemes; they put them in all their inflection types and they formed all the derivatives and the compound words which shared the same spelling parts with the words which they had to learn.

The children of the first group were taught the twenty words in three hourly sessions; the children of the second group were taught the same twenty words in ten hourly sessions. More lessons were given to the children of the second group because there were far more activities to carry out in order to teach them as effectively as possible by the traditional methods. No opportunities for revision were given, the children not being allowed to take their materials home.

A spelling test comprising these twenty words was given to both groups immediately after the last session of teaching, and a second test was given to them after an interval of one month. At the initial testing the children in the first group obtained a 100% success rate (twenty words correct out of twenty), whereas for those in the second group the mean number of words correctly spelled was only 5.8 (sd 1.86). One month later, when the list of the twenty words was dictated to the children, all the nine children in the first group were again able to spell correctly 100% of the words, whereas for the children of the second group the mean number of words correctly spelled was only 1.8 (sd 1.21). This difference in score (mean 1.8 words against mean 5.8 words correct) shows that the children in the second group had forgotten some of the words during the interval between the two tests. Details of the children's age and the number of correctly spelled words on the above two spelling tests will be found in Appendix 2.

Although the number of the children in the first exploratory study was small, its findings suggested that the pictographic method might, indeed, contribute to making spellings easier to remember. However, there was no great variety in the 'difficult' letters taught in this study (see Appendix 1) since there were thirteen *υ* 's, and the possibility had to be considered that the children produced the right answer without using the pictograms. It seems, however, that this could not have been so, since the difference between those taught by the pictographic method and those taught by the combination of traditional methods would in that case be hard to explain.

It was therefore decided to concentrate all efforts on the following targets:

a. To find pictographic representations for the 'difficult' spelling parts of as many Greek words as possible.

b. To try to find ways by which each pictographic representation could aid the memorisation of as many words as possible.

### 5.3.2 The second exploratory study

The basic aim of this study was to investigate whether children taught by the pictographic method were able to use their acquired knowledge of the spelling of the 'difficult' parts of the words and apply it in spelling the same 'difficult' parts in other words which belonged to the same word-family. The children of this study were the same nine children who had been taught by the pictographic method.

A list of 100 words was used as a spelling test. All of them were either derivatives or compound words of the twenty words which were taught in the first exploratory study and were selected at random from the total of derivatives and compounds of the original twenty words.

All the children spelled more than half of the 100 words correctly (mean: 74.4, sd 12.70). The number of the correctly spelled words for each child is given in Appendix 3. Although all the children scored highly on the derivatives' test the question arises as to possible reasons why some of these words were misspelled. A discussion with each one of the children showed that in all cases of misspelled words the relation of the derivatives and the compounds to the meaning of the original word which had been depicted had not been understood. The incorrect words were all related to the meaning of the original words not in a direct but in a 'metaphorical' sense . For example, the word *γυαλί* means 'glass', the material, but there are other 'metaphorical' senses, for instance *γυάλα* which means 'fish-bowl', and *γυαλίζω* which means 'polishing something so that it looks like glass'. Considering that the depicted 'difficult' parts of the words were all root-morphemes, the children's mistakes reflected their failure to grasp the semantic relationship between the depicted words and their derivatives.

### 5.3.3 The third exploratory study

As a result of the findings of the second exploratory study it was decided to introduce a third study in order to investigate the reasons why some of the derivatives had been spelled correctly while others had not. The children were the same nine children who had taken part in the second exploratory study.

These children were taught for five sessions in one week and required to concentrate on the meaning of the 100 words presented to them. They discussed either the direct or the metaphorical meaning of the words and devised sentences which used them. All the activities were conducted orally, so that they had no opportunity for revising the words' spellings.

One month after the teaching sessions all the nine children were given the same spelling test comprising the 100 words used in the second study. All of them wrote all the words correctly. It is therefore possible that the use of additional time spent in detailed teaching of the meaning of the derivatives and compounds is an effective way of improving children's spelling.

### 5.3.4 New targets for the next exploratory studies

A weakness of the three first studies was that the twenty words which had been taught by pictograms were all concrete nouns, mostly objects, and a further weakness was that their 'difficult' parts contained only two out of the five letters which represent the sound /i/. This arose because of the difficulty at that stage in inventing pictograms for the remaining vowel representations and the double consonants. Consequently it seemed desirable to attempt to find pictographic representations for a greater variety of 'difficult' words.

Pictographic representations were therefore created for the 'difficult' parts of eighty five new words. The 'difficult' part of the word comprised the root morpheme



U.W.B. LLYFRGELL U.W.B LIBRARY

which contained one 'difficult' letter in each word.

The twenty words for which pictographic representations had been created before the first exploratory study and the new eighty five words formed a list of 105 words which were used in the fourth exploratory study. A greater variety was included than in the words of the first three exploratory studies in respect of their 'difficult' letters and their grammatical type. These 105 words with their 'difficult' letters and their English translation will be found in Appendix 4. Their pictographic representations will be found in Appendix 19, table 19.2 . Details of their 'difficult' letters and their grammatical type will be found in the tables of Appendix 5.

### 5.3.5 The fourth exploratory study

Since the previous exploratory studies had suggested that the combination of the pictographic method and the linguistic method helped in learning the spelling of the words, the aim of the fourth study was to explore further this possibility. For this purpose, the spellings of the 105 words for which pictographic representations had been created were taught to twenty-one children. All of them were aged between nine and thirteen years and were students at the fourth, fifth and sixth grade of Primary School or the first and second grade of High School.

Five out of the twenty-one children were taught in a group; their mean age was 121 months (sd 14.65). The remaining sixteen children were taught individually; their mean age was 131.6 months (sd 10.49).

The 105 words for which pictograms had been created were given as a spelling test. Each child taught individually was required to learn the spelling of the words which he/she had misspelled. This meant that each child was taught different words, the number of words taught ranging from 84 to 105. The children taught in a group were all required to learn the words which everyone in the group had misspelled; these were found to be 64 in number. The number of teaching sessions varied according to the number of words

which each child had to be taught.

In the case of both the pictographic and the linguistic methods the following procedures were followed. The researcher presented the children with one word at a time and they discussed the meaning of the word. In the case of those taught individually each word was written on a piece of white paper; in the case of those taught as a group the words were written on the blackboard. The researcher drew the pictograms on the 'difficult' letters of the words. The children were required to draw the same pictograms on the written words which had been distributed to them. They analysed the words into their morphemes; they found all the words of the same word-family which shared the same 'difficult' parts as the words which they had drawn; they wrote a few of them in several inflections and they made up sentences which contained as many of them as possible.

A spelling test of the taught words was given to them after the end of their teaching programme. The mean of the number of the correctly spelled words in the case of the children who were taught in a group was 63.4 (99.06%), while in the case of the children who were taught individually it was 98.99% [7]. The children's age, the number of the misspelled words to be taught and of the correctly spelled words will be found in Appendix 6 .

In addition to the above spelling test, another spelling test was given. This test consisted of ten sentences which contained sixty derivatives of the forty three words which were found to be the words which had been misspelled by every child. The children taught in a group had a mean of 54.2 correctly spelled words (90.31%) (sd 2.31) while the children taught individually had a mean percentage of 93.53%. Details of the results will again be found in Appendix 6.

The findings of this study suggested that the combination of the pictographic and the linguistic method might be very effective. This, therefore, was something which need

---

[7] Because the children taught individually varied in the number of words which they were required to learn, a percentage figure, not a mean, is the appropriate measure.

to be tested by systematic research. There was also the opportunity for some interesting informal observations.

i. Although the teaching time and the number of the taught words varied between one child and another the results of the spelling tests were very similar.

ii. The children at the end of their programme were reported by their teachers to have improved their school performance and achieved progress not only in the language lesson but also in other areas (e.g. History, Environmental Studies, Physics). They also showed greater awareness of the way in which words are derived from others or can be combined so as to make new ones, and they had fewer difficulties with text comprehension.

iii. Another interesting point was that there were noticeable changes in the children's attitudes to spelling and to the requirements of having to study sentences for their spelling as homework. They used their imagination and attempted to create pictograms for the depiction of the ambiguous letters of the words which they had to learn. This last informal observation, in particular, led to a further exploratory study.

### 5.3.6 The fifth exploratory study

The aim of the fifth exploratory study was to investigate whether pictograms which had been created by the pupils themselves could help them with their spelling.

Two groups of children participated in this exploratory study, aged between ten and fourteen years. The first group consisted of three out of the five children who had been taught in a group during the fourth exploratory study (mean age 111.3 months, sd 11.08). The second group consisted of twelve out of the sixteen children who had been taught individually during the fourth exploratory study (mean age 129 months, sd 10.63). All of them had some experience of having been taught by pictograms.

A list of seventy words was used as a spelling test in order to find out which words

each child spelled wrongly. These words were different from those which had been dictated to them in the previous exploratory studies. They included a large variety both of 'difficult' letters and of grammatical types (not only concrete nouns but also abstract nouns, adjectives and adverbs). There was one 'difficult' letter in each of them.

The seventy words with their 'difficult' letters and their English translation will be found in Appendix 7 . Further information about the words' 'difficult' letters and grammatical types will be found in the tables of Appendix 8 .

All the children were tested on these seventy words. Since it was necessary for each individual to be taught all the words which he/she had misspelled each child-taught individually had to learn a different number of words, ranging from 53 to 66. Each child taught in a group had to learn the spelling of all words which every one in the group had misspelled; these were found to be 58 in number. The number of the teaching sessions varied according to the number of the words which each child had to be taught.

In the case of both the pictographic and the linguistic methods the same procedures were followed as those of the fourth exploratory study, the only exception being that the children were allowed to invent their own pictographic representations of the 'difficult' letters.

At the end of the teaching programme all the children took a final spelling test which consisted of all the words which they had been taught. Those taught in a group had a mean of 3 (5.17%) correctly spelled words (sd 1.63); the children taught individually had a mean percentage of 8.9% correctly spelled words. Details of the number of the misspelled words to be taught and the correctly spelled words in the spelling test will be found in the tables of Appendix 9.

A comparison of the findings of the fourth and the fifth exploratory studies showed that the two studies produced different results. The three children taught in a group had a mean percentage of 99.47% correctly spelled words in the spelling test of the fourth exploratory study, whereas they had only 5.17% in the spelling test of the fifth study. The twelve children taught individually had a mean percentage of 98.83% in the spelling test of the fourth study while their mean percentage in the spelling test of the

fifth study was only 8.09%. The question now arises as to whether the pictographic method was at fault, or whether the structure underlying the teaching programme was ultimately the decisive element.

Examination of the children's errors showed that they occurred in the case of words whose pictographic representations had been forgotten. In contrast, when the children remembered the pictograms drawn, whether by themselves or by the researcher, they also remembered the word's spelling. This seemed to indicate that pictograms could in principle be very helpful but that a method of producing them was needed such that the children would be able to remember them even a long time after the end of their teaching programme.

This need led to the specification of certain rules for the creation of pictograms. These rules are explained in chapter 6 and are demonstrated by the use of examples. Because of these rules, the creation of pictograms for 703 words was made possible (see Appendix 21). These pictograms were taught to a number of children in the sixth and the seventh exploratory studies so that they could be tested for their effectiveness. The resultant studies will be described in the next section.

## *5.4 Exploratory Studies B*

### 5.4.1 The sixth exploratory study

The aim of this exploratory study was to find out whether knowledge of the rules according to which the pictographic representations of the 703 words had been created could help children to remember both the pictograms which they drew and the 'difficult' spelling of the words themselves. For this new exploratory study it was decided to use the seventy words of the fifth study for which the pupils themselves had drawn pictograms with unsuccessful results.

A total of thirteen children participated in this study. They were all students at the

fifth and sixth grade of Primary School. Of these, six (mean age 132.5 months, sd 4.78) were taught in a group while the other seven (mean age 129 months, sd 4.50) were taught individually.

The list of the seventy 'difficult' words which had been used in the fifth exploratory study was also used in the present study as a spelling test. Those words which were incorrectly spelled would then constitute the words to be taught. Each child taught individually had to learn a different number of words; these varied from 59 to 67. The children taught in a group were required to learn the 51 words which every one in the group had misspelled. The number of the teaching sessions varied depending on the number of words each child had to be taught.

The teaching procedure was very similar to that followed in the first exploratory study. The investigator wrote the words either on the blackboard or in a piece of A4 white paper one at a time in very large letters. She drew pictograms on the ambiguous letters and she explained the meaning of the pictographic representation. The children discussed the story and the technique of converting the ambiguous letters into pictograms. They were taught the rules for depicting the ambiguous letters; afterwards they drew the same pictograms by themselves on the white pieces of paper which had been provided, the word being written in large letters.

Unlike the results of the fifth exploratory study the results of this study were striking. The children taught in a group achieved a mean of 47.3 (92.75%) correctly spelled words (sd 2.28); the children taught individually achieved a mean percentage of 94.4% correctly spelled words. Details of the children's age, number of the misspelled words to be taught and number of the correctly spelled words in the spelling test will be found in the tables of Appendix 10 .

A comparison between the results of the fifth and the sixth exploratory studies pointed to the fact that the rules devised were instrumental in the improved results. It seemed likely that the defect was not in the method itself; the failure almost certainly lay in the inability on the part of the children to construct suitable pictograms.

### 5.4.2 The seventh exploratory study

In view of the encouraging results of the sixth exploratory study it was imperative to find out whether the rules which were specified for depicting the 'difficult' letters could help children to remember the spelling of a larger number of 'difficult' words. For this purpose the children in this study were taught the spelling of the 703 words for which pictographic representations had been created (Appendix 21).

One hundred and twenty-four children aged from nine to nineteen years participated in this study. Some of them were Primary School students, some were High School students and one of them was an adult of nineteen years old (details of their ages will be found in the tables of Appendix 11).

The list of the 703 words was used as a spelling test in order to identify which were the words the spelling of which the children did not know. The 703 words were not dictated to them all at once but 100 words at a time. On each occasion the children were taught all the words out of the dictated 100 which they had misspelled; and afterwards they were given the next 100 of them and taught them until the whole list of the 703 words had been completed.

Sixteen of the 124 children were taught in two groups; the first consisting of 6 and the second of 10 children, while the remaining 108 (85 students of Primary School and 23 students of High School) were taught individually. Each child taught individually was taught the words which he/she had misspelled, while the children taught in a group were taught the words which every child had misspelled. The number of the teaching sessions varied according to the number of the words which had to be taught and the time which had been agreed with the child's parents for his/her participation in this study.

They were taught according to a procedure very similar to that of the first exploratory study. This was as follows.

They were given the words one at a time, written in large letters on white pieces of A4 sized paper. They discussed the meaning of them and they looked at their 'difficult' letters; they were introduced to the idea of changing the 'difficult' letters into

pictograms. They were not only told that the pictograms had to be closely related to the meaning of the words and to the shape of the 'difficult' letters but were also given all the rules that had been specified for their depiction. The researcher wrote the words on the blackboard and drew the pictograms on their 'difficult' letters. Afterwards the children drew the same pictograms on the 'difficult' letters of the words which had been given to them.

In the case of the Primary School children who had been taught in a group, the first group (mean age 130.6 months, sd 7.84) had a mean of 93.22% correctly spelled words, and the second group (mean age 132.5 months, sd 6.51) had a mean of 91.81% correctly spelled words. Those taught individually (81 pupils, mean age 126.93 months, sd 6.12) had a mean of 95.54 % correctly spelled words. The High School children were all taught individually (23 pupils, mean age 170.4 months, sd 23.98) and had a mean of 96.55% correctly spelled words. IQ figures of the Coloured Progressive Matrices test (Raven, 1962) were available for all 124 children. It was found that there were four pupils of Primary School with IQ less than 94 (mean age 134.25 months, sd 5.21, and mean IQ 85.5). These pupils had a mean percentage 72.77% of correctly spelled words. Details will be found in Appendix 11.

The present exploratory study provided further evidence of the effectiveness of the pictographic method. Another exploratory study was therefore devised, on a small scale, which aimed at comparing the pictographic method with traditional teaching methods in a more systematic way. The intention was that, provided possible difficulties were ironed out, this study would lead on to the main investigation.

Due to the smaller low percentage of correctly spelled words in the case of the pupils who had IQ<90, the IQ level was noted as something to be taken into account in the main experiment.

### 5.4.3 The eighth and final exploratory study

In this final exploratory study it was decided to try out on a small scale the experimental design which was planned for use in the main research.

Twenty children who were pupils at the fifth and the sixth grade of Primary School participated at this study. Ten of these children (mean age 125.2 months, sd 3.09) were taught the spelling of sixty 'difficult' words by the pictographic method and another ten (mean age 127.6 months, sd 7.69) were taught the spelling of the same sixty words by a combination of the multisensory and the linguistic method.

Since the purpose of this study was to test the experimental design of the main research, the selection of the children (out of a sample of 264 pupils) and of the sixty words which were to be taught to them (out of 100 'difficult' words - see Appendix 13) was done by following the same procedure as that of the main research. Details will be found in chapter 6.

The effectiveness of the pictographic method was confirmed on the basis of two spelling tests, one given immediately after the period of tuition, one a month later. The children taught by the pictographic method had a mean of 57.1 (sd 1.13) correctly spelled words out of 60 in the first spelling test, and 54.8 (sd 1.73) in the second. The children taught by the traditional methods had a mean of 17.5 (sd 3.82) correctly spelled words out of 60 in the first spelling test and 4.2 (sd 1.72) in the second. Thus on both tests those taught by the pictographic method obtained very much higher scores both immediately after tuition and one month later; in contrast, the other group showed an appreciable falling off (for details of individual scores see Appendix 12).

As a result of this final exploratory study it was decided that it was now safe to go ahead with experimentation on a larger scale and with strict controls. The only further requirement was the provision of another comparison group comprising children who would receive no teaching at all other than that given in the ordinary classroom. It was important to be sure that any gains in spelling score were not attributable simply to standard classroom teaching.

## *5.5 Conclusions from the exploratory studies*

The first three exploratory studies appeared to support the view that pictograms helped the children to remember the spelling of the taught words. They also suggested that teaching the associations between the spelling and the meaning of the words, as well as the way the words of a word-family derive from the original word, contributes to learning the spelling of all the words of the word family to which the depicted word belongs.

This combined teaching method was followed in the fourth exploratory study by teaching twenty-one children the spelling of 105 words for which pictograms had been invented. Their percentage of success was above 90% in all cases.

In the fifth exploratory study the children were asked to produce their own pictograms. The results in this case were very different, the success rate being less than 10%. It appeared that an important difference between the fourth and fifth exploratory studies was that in the fourth study the spelling-meaning associations and the derivatives of the depicted words were taught. This led the researcher to suppose that the pictographic method might in general make the greater contribution to the children's success but that in this case it had not been properly applied.

These thoughts led her from then on to test the pictographic method on its own and to specify distinctive ways for the depiction of letters. It was then possible to test these ways by inventing pictograms for the particular seventy words which had been taught to the children of the fifth exploratory study without success.

In the sixth exploratory study thirteen children were taught the spelling of these seventy words by the pictographic method alone, using the new pictograms. All the children had more than 90% correctly spelled words in the spelling test.

Since the developed pictographic method was effective for the 13 children of the sixth study it was applied in the seventh study to the teaching of 703 words to 124 children. The aim of this study was to test the effectiveness of the final version of the pictographic method on a larger number of children and with a larger number of words,

so as to be able to decide about possible changes in the words' pictographic representations before the main investigation was carried out. 120 out of the 124 children had above than 90% success in the final spelling test; however there was a small group consisted of 4 children whose IQ was lower (mean IQ=85.5, sd 5.36) than the rest (IQ>100) and these scored relatively lower than the other children with 72.77% success.

The eighth exploratory study was a kind of 'dress rehearsal' for the main research.



P.C.B. LLYFRGELL U.W.B LIBRARY

# CHAPTER 6

# THE FINAL VERSION OF THE PICTOGRAPHIC METHOD

## *6.1 Introduction*

In the light of the contradictory results of the fourth and the fifth exploratory studies the question arose as to whether there could be a way in which the pictographic method could be successful in the teaching not only of concrete words but also of abstract words, particularly when these contained a large variety of 'difficult' letters and grammatical types.

The above need led to the specification of rules for the production of pictograms. Since problems arise from the 'difficult' letters of the word's root-morphemes, it was these letters which had to be converted into pictographic representations. Grammatical morphemes usually contain very few 'difficult' letters and their spelling in almost all cases follows specific spelling rules the learning and application of which has been observed to be easy. It was therefore considered that the letters of the grammatical morphemes of the words did not have to be depicted.

It has to be remembered that the pictographic method is considered to be suitable for teaching spelling to children who have mastered the grapheme-phoneme and phoneme-grapheme conversion rules and who are able to produce spellings which, even if incorrect, are phonetically accurate. What remains afterwards is that these children have to learn how to spell the 'difficult' words by choosing the correct letters among the alternatives which represent the same sound.

The rules which were finally specified for the depiction of the 'difficult' letters will be explained and illustrated by means of a small number of examples. More details about the depiction of the words which were used either in the exploratory studies or in

the main research will be found in Appendices 17 and 18. The aim of these rules was to depict the 'difficult' letters with consistency. Details follow as to how exactly this was done.

## *6.2 Specification of rules*

### 6.2.1 The first rule

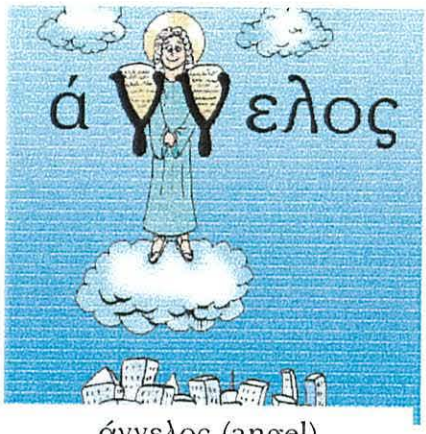
In cases where the 'difficult' letters of concrete words can be drawn exactly into the shape of the objects, faces, animals etc. which are described by the meaning of the words, then they are converted into these objects. For example letter *ω* which is the 'difficult' letter of the word *φωλιά* (nest) is depicted as a nest while the letters *γγ* which are the 'difficult' letters of the word *άγγελος* (angel) are depicted as an angel.

### 6.2.2 The second rule

Where words - either concrete or abstract - contain 'difficult' letters that cannot be transformed into pictograms of the objects or of the concepts referred to by the word, these letters are depicted as individuals (either men or women) in an imaginary role which is in keeping with the word's meaning. The method of their depiction will be illustrated by means of examples.

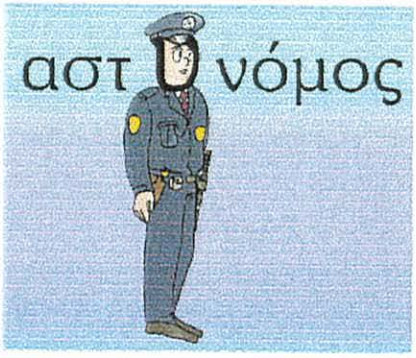
***i) The depiction of letter υ /i/*:** The 'difficult' letter *υ* /i/ is depicted as a man (or a boy) with short-cut hair. It is never depicted as a woman or a girl. For example in the word *φυσώ* (to blow) it is depicted as a boy who blows out the candle of his birthday cake, while in the word *αστυνόμος* (policeman) it is converted into a pictogram of a policeman.

φωλιά (nest)




άγγελος (angel)

φυσώ (to blow)




αστυνόμος (policeman)

***ii) The depiction of the letter η /i/***: This letter is depicted in two different ways:

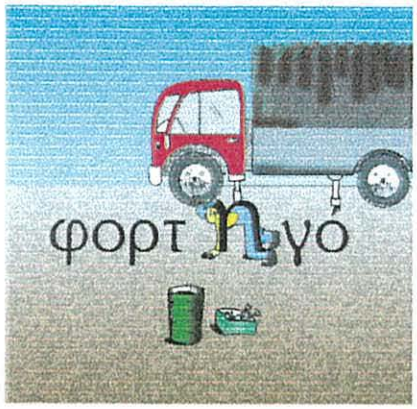
1) as a woman (or a girl) because the shape of the particular letter looks like the ponytail of a woman. It is never depicted as a man or a boy so as to ensure that it is not confused with the letter *υ* which represents the same sound. This way of depicting the letter *η* is illustrated in the examples which follow. It is converted into a pictogram of a pregnant woman in the word *μητέρα* (mother) and into a famous singer in the word *φήμη* (fame).

2) as a kneeling person because the shape of the letter reminds us of the curve of the back of a man or woman who is on his or her knees. Examples of this way of depicting letter *η* will also follow. It is depicted as the mechanic who is repairing the wheel of a van in the word *φορτηγό* (van) while in the word *κηπουρός* (gardener) is depicted as a gardener who is going to plant a tree.

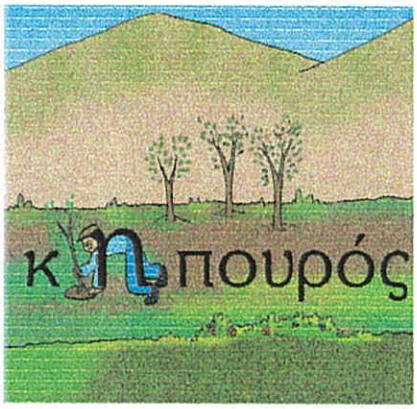
***iii) The depiction of the digraph ει /i/*** **:** A digraph is composed of two letters producing one sound. In that case both letters have to be converted into pictograms. The two pictograms have not only to be related to each other but also to be connected in such a way that the child remembers them as a whole. Thus the digraph *ει* /i/ is depicted as a person who is holding something in his hand which is necessary for him in order to do the job specified by the word; for example in the word *πεινάω* (to be hungry) it is depicted as a very hungry boy who is eating a huge sandwich and in the word *δουλειά* (work) as a working man who is holding a tool.

μητέρα (mother)

φήμη (fame)




φορτηγό (van)




κηπουρός (gardener)

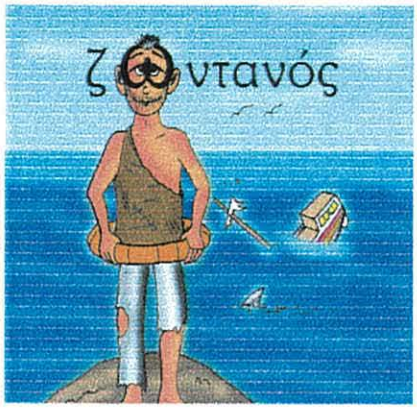
πεινάω (to be hungry)

δουλειά (work)

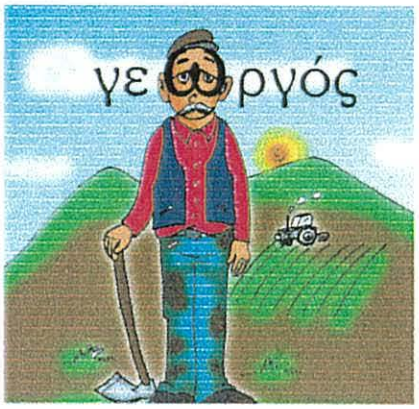
***iv) The depiction of the letter ω /o/*** **:** This letter is also converted into an individual in the way shown in the following examples. Since the letter *ο* /o/ is considered to be the 'easy' or regular way of representing the sound /o/, in contrast with the *ω* which is less frequent, it was not considered necessary to change this letter into a pictographic representation. It was assumed that if a pupil remembered that there was a pictogram in the place of an /o/ sound he had to conclude that it was the letter *ω*. As is demonstrated in the following examples, in the word *ζωντανός* (alive, survive) the letter *ω* is depicted as a man who survived from a wreck and now is alive on a small island waiting for help; in the word *γεωργός* (farmer) it is depicted as a farmer.

***v) The depiction of the digraph αι /e/*** **:** The sound /e/ is represented by either the letter *ε* or the digraph *αι*. Since the digraph was considered to be the 'difficult' representation the decision was made to depict it as an individual - a woman in most cases because of the line which is on the right side of the letter and which is depicted as the woman's hair. The woman (letter *α*) is holding something in her hand (letter *ι*) in agreement with the meaning of the word. There are also four words where the digraph *αι* is depicted as a man, in which case the man has long hair - for example see the pictogram of the *αι* in the word *γενναίος* = *brave* (in page 99).

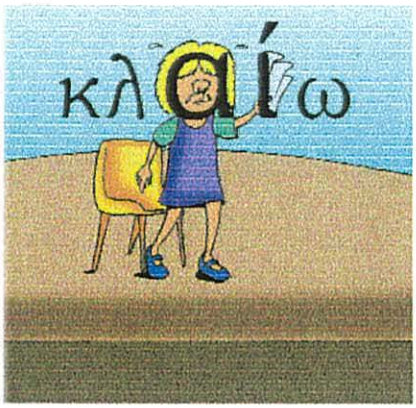
It was assumed that if the pupils remembered that there was a pictogram in the place of an /e/ sound it was necessary to write the digraph *αι*. Although both the letter *η* /i/ and the digraph *αι* /e/ are depicted as women, substitution errors between them are not possible as they represent different sounds. Examples of the depiction of the digraph *αι* /e/ are given below. It will be seen that in the word *κλαίω* (cry) the *αι* /e/ is depicted as a girl who cries and holds a tissue for her tears and in the word *καλοκαίρι* (summer) it is depicted as a woman who is lying on the sand of the beach holding a drink.




ζωντανός (alive, surviver)




γεωργός (farmer)




κλαίω (cry)

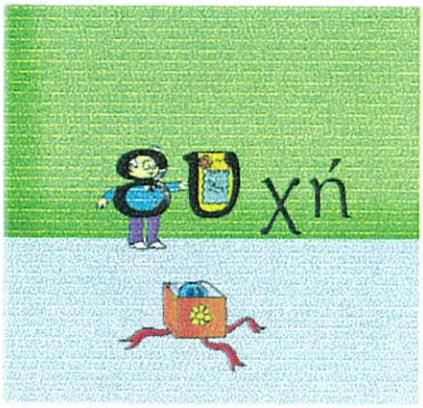
καλοκαίρι (summer)

***vi) The depiction of the 'combinations' αυ /av/ or /af/ and ευ /ev/ or /ef/ :*** These *combinations* are also depicted as individuals. The *αυ* is a woman and the *ευ* is a man; both are holding something which fits the shape of the *υ* and which relates to the meaning of the word. Thus, in the word *αυλή* (yard) the *αυ* /av/ combination is depicted as a woman who is holding a flower-pot in the yard. She has just bought this flower-pot and she is going to put it near the others. The same combination in the word *θησαυρός* (treasure) is depicted as a woman who is holding a box with the treasure which she and her husband found deep down in the earth.

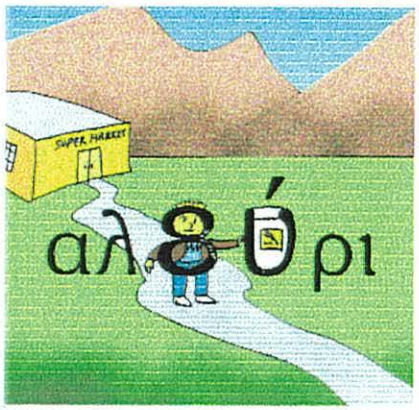
The *ευ* /ef/ combination in the word *ευχή* (wish) is converted into a pictogram of a boy who is holding a birthday card. He received this card as a present. In the word *αλεύρι* (flour) the *ευ* /ev/ is converted into a pictogram of a boy who had bought a package of flour.

***vii) The depiction of the digraph οι /i/:*** This digraph is not depicted according to any specified rule. It is converted into an object which is related to the meaning of the word. The only rule is that it should never be depicted as an individual. This was decided on because in that case it would have to be converted either into a man or into a woman and therefore might be confused with the *ει* which represents the same sound (/i/).

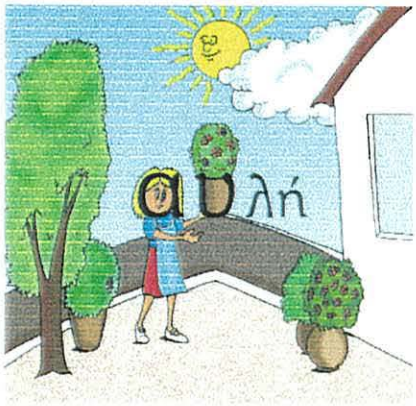
For example the *οι* /i/ in the word *υπόλοιπο* (remaining, rest) is depicted as the rest of a pizza which the family ate for dinner. The fat boy of the family was looking forward to eating the remaining part of the pizza. When his family went to the TV room he went to eat it. The digraph *οι* /i/ in the word *κοιτώνας* (dormitory) is depicted as the helmet and the gun of the soldier who is going to sleep in the dormitory.



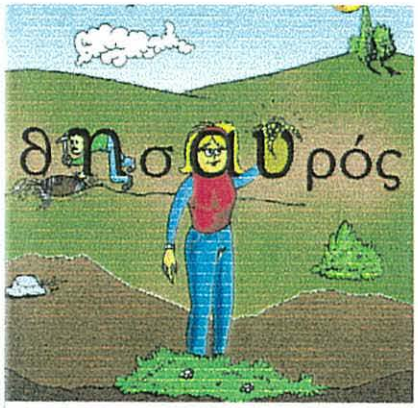

ευχή (wish)




αλεύρι (flour)

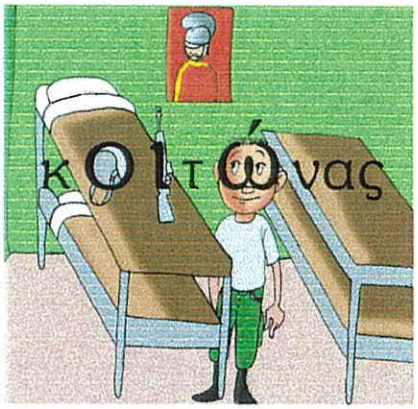



αυλή (yard)




θησαυρός (treasure)

υπόλοιπο (remaining, rest)



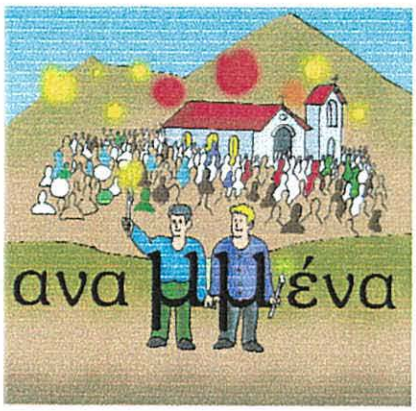

κοιτώνας (dormitory)

***viii) The depiction of two identical consonants*** **:** In most cases two identical consonants are converted either into pictograms of individuals or into objects related to the meaning of the word. The consonants which are depicted are the following - *ββ, γγ, κκ, λλ, μμ, νν, ππ, ρρ, σσ*, and ττ.

The *μμ, λλ, γγ, νν, σσ, κκ,* which are the most frequent of them (Zachos, 1991), are consistently depicted as individuals. The other double consonants (*ββ, ππ, ρρ, ττ*) are converted into something different for different words, depending on the word's meaning.

Although the consonants are depicted as individuals (either men or women) it is expected that children will not make substitution errors because these consonants represent different sounds.

Below are some examples of the depiction of the double consonants which are always converted into individuals.

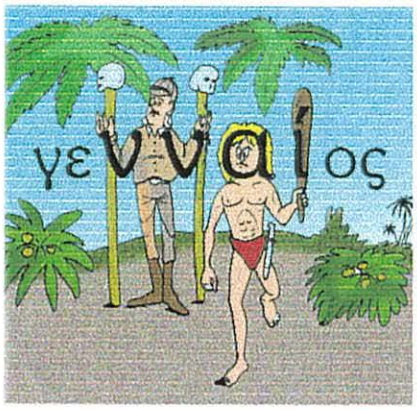



αναμμένα (on, lighting)

Two boys hold their candles during the Easter service.

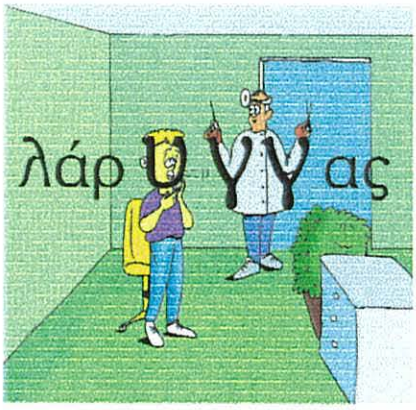
μεταλλείο (mine)

Two workers work in a mine. Their boss (digraph "ει"/ι) came to give their wages to them.




γενναίος (brave)

Here is very brave man who is going to free the captive who has been captured by a wild tribe.




λάρυγγας (larynx)

The doctor is going to make a clinical examination of the larynx of a boy.

κυπαρίσσι (cypress)

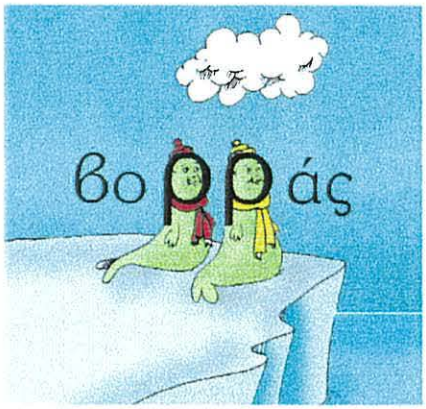
Two forest guards protect the forest from the arsonists.

κόκκινο (red)

Two friends are waiting for the red light to be gone off in order to cross the road.

The double consonants *ρρ* /r/, *ππ* /p/, *ττ* /t/ and *ββ* /v/ are not very frequent and they are usually depicted as objects related to the word's meaning and to their shape. For example in the word *βορράς* (north) the *ρρ* /r/ are depicted as two seals which live in the icy north and in the word *ιππότης* (knight) the *ππ* /p/ are depicted as the feet of a horse.

ιππότης (Knight)



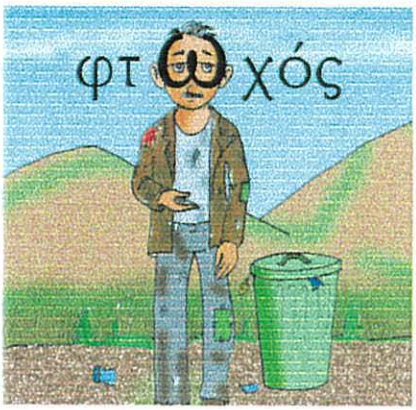

βορράς (North)

depiction is made in such a way that the children are able to spell all the words of the word family correctly. For example the word *φτωχός* (poor, needy) which contain the 'difficult' letter *ω* is depicted as a poor man. The word *φτώχεια* (poverty) which is a derivative of the word *φτωχός* contains an extra 'difficulty' in addition to the *ω*, that is, the digraph *ει* /i/. This digraph is also depicted according to the specified rules into a man who is holding money; he is going to give them to the poor man so as to help him.

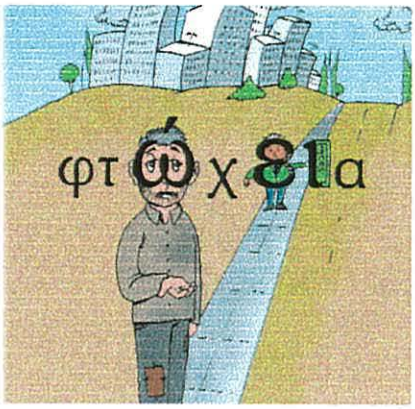
The 'difficult' letter *υ* of the word *δίχτυ* (fishing-net) is depicted as the fishing-net of a fisherman. The letter *ι* /ι/ -which is contained in the same word and is supposed to be the 'easy' letter which does not need depiction - is converted into the sign which says that fishing is allowed in that area.

The word *διχτυωτό* derives from the word *δίχτυ* (fishing-net) and contains one more ambiguous letter - the *ω* /o/. This letter has also to be depicted. It is converted into an octopus which lives in the sea.

Another example of something similar is that of the word *συγγένεια* (relationship). This word derives from the word *συγγενής* (relative). The word *συγγένεια* contains an extra difficulty in addition to the *γγ* - the digraph *ει* /i/. This is also depicted. It is converted into the nurse who is going to give an injection to the patient.




φτωχός (poor, needy)




φτώχεια (poorness, poverty)

δίχτυ (fishing-net)

διχτυωτό (the adjective)

συγγενής (relative)

συγγένεια (relationship)

### 6.2.3 The third rule

Many words contain two or more 'difficult' letters. Most of the time these letters are depicted according to the above rules. However there are also some letters which are converted into objects which supposedly are needed by the persons who have been drawn on the other 'difficult' letters. Thus the pictographic representation of the whole word is as close as possible to its meaning. This case is illustrated in the following examples.

The letter *υ* /ι/ in the word *ταχύτητα* (speed) is not depicted as a man as might be expected but as a racing car. According to the pictographic representation of this word the driver of the car is the husband of the depicted lady (letter *η*). This man is taking part in a rally. He drives at a steady speed and he is going to be the winner. His wife is watching him, clapping and cheering, waiting for him to reach the finish.

### 6.2.4 The fourth rule

It is sometimes necessary to depict not only a word's root morphemes but also its derivational morphemes. These morphemes occur in many words and they are always spelled by the same letters. They are necessary for the formation of the derivatives of the words and they give the same meaning to all the words which contain them. It was therefore decided that these spellings had always to be depicted by the same pictograms. For example the derivational morpheme *ει* /ι/ in the ending - *είο* of a large number of Greek words - such as *φαρμακείο* (pharmacy), *κουρείο* (barber's shop), *νοσοκομείο* (hospital), *ξενοδοχείο* (hotel), etc. - the ending -*είο* gives them the meaning of a place of work. It was therefore decided to depict this morpheme as a customer, client or guest who is holding money in order to pay for the particular job for which he has visited the place. Two examples of the depiction of these words follow.

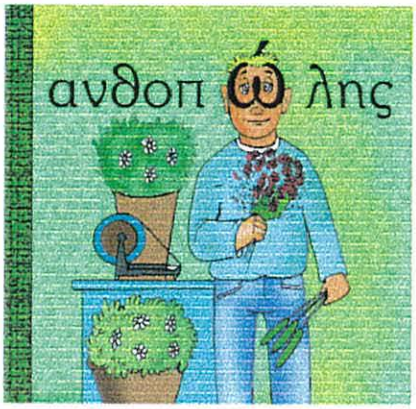
ταχύτητα (speed)

φαρμακείο (pharmacy)

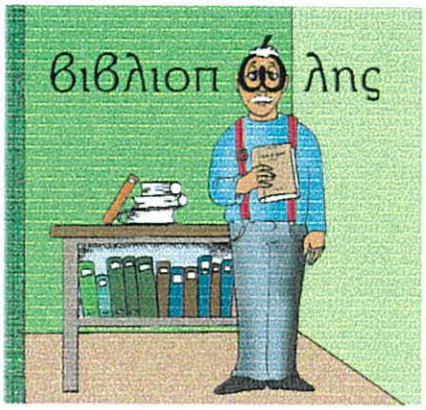
κουρείο (barber's shop)

Another similar example is the derivational morpheme *-πωλ-* . Its etymological origin relates to the word ***πωλώ*** which means 'to sell'. The words *ανθοπώλης* (florist) and *βιβλιοπώλης* (bookseller), for example, contain this morpheme. The 'difficult' letter *ω* of the derivational morpheme *-πωλ-* is depicted as a salesman who sells something according to the meaning of the word. For example, in the case of the word *ανθοπώλης* (florist) this letter is depicted as a florist who works in a flower-shop and in the case of the word *βιβλιοπώλης* (bookseller) it is depicted as a bookseller.

In addition, there are the words *ανθοπωλείο* (flower shop) and *βιβλιοπωλείο* (bookshop) which are also derivatives of the same roots and contain an additional derivational morpheme, viz. the *-ει-* of the ending *-είο* . As has been previously described, the *-ει-* is depicted as a customer who is going to buy flowers or books holding money in his hand.




ανθοπώλης (florist)




βιβλιοπώλης (bookseller)

ανθοπωλείο (flower shop)

βιβλιοπωλείο (bookshop)

# PART II

# THE RESEARCH

# CHAPTER 7

# AIMS OF THE MAIN RESEARCH AND SELECTION OF PARTICIPANTS

In PART I of this thesis attention was called to a number of teaching techniques which had been effectively used with English-speaking dyslexic children and which involved the use of multisensory methods. It was also suggested, however, that because of differences between the English and Greek languages such methods might not necessarily be appropriate ones for teaching spelling to Greek dyslexics. It was in this context that the idea of teaching spelling by the use of pictograms originated.

It is known that Greek dyslexic children have difficulties in memorising ambiguous spelling patterns (Porpodas, 1989). If, in addition, account is taken of those research findings with English-speaking participants which can reasonably be generalised to other languages, it may be concluded i) that dyslexics in general process non-verbal material more easily than they process written language (see chapter 1, section 1.1.2) and ii) that memorisation in general is better when items are presented as pictures rather than as words (chapter 4).

The aim of the present research was therefore to compare the effectiveness of the pictographic method with the effectiveness of the other two methods (multisensory and linguistic) which in Greek schools are usually used in combination. It will be noted that the use of these methods is necessarily time-consuming; if, therefore, the pictographic method were found to achieve equal results in a shorter period of time this would count in its favour.

It has already been pointed out that there are many difficulties over the definition of dyslexia (see chapter 1, section 1.2). However, what is needed in the present context is not a resolution of all these difficulties but rather the specification of a suitable set

of criteria by which dyslexics may be picked out.

One of the problems which was raised earlier concerned the use of 'discrepancy' definitions, i.e. definitions based on a discrepancy between reading or spelling performance and IQ. The first question therefore which requires discussion is whether for purposes of this research information with regard to a child's IQ needs to be taken into account.

Now there was suggestive evidence in the seventh exploratory study that the pictographic method was less likely to be effective with children of limited ability. At the very least low ability appeared to be an extra complication.

It was therefore considered that a test of intelligence which would exclude low ability children was very desirable. This decision was taken not on the basis of any *a priori* assumption to the effect that low ability children could not be dyslexic but simply so as to avoid unnecessary complication.

There was the further problem that if the Wechsler Intelligence Scale for Children (WISC) was used there would be problems connected with the so-called ACID profile - that is, the fact that dyslexic children have been regularly found to be weak at the Arithmetic, Coding, Information and Digit Span items (for more details and theoretical discussion see Miles and Ellis, 1981, and Miles ad Miles, 1999). It follows that if IQ tests were to be used at all it was essential that they should be of a kind that would not cause the intelligence of dyslexics to be underestimated.

Now it is widely agreed that the Coloured Progressive Matrices (CPM) test (Raven, 1962) is not open to the same objection as the WISC; it has been standardized in Greek children and in fact norms are available (Tsakris, 1970).

It was therefore decided that all children in the study should be given the Greek version of the CPM and that no child should be included whose IQ was less than 95. Although a cut off point of 85 is the standardly accepted one, the relatively high figure of 95 was chosen so as to make totally sure that any difficulties in responding to the pictographic method were not simply the consequence of low intelligence.

With regard to the issue of definition it can also be assumed that one would not

describe a child as 'dyslexic' unless he or she was a poor speller. As there are no standardised tests of spelling in Greek, it was necessary for the researcher to devise her own spelling test and on the basis of the results to pick out the poorest spellers.

The test in question contained 100 words, and a 'poor speller' was defined as one who spelled fifteen or fewer words correctly. The words chosen were 'difficult' in the sense given on chapter 5, section 5.2, and, as for the level of 'difficulty', given that the children were of the fourth, fifth or sixth grades, it was decided to set this at approximately the third grade. Every attempt was therefore made to ensure that the 100 words included in this spelling test reflected the whole range of the third grade vocabulary level and included a wide variety of grammatical types of words and a wide variety of irregularities. All the 100 words were taken from the list of the 703 words for which pictorial representations had been created (see Appendix 21).

In addition, since children can be poor spellers without displaying the typical signs of dyslexia, something more than poor spelling was needed to establish that a child was dyslexic.

Now there is a version of the Bangor Dyslexia Test (BDT) (Miles, 1997) available in Greek (see Miles, 1993, pp. 254-256, co-author A. Kasviki). The BDT comprises 10 items, each of which is scored either as 'plus' (dyslexia positive), as 'minus' (dyslexia negative), or as 'zero' (ambiguous). It is the combination of 'plus' signs (positive indicators) which is believed to justify a diagnosis of dyslexia (a 'zero' result being scored as half a 'plus'). Now Kasviki (1992) has carried out research on Greek children using this test and produced evidence that it differentiates poor spellers from good spellers. None of her control participants (adequate spellers) had more than 4.5 positive indicators on the BDT, whereas all her poor spellers had five positive indicators or more. There is therefore justification for using the Greek version of the BDT in order to pick out dyslexics and for making the cut-off point five positive indicators.

It was also necessary to ensure that the results were not distorted by factors irrelevant to the research. For this reason it was decided not to include in the study any

child whose first language was not Greek. For the same reason it was decided not to include children who had any severe physical disability or who were judged by their teachers to have any gross psychiatric or emotional problems.

It was therefore decided that the following conditions had to be satisfied if a child was to count as 'dyslexic' for purposes of the present research:

i. the child had to be a poor speller, as defined above
ii. the child had to have five or more positive indicators on the BDT
iii. the child had to have an IQ of at least 95 on the CPM
iv. the child's first language had to be Greek
v. the child had to be free from any gross physical disability and to be free in the judgment of their teachers from any severe psychiatric or emotional problems.

The spelling test of the 100 Greek 'difficult' words which was mentioned in the criteria for the selection of the participants (see chapter 7 and Appendix 13) was given to all the 748 children who were at a Primary School in Athens (202 in the fourth grade, 294 in the fifth grade, and 252 in the sixth grade). This test will be referred to in what follows as TEST 1. It was given to everyone during the same day by nine different teachers of Special Education. These nine teachers were all volunteers; they had been specially trained by the researcher to dictate the words and check the children's spellings. The dictation was given by them instead of by their class teachers so as to eliminate the possibility of the pupils being helped by the class teachers in writing the words with the correct letters.

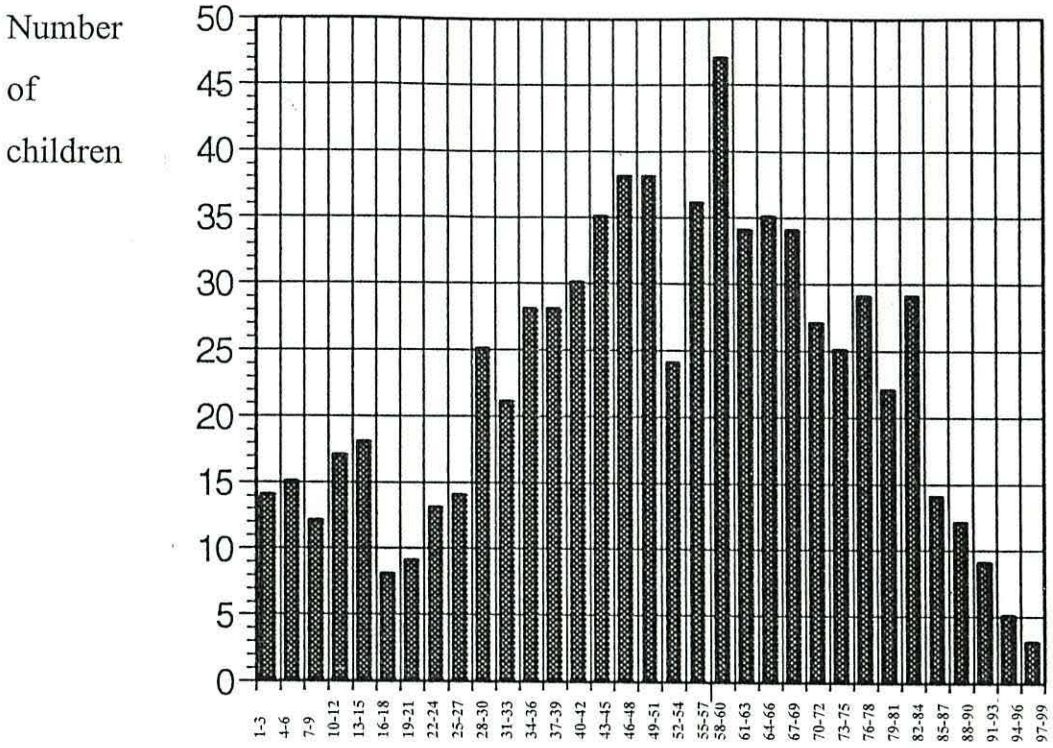
All the pupils who had spelled only 15 words or fewer correctly on TEST 1 were picked out from the initial sample of the 748 pupils. Seventy-six children out of the 748 satisfied this criterion. However, four of the seventy-six were excluded from the sample, in two cases because their first language was not Greek and in two cases on grounds of low IQ. The final sample therefore comprised seventy-two children.

The distribution of the correctly spelled words for the 748 pupils will be found

in Appendix 14 . A histogram showing the grouped frequencies (1-3, 4-6, 7-9, etc.) of children who obtained a given score on TEST 1 is shown in figure 1.

Figure 1

Grouped frequencies of children who obtained a given score on TEST 1 (100 words).



The 72 children were divided into three groups for comparison purposes. The comparisons to be made were between the pictographic method and the traditional methods. There was also a need for a third comparison group, that is, children who received no treatment other than that given in their ordinary classroom. In what will follow this group will be referred to as the 'untreated' group.

The means and the standard deviations of the age, IQ, and positive indicators on the BDT of the seventy-two participants broken down by group are shown in table 7.1.

It can be seen by inspection that the three groups were matched in age, IQ and number of positive indicators on the BDT. The numbers of positive indicators on the BDT obtained by each participant separately will be found in Appendix 15.

Table 7.1

*Means and standard deviations in respect of age in months, IQ and number of positive indicators on the BDT broken down by group.*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| AGE (months) | | | |
| Mean | 125.8 | 125.2 | 125.7 |
| sd | (9.0) | (9.2) | (8.5) |
| IQ | | | |
| Mean | 111.8 | 112.5 | 111.8 |
| sd | (8.1) | (7.5) | (6.8) |
| BDT | | | |
| Mean | 6.9 | 7.0 | 6.9 |
| sd | (1.2) | (1.2) | (1.2) |

The means and standard deviations of the number of the correctly spelled words on the first spelling test of the 100 words are set out in table 7.2.

Table 7.2

*Means and standard deviations of the number of the correctly spelled words on TEST 1 according to group.*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| TEST 1 | | | |
| Mean | 8.71 | 8.63 | 8.32 |
| sd | (4.86) | (4.62) | (4.32) |

An analysis of variance (see Appendix 16) showed no significant differences among the three groups in respect of spelling performance (F=0.03, df=2, 69, ns).

The three groups each contained four children from the fourth grade, eleven children from the fifth grade and nine children from the sixth grade. As far as the distribution of sample according to group and gender is concerned, the overall boy : girl ratio of the poor spellers was 2.6:1. No attempt was made to counterbalance the groups in respect of gender. However, as an additional part of the data analysis it was possible to make comparisons in respect of gender (see chapter 10).

# CHAPTER 8

# WORDS TO BE TAUGHT, THE TEACHERS, THE ORDER OF TEACHING METHODS AND THE TEACHING TIME

## *8.1 The selection of the words to be taught*

On the basis of TEST 1 the fifty-seven words which every child had misspelled were picked out. One week later these words were dictated again to the children. Those words which all of them spelled incorrectly on both occasions were included in the list of words to be taught. These came to fifty-one words. One word was excluded at random so as to end up with a round number of fifty words. These words were randomly divided into two groups. In what follows, the first group of twenty-five words will be referred to as SET A and the second group of twenty-five words will be referred to as SET B.

The words of SET A are presented in table 8.1.

Table 8.1

*The words of SET A with their ambiguous letters and English translation.*

| SET A | Ambiguous letters | English translation |
|---|---|---|
| θύελλα | υ, ε, λλ | storm |
| κίνδυνος | ι, υ, ο | danger |
| γοητεία | ο, η, ει | charm |
| μυρωδιά | υ, ω, ι | smell |
| απειλώ | ει, ω | to threaten |
| κυπαρίσσι | υ, ι, σσ, ι | cypress tree |
| ανησυχώ | η, υ, ω | to worry |
| συμμορία | υ, μμ, ο, ι | gang |
| Ποσειδώνας | ο, ει, ω | Posidonas |
| μυωπία | υ, ω, ι | short-sight |
| καλλυντικά | λλ, υ, ι | cosmetics |
| δηλητηριώδες | η, η, η, ι, ω, η | poisonous |
| σύκο - σήκω | υ, ο - η, ω | fig - get up |
| διάλειμμα | ι, ει, μμ | break |
| ορυχείο | ο, υ, ει | mine |
| τύραννος | υ, νν, ο | tyrant |
| συνεργείο | υ, ε, ει | garage |
| ισορροπία | ι, ο, ρρ, ο, ι | balance |
| σωλήνας | ω, η | tube |
| προκυμαία | ο, υ, αι | mole |
| αιμορραγία | αι, ο, ρρ, ι | bleeding |
| λειτουργία | ει, ι | divine service |
| σύλληψη | υ, λλ, η, η | arrest |
| Ευρωπαίος | ευ, ω, αι, ο | European |
| συγυρίζω | υ, υ, ι, ω | to tidy |

Table 8.2 presents the words of SET B.

Table 8.2

*The words of SET B with their ambiguous letters and their English translation.*

| SET B | Ambiguous letters | English translation |
|---|---|---|
| προσκύνημα | ο, υ, η | worship |
| δυστύχημα | υ, υ, η | accident |
| αρραβώνας | ρρ, ω | engagement |
| αποτυπώματα | ο, υ, ω | finger prints |
| κρύσταλλο | υ, λλ | crystal |
| πίθηκος | ι, η, ο | monkey |
| σκουλήκι | η, ι | worm |
| μαγείρισσα | ει, ι, σσ | cook |
| δαντελωτός | ε, ω, ο | lace |
| ειδοποιώ | ει, ο, οι, ω | to notify |
| γειτόνισσα | ει, ο, ι, σσ | neighbour |
| ξυπόλυτος | υ, ο, υ ο | barefooted |
| κρυμμένος | υ, μμ, ε, ο | hidden |
| σημείωμα | η, ει, ω | note |
| συνδυασμός | υ, υ, ο | combination |
| καλλιέργεια | λλ, ι, ε, ει | cultivation |
| χειρουργείο | ει, ει, ο | operation room |
| συζητώ | υ, η, ω | to discuss |
| κομμωτήριο | ο, μμ, ω, η, ι, ο | hairdresser's |
| ορειβάτης | ο, ει, η | mountain climber |
| πανηγύρι | η, υ, ι | festival |
| λεωφορείο | ε, ω, ει, ο | bus |
| μαιευτήριο | αι, ευ, η, ι, ο | maternity clinic |
| εμπρησμός | ε, η, ο | fire-raising |
| ανελκυστήρας | ε, υ, η | elevator |

Table 8.3 shows the number of ambiguous letters which are contained in the two sets of words. It will be seen from this table that the two sets contained approximately equal numbers of /i/, /o/ etc., sounds and can therefore be assumed to be of equal difficulty.

Table 8.3

*Number of words according to word-set and to the sound of their ambiguous letters.*

| | /i/ | /o/ | /e/ | Double consonants | Digraph /ev/ |
|---|---|---|---|---|---|
| SET A | 47 | 24 | 5 | 9 | 1 |
| SET B | 43 | 25 | 7 | 7 | 1 |

The number of ambiguous letters varied in different words as it is shown in table 8.4. Exact matching of numbers was not possible because of the lack of availability of suitable words. It was considered, however, that the matching was close enough to enable valid comparisons to be made.

Table 8.4

*Number of ambiguous letters in the two sets of words.*

| Number of ambiguous or irregular letters in a word | Number of words in SET A | Number of words in SET B |
|---|---|---|
| 2 | 4 | 3 |
| 3 | 11 | 14 |
| 4 | 8 | 6 |
| 5 | 1 | 1 |
| 6 | 1 | 1 |

The mean number of the ambiguous letters contained in the two sets of words and the standard deviations are presented in table 8.5.

Table 8.5

*Means and standard deviations of the number of the ambiguous letters contained in the words of SET A and SET B.*

| | SET A | SET B |
|---|---|---|
| Mean | 3.36 | 3.32 |
| sd | (0.95) | (0.90) |

There was no significant difference between the two sets of words as far as the number of their ambiguous letters is concerned (t=0.15, df=48, ns).

## *8.2 The teachers who taught the participants*

In order to secure a balanced and fair approach towards the two methods four teachers (including the researcher) were assigned to perform the task. Each of the groups of twenty-four children was divided at random into two smaller groups; in all, therefore, there were four groups of twelve children. It was decided to limit this number to 12 per group because of the large number of activities involved particularly in the case of the traditional methods. With larger numbers not all the children would have had the chance to take part in all these activities.

The three other teachers had been trained in special needs and were experienced in applying the two traditional methods. They were, however, briefed by the researcher on details concerning the pictographic method. They were given two separate leaflets, which had been written by the researcher, with full instructions, one for the efficient application of the traditional methods, the other for the efficient application of the pictographic method. These leaflets contained information and details about the strategies,

the exercises, the activities and the games which were to be used. They were also informed of the exact dates on which the teaching sessions had to be given and told the names of the children in the group whom they had to teach. The teachers were not informed of the fact that the pictographic method had been invented by the researcher. This information was held back in order to offset any possible bias towards the researcher, either positive or negative.

## *8.3 The order of the teaching methods*

In what follows, use of the traditional methods will be abbreviated to 'TRAD' and use of the pictographic method to 'PICTO'.

The participants were taught the spelling of the two sets of words (SET A and SET B) according to the following procedure:

- The first group of participants (consisting of two groups of twelve children in each) was taught the spellings in SET A by PICTO and those in SET B by TRAD.
- The second group of participants (also consisting of two groups of twelve children each) was taught the spelling in SET A by TRAD and those in SET B by PICTO.
- The third group of participants was not taught at all.

The above order of teaching methods is shown in table 8.6.

Table 8.6

*Order of teaching methods.*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| SET A | PICTO | TRAD | NO METHOD |
| SET B | TRAD | PICTO | NO METHOD |

## *8.4 The teaching time*

The two methods were taught systematically, sufficient time being given for ensuring that they were made as effective as possible. This was particularly necessary in the case of TRAD with its variety of activities.

PICTO needed ten teaching sessions of forty minutes each. This meant that the teaching was carried out over two weeks, which included one session for revision and one session for the final spelling test. TRAD needed sixty teaching sessions of forty minutes each. As a consequence the teaching had to be carried out over twelve weeks, which included one session for revision and one session for the final spelling test. The large difference in teaching time between the two teaching programmes was due to the difference in the activities which needed to be performed for the successful application of each method. These teaching times are illustrated in table 8.7.

Table 8.7

*Teaching time in weeks according to group of participants and method*

| Number of weeks | 1st 2nd | 3rd 4th 5th 6th 7th 8th 9th 10th 11th 12th | 13th 14th |
|---|---|---|---|
| 1st group | PICTO SET A | TRAD SET B | |
| 2nd group | TRAD SET A | | PICTO SET B |
| Untreated group | NO METHOD | | |

# CHAPTER 9

# THE CARRYING OUT OF THE RESEARCH

## *9.1 The four spelling tests*

The tests given to the participants were as follows. Immediately after the use of PICTO (either for the words in SET A or for the words in SET B) a spelling test was given to the participants (referred to in what follows as PICTO 1). One month later a second spelling test was given to the same participants (referred to in what follows as PICTO 2).

Similarly, immediately after using TRAD (either for the words in SET A or for the words in SET B) a spelling test was given to the participants (referred to in what follows as TRAD 1), and one month later a second spelling test was given to the same participants (referred to in what follows as TRAD 2).

The third group of participants, which was the untreated group, was given only one spelling test of all the fifty words. This was done one month after the end of the 14$^{th}$ week which was the last week of the whole teaching programme. In that way these children were given the maximum amount of time for learning words in the normal classroom setting.

## *9.2 The activities followed*

The activities which were followed in each teaching session for the application of the two teaching methods (PICTO and TRAD), as well as the exercises which were given to the participants, were strictly specified and all four teachers were instructed to follow

them in exactly the same way. These activities are described in detail in the following pages.

### *i) Activities followed for the application of the PICTO*

1. The teacher wrote the word to be taught on the blackboard in large letters.
2. He or she discussed the meaning and the 'difficulties' of the word.
3. He or she drew the pictographic representation of the word on the blackboard and explained the specific reasons for which the particular pictograms had been chosen. The children were told that these reasons always related to the shape of the 'difficult' letters. The pictographic representations of SET A and SETA B of words will be found in Appendix 20.
4. The children observed the teacher drawing the pictograms on the letters.
5. At the same time the teacher explained the 'story' of the pictographic representation; this was always related to the meaning of the word.
6. All the children drew the pictograms on the written word which had been supplied to them on a piece of A4 sized paper.

The teacher taught approximately three words in every session, thus covering the whole set of twenty-five words in nine days. The ninth and the tenth day were spent on revision of the taught words. On the eleventh day the first spelling test (PICTO 1) was given. One month after they had been given PICTO 1 they were given PICTO 2. During the whole period between the presentation of PICTO 1 and PICTO 2 there were no opportunities for revision or other exercises. Both the PICTO and the TRAD materials were removed after use so as to make it impossible for the pupils to carry out any revision of the words either at home or at school.

### *ii) Activities followed for the application of TRAD*

1. The teacher wrote the word to be taught on the blackboard in large letters.

2. He or she discussed the meaning and the 'difficulties' of the word.
3. The children constructed sentences orally which contained the word so as to enable them to understand the word's meaning in a sentence.
4. Sheets of white A4 paper on which the word was written in very large letters were given to the children who then traced the word with their fingers and said its letters orally.
5. The children traced the word in the air again saying all the letters aloud.
6. They traced the word with their fingers on another child's back.
7. They wrote the word on the blackboard with a piece of chalk.
8. They repeatedly wrote the word in large letters on A4 paper with differently coloured pencils.
9. They were given sheets of A4 paper on which the word was outlined, and they were required to fill the space in between with colour.
10. They wrote the word on the floor in very large letters with a piece of chalk and then walked on the different parts of the word as they if were writing the letters with their feet.
11. They were given pieces of coloured paper where the letters of the word were printed in very large size (2cm width approximately). They cut out all the letters and glued them on another piece of A4 paper in the right order. They cut out the outline of the letters carefully, so as not to tear them, and they had the opportunity to 'feel' their shape.
12. They looked at the word carefully and spoke the letters one by one aloud. They then covered the correct word, or closed their eyes, and repeated all the letters. Then they wrote the word and checked it for spelling mistakes.
13. The teacher explained the etymology of the word and he or she helped the children to analyse it into its morphemes.
14. He or she helped the children to think of as many derivatives of the word as they could and to explain the exact meaning of each derivative.
15. The children were given a printed version of all the derivatives, and once more

they discussed their spelling in relation to their meaning and etymological origin and made sentences orally which included them.

16. They wrote the word in all its inflections.
17. The teacher helped them to think of and say aloud as many compounds of the same word family as possible. They also had to point out the parts of the word which had exactly the same spelling units as the original word.

Activities one to twelve involved the multisensory method while activities 13 to 17 involved the linguistic method.

In the first week, activities one to twelve were followed by every child and involved the teaching of three separate words. In the second week a further three words were learned, again by means of activities one to twelve. In the third week all six words were taught by means of activities thirteen to seventeen where the amount of time necessary was less than in case of activities one to twelve. This procedure provided the opportunity for revision over three weeks and was followed in subsequent weeks until all 25 words had been taught.

# CHAPTER 10

# THE RESULTS OF THE RESEARCH

Table 10.1 shows the means and standard deviations of the number of the correctly spelled words on the first two spelling tests (PICTO 1 and PICTO 2) by each group of participants for each set of words (SET A and SET B) and for each teaching method.

Table 10.1

*Means and standard deviations of the number of the correctly spelled words on the first spelling test by each group of participants for each set of words and for each teaching method.*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| SET A<br>Mean<br>sd | PICTO 1<br>22.92<br>(2.36) | TRAD 1<br>7.12<br>(4.27) | - |
| SET B<br>Mean<br>sd | TRAD 1<br>8.33<br>(3.18) | PICTO 1<br>22.38<br>(2.24) | - |

For both groups the difference between the PICTO 1 results and the TRAD 1 results was highly significant (first group, $t=21.26$, $df=23$, $p<0.001$; second group, $t=20.01$, $df=23$, $p<0.001$).

One month after the end of their teaching programme two more spelling tests (PICTO 2 and TRAD 2) were given to the participants. Table 10.2 gives the means and standard deviations of the number of the correctly spelled words on these spelling tests (PICTO 2, TRAD 2 and NO METHOD) by each group of participants for each set of words (SET A and SET B) and for each teaching method.

Table 10.2

*Means and standard deviations of the number of the correctly spelled words on the second spelling test by each group of participants for each set of words and for each teaching method.*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| SET A | PICTO 2 | TRAD 2 | NO METHOD |
| Mean | 22.65 | 3.00 | 1.32 |
| sd | (2.42) | (3.13) | (1.49) |
| SET B | TRAD 2 | PICTO 2 | NO METHOD |
| Mean | 4.67 | 20.83 | 1.41 |
| sd | (2.44) | (3.05) | (1.76) |

For the first and second groups of participants the difference between the PICTO 2 results and the TRAD 2 results was highly significant ( first group, $t=29.70$, $df=22$[1], $p<0.001$; second group, $t=25.25$, $df=23$, $p<0.001$).

One-way analysis of variance showed significant differences between the means of the number of the correctly spelled words on PICTO 2 and TRAD 2 and NO METHOD, for both SET A ($F=529.47$, $df=2, 66$, $p<0.001$), and SET B ($F=409.24$, $df=2, 67$, $p<0.001$). Details will be found in Appendix 17, tables 17.1 and 17.2.

In addition, post hoc comparisons (*Scheffé*) were carried out between the means of the number of the correctly spelled words of the first group, the second group and the untreated group, in both SET A and SET B. The first post hoc comparisons (for SET A) indicate significant differences ($p< 0.001$) between the first group and the other two groups, but suggest that there is no evidence for a significant difference between the

[1] One child form the first group was not available to take the PICTO 2 spelling test.

second group and the untreated group. The second post hoc comparisons (for SET B) indicate significant differences ($p<0.001$) between all pairs of groups. Details will be found in Appendix 17, tables 17.3 and 17.4. Again PICTO shows the greatest improvement compared to the other conditions. However, there is some evidence (on SET B at least) that TRAD is better than doing nothing.

The next stage in the analysis was to compare the results of PICTO 1 with those of PICTO 2 and the results of TRAD 1 with those of TRAD 2. Since PICTO 2 and TRAD 2 were administered one month after teaching had stopped, there was reason to suppose that a number of the words might have been forgotten in the interim. If this were so, then there would be fewer words correct on PICTO 2 than on PICTO 1 and fewer words correct on TRAD 2 than on TRAD 1. It was also possible a priori that there would be a greater - or lesser - degree of forgetting in the case of those taught by the traditional methods. These possibilities are investigated in tables 10.3 and 10.4.

Table 10.3 shows the means and standard deviations in brackets of the number of the correctly spelled words in PICTO 1 and PICTO 2 spelling tests for both groups.

Table 10.3

*Means and standard deviations of the number of the correctly spelled words on PICTO 1 and PICTO 2.*

| | Correctly spelled words on PICTO 1 | Correctly spelled words on PICTO 2 |
|---|---|---|
| 1st group | | |
| Mean | 22.92 | 22.65 |
| sd | (2.36) | (2.42) |
| 2nd group | | |
| Mean | 22.38 | 20.83 |
| sd | (2.24) | (3.05) |

In the case of the first group the difference between the scores on PICTO 1 and PICTO 2 was found to be non-significant (t=0.81, df=22, ns); in the case of the second group the result was marginally significant (t=2.78, df=23, $p<0.05$); this suggests a small amount of forgetting. Table 10.4 shows the means and standard deviations of the number of the correctly spelled words on TRAD 1 and TRAD 2 for both groups.

Table 10.4

*Means and standard deviations of the number of the correctly spelled words on TRAD 1 and TRAD 2*

| | Correctly spelled words on TRAD 1 | Correctly spelled words on TRAD 2 |
|---|---|---|
| 1st group | | |
| Mean | 8.33 | 4.67 |
| sd | (3.18) | (2.44) |
| 2nd group | | |
| Means | 7.12 | 3.00 |
| (sd) | (4.27) | (3.13) |

For both groups the differences between TRAD 1 and TRAD 2 were highly significant (first group, t=4.19, df=23, $p<0.001$; second group, t=5.55, df=23, $p<0.001$). This result indicates a large amount of forgetting in both groups.

To complete the analysis, three further questions seemed worth asking. These were:

i. Was there any differential effect as a result of the children's grade? In other words, did the older children perform better or worse than the younger children?

ii. Were there any gender differences?

iii. Did any of the teachers achieve better results than others?

It not impossible a priori that there is an optimum age at which teaching of this kind is most effective. A comparison was therefore made between the children in the three different grades to check if the ratio of correct to incorrect words on PICTO 1 and PICTO 2 and on TRAD 1 and TRAD 2 was any different.

Table 10.5 shows the means and standard deviations of the number of the correctly spelled words on PICTO 1 for grades four, five and six; table 10.6 shows the means and standard deviations for PICTO 2 for the three grades.

Table 10.5

*Means and standard deviations of the number of the correctly spelled words on PICTO 1 for the three grades.*

| | 4th grade | 5th grade | 6th grade |
|---|---|---|---|
| Mean | 23.50 | 22.59 | 22.33 |
| sd | (1.92) | (2.34) | (2.40) |

Table 10.6

*Means and standard deviations of the number of the correctly spelled words on PICTO 2 for the three grades.*

| | 4th grade | 5th grade | 6th grade |
|---|---|---|---|
| Mean | 22.87 | 21.04 | 22.00 |
| sd | (2.16) | (2.92) | (3.02) |

A one way ANOVA showed that there was no significant difference among the three grades either for PICTO 1 ($F=0.72$, $df= 2, 45$, ns) or for PICTO 2 ($F=1.31$, $df= 2, 44$, ns) spelling test. Details will be found in Appendix 18, tables 18.1 and 18.2.

Table 10.7 shows the means and standard deviations of the number of the correctly spelled words on TRAD 1 for the three grades and table 10.8 shows the means and the standard deviations of the number of the correctly spelled words on TRAD 2 for the three grades.

Table 10.7

*Means and standard deviations of the number of the correctly spelled words on TRAD 1 for the three grades.*

| | 4th grade | 5th grade | 6th grade |
|---|---|---|---|
| Mean | 8.37 | 7.13 | 8.16 |
| sd | (4.80) | (3.54) | (3.66) |

Table 10.8

*Means and standard deviations of the number of the correctly spelled words on TRAD 2 for the three grades.*

| | 4th grade | 5th grade | 6th grade |
|---|---|---|---|
| Mean | 4.25 | 3.81 | 3.66 |
| sd | (3.32) | (2.68) | (3.12) |

A one way ANOVA showed that there was no significant difference between the means of the correctly spelled words either for TRAD 1 (F= 0.49, df= 2, 45, ns) or for TRAD 2 (F= 0.10, df= 2, 45, ns). Details will be found in Appendix 18, tables 18.3 and 18.4.

It may be concluded, therefore, that the age at which the children were being taught had not affected the results.

It is also not impossible that boys would be found to be more receptive to the teaching than girls or vice versa. A comparison was therefore made of the means of the correctly spelled words on PICTO 1 and PICTO 2 as well as on TRAD 1 and TRAD 2 to check if there was any difference between boys and girls.

Tables 10.9 and 10.10 show the means and standard deviations of the number of the correctly spelled words on PICTO 1 and PICTO 2 for boys and girls respectively.

.

Table 10.9

*Means and standard deviations of the number of the correctly spelled words on PICTO 1 for boys and girls.*

| | Boys | Girls |
|---|---|---|
| Mean | 22.84 | 22.20 |
| sd | (2.34) | (2.17) |

Table 10.10

*Means and standard deviations of the number of the correctly spelled words on PICTO 2 for boys and girls.*

| | Boys | Girls |
|---|---|---|
| Mean | 21.59 | 22.00 |
| sd | (3.13) | (2.33) |

No significant difference was found between the means of the number of the correctly spelled words either for PICTO 1 (t=0.91, df= 46, ns) or for PICTO 2 (t=0.45, df= 45, ns).

Table 10.11 shows the means and standard deviations of the number of the correctly spelled words on TRAD 1 for boys and girls and table 10.12 shows the means and standard deviations of the number of the correctly spelled words on TRAD 2 for boys and girls.

Table 10.11

*Means and standard deviations of the number of the correctly spelled words on TRAD 1 for boys and girls.*

| | Boys | Girls |
|---|---|---|
| Mean | 7.72 | 7.73 |
| sd | (4.32) | (2.25) |

Table 10.12

*Means and standard deviations of the number of the correctly spelled words on TRAD 2 for boys and girls.*

| | Boys | Girls |
|---|---|---|
| Mean | 3.42 | 4.73 |
| sd | (2.88) | (2.84) |

No significant difference was found between boys and girls either for the TRAD1 (t=0.01, df= 46, ns) or for the TRAD 2 (t= 1.46, df= 46, ns).

It may be concluded that there was no difference between the boys and the girls in the way in which they responded to the teaching.

Finally it is sometimes argued that in the case of any teaching programme the personality of the teacher affects the results more than the method used. Since in the present study four different teachers were used (including the researcher) this was a matter, which could be checked. If the personalities of the teachers were having a differential effect on the results there would be a significant difference in the number of the correctly spelled words according to which teacher had done the teaching. A comparison was therefore made in the means of the number of the correctly spelled words on PICTO 1 and PICTO 2 as well as on TRAD 1 and TRAD 2. Tables 10.13 and 10.14 show the means and standard deviations of the number of the correctly spelled words on PICTO 1 and PICTO 2 respectively broken down by teachers.

Table 10.13

*Means and standard deviations of the number of the correctly spelled words on PICTO 1 broken down by teachers.*

| | 1st teacher | 2nd teacher | 3rd teacher | 4th teacher |
|---|---|---|---|---|
| Mean | 23.33 | 22.50 | 22.33 | 22.41 |
| sd | (1.82) | (2.81) | (2.38) | (2.19) |

Table 10.14

*Means and standard deviations of the number of the correctly spelled words on PICTO 2 broken down by teachers.*

| | 1st teacher | 2nd teacher | 3rd teacher | 4th teacher |
|---|---|---|---|---|
| Mean | 22.83 | 22.45 | 20.75 | 20.91 |
| sd | (1.40) | (3.26) | (3.84) | (2.15) |

A one way ANOVA showed that there was no significant difference between the means of the number of the correctly spelled words either for PICTO 1 (F=0.47, df= 3, 44, ns) or for PICTO 2 (F=1.67, df= 3, 43, ns). Details will be found in Appendix 18, tables 18.5 and 18.6.

Tables 10.15 and 10.16 show the means and the standard deviations of the number of the correctly spelled words on TRAD 1 and TRAD 2 respectively broken down by teachers.

Table 10.15

*Means and standard deviations of the number of the correctly spelled words on TRAD 1 broken down by teachers.*

| | 1st teacher | 2nd teacher | 3rd teacher | 4th teacher |
|---|---|---|---|---|
| Mean | 8.08 | 8.58 | 8.25 | 6.00 |
| sd | (2.64) | (3.75) | (4.49) | (3.88) |

Table 10.16

*Means and standard deviations of the number of the correctly spelled words on TRAD 2 broken down by teachers.*

| | 1st teacher | 2nd teacher | 3rd teacher | 4th teacher |
|---|---|---|---|---|
| Means | 4.75 | 4.58 | 3.08 | 2.91 |
| sd | (2.73) | (2.23) | (3.34) | (3.05) |

A one way ANOVA showed that there was no significant difference either for TRAD 1 (F=1.16, df= 3, 44, ns) or for TRAD 2 (F=1.36, df=3, 44, ns). Details will be found in Appendix 18, tables 18.7 and 18.8.

These tables show that there was no significant difference among the four teachers in the number of the correct words on either PICTO or TRAD. Moreover, had the personality of the teacher been a major factor it would be hard to explain why all teachers achieved better results with the pictographic method than with the traditional methods.

# CHAPTER 11

# DISCUSSION AND SUGGESTIONS FOR FURTHER RESEARCH

The evidence contained in this study supports the claim that the pictographic method is more effective than the traditional methods for teaching spelling to Greek dyslexic children. This was found to be the case despite the extra time spent on the traditional methods. Moreover, when the pictographic method was used, it was found that even when the children had gone for a month without having revised a single word, they were able to remember the majority of the words which they had been taught. It remains to consider why this should be so.

The Pictographic method is in fact a multisensory method in the sense that all the sensory modalities - visual, auditory, kinesthetic and tactile - are involved. Thus the children were required to look at and to say the ambiguous letters, to describe their shape, to discuss the meaning of the words, to look at the way in which the teacher was drawing the pictograms, and to draw the same pictograms by themselves.

Thus the pictographic method and the traditional multisensory teaching method, as presented in Gillingham and Stillman programme and as used in English-speaking countries, have very much in common. The only difference between the two methods seems to be the fact that in the pictographic method pictures are used as an aid to memorisation. Is, then, the presence of the pictures the main reason for the success of the pictographic method?

An important reason for its success appears to be that by eliminating alternative ways of representing the same sound it reduces the non-transparency of the Greek writing system. In addition, it replaces the symbolic alphabetic material by the use of pictures - which are easier to remember than linguistic symbols. In this connection the work of

Vellutino (1979, see chapter 1) and Paivio (1991, see chapter 4) are of particular theoretical importance.

It seems, too, that a necessary condition for the success of the pictographic method was that the pictograms were organized into a system. The essence of the system was the fact that links exist between the pictogram, the meaning of the word and the shape of the letters, and, above all, the fact that these pictograms either represent the object which is referred to by the meaning of the word or remain constant by representing only human figures (men and women); in that case each figure is drawn in a unique way and confusion between the ambiguous letters is therefore impossible. Thus it seems likely that an essential ingredient of success is that the pictograms should be constructed in accordance with rules, for instance that the letter *v* /i/ has always to be depicted as a man or a boy and never as a woman or a girl.

It should be remembered that in the 5th exploratory study the children were allowed to convert the ambiguous letters of the target words into pictograms according to their own ideas and without any rules. The results showed that after having drawn pictographic representations for a large number of words they had forgotten the pictograms which they had chosen. It is therefore possible that the use of pictures is not sufficient on its own for the success of the pictographic method; it appears to be necessary to use them in a context where memorisation has been helped by the reduction of ambiguity.

It is perhaps significant that no one, so far, has attempted a similar pictographic method for teaching English spelling or another language's spelling.

With regard to *Lyn Wendon's* pictorial method (see chapter 2), it is different from the pictographic method described in this thesis in that it does not aim to help children in learning irregular spelling patterns. Rather the letters are depicted so that they represent words the initial sound of which is the sound of the depicted letter. For example letter *k* is depicted as a *king*; it represents the word *king* the initial sound of which is /k/. In contrast, in the method used in the present research, the letters are depicted in such a way that the shape of the depicted object would remind the children of the shape of the letters.

In other words, the aim of the Greek pictographic method is to help the children to remember the depicted letters as a part of the spelling pattern of a word and not to help them to make letter-sound associations.

The fact that Greek is more transparent than some other languages which use an alphabetic system (e.g. English) made the pictographic method more workable in Greek than it might have been in other languages. The fewer the ambiguous (or irregular) letters the less are the effects of non-transparency and the greater the possibility of making the language totally transparent.

In view of the fact that the rules of the pictographic method depend on the morphology of the language and on its distinctive peculiarities, creation of pictograms similar to the Greek ones for teaching spelling in another language might not be effective. If such a system were to be created different rules would have to be invented so as to take account of the specific irregularities of that language's written form. In addition, in languages which have a high degree of non-transparency the creation of such a pictorial system would become very difficult.

Apart from the above, the present investigation has raised the following points which also need further research.

1. It would be interesting to investigate whether the pictographic method can be effective in the case of slow learners and children with below average intelligence and in the case of poor spellers of average intelligence and above who are not dyslexic.
2. The exploratory studies suggested that a combination of the pictographic method and the linguistic method might be more effective than the pictographic method on its own. It would therefore be interesting to investigate this point further.
3. A longitudinal study needs to be undertaken in which children's spelling progress is monitored over a longer period of time than was possible in the present study. As a first stage of research this would involve investigating whether a child who has acquired spelling skills up to a particular level through the pictographic method and who at the same time has developed understanding of the etymology

of the words will continue to make progress in spelling. Both points, namely the spelling level and the level of linguistic ability necessary for the child to progress without special help, need themselves to be investigated. Following from this, the next stage would be to assess other aspects of literacy such as reading ability, text comprehension, phonological skills and syntactic difficulties. Such skills could be tested routinely.

Much, therefore, remains to be discovered. For the present, however, it can be claimed with confidence that in the case of Greek children within the age range of the present study the pictographic method is likely to be a successful way of teaching spelling.

# REFERENCES

# REFERENCES


Augur, J. and Briggs, S. (1992) *The Hickey Multisensory Language Course.* London, Whurr.

Augur, J. (1993) *Early Help: Better Future*. Reading, British Dyslexia Association.

Baddeley, A. D., Thomson, N. and Buchanan, M. (1975) Word length and the structure of short-term memory. *Journal of Verbal Learning and Verbal Behaviour*, 14, 575-589.

Bakker, D. J. (1967) Temporal order, meaningfulness and reading ability. *Perceptual and Motor Skills,* 24, 1027-1030.

Bakker, D. J. (1972) *Temporal Order in Disturbed Reading.* Rotterdam, Rotterdam University. Press.

Bradley, L. (1981) The organisation of motor patterns for spelling: an effective remedial strategy for backward readers. *Developmental Medicine and Child Neurology*, 23, 83-91.

Bradley, L. (1992) Rhymes, rimes and learning to read and spell. In Ferguson C. A., Menn, L. and Stoel-Gammon, C. *Phonological Development: Models, Research, Implications.* Timonium, Maryland.

Bradley, L. and Bryant, P. (1978) Difficulties in auditory organisation as a possible cause of reading backwardness. *Nature*, 271, 746-747.

Bradley, L. and Bryant, P. (1983) Categorising sounds and learning to read - a causal connection. *Nature*, 301, 419-421.

Bradley, L. and Huxford, L. (1994) Organizing sound and letter patterns for spelling. In G. Brown & N. Ellis (eds.) *Handbook of Spelling: Theory, Process and Intervention.* Chichester, Willey.

Bryant, P. and Bradley, L. (1988) *Children's Reading Problems.* Oxford, Blackwell.

Catts, H. W. (1989) Phonological processing deficits and reading disabilities. In G. Kamhi and H. W. Catts (eds) *Reading Disabilities: A Developmental Language Perspective.* Boston, Little Brown and Co.

Catts, H. W. (1995) Early impairments and developmental dyslexia. *Dyslexia: An International Journal of Research and Practice,* 1, 1, 51-54.

Coltheart, M., Patterson, K. E. and Marshall, J. C. (1986) (eds.) *Deep Dyslexia.* London, Routledge.

Cotterell, G. C. (1969) *Check List of Basic Sounds.* Wisbech, Cambs., Learning Development Aids.

Critchley, M. and Critchley E. A. (1978) *Dyslexia Defined.* London, Heinemann.

Denckla, M. B. and Rudel, R. G. (1976). Naming of object drawings by dyslexic and other learning disabled children. *Brain and Language*, 3, 1-15.

Done, D. J. and Miles, T. R. (1978) Learning, memory and dyslexia. In: M. M. Gruneberg, P. E. Morris and R. N. Sykes (eds.) *Practical Aspects of Memory I.* London, Academic Press.

Done, D. J. and Miles, T. R. (1988) Age of word acquisition in developmental dyslexics as determined by word latencies in a picture naming task. In M. M. Gruneberg, P. E. Morris and R. N. Sykes (eds.) *Practical Aspects of Memory II: Current Research and Issues* (Vol 2). Chichester, Wiley.

Ellis, A. W. (1994) *Reading, Writing and Dyslexia: A Cognitive Analysis.* London, Lawrence Erlbaum.

Ellis, N. C. and Hennelly, R. (1980) A bilingual word-length effect: implications for intelligence testing and the relative case of mental calculation in Welsh and English. *British Journal of Psychology*, 71, 43-52.

Ellis, N. C. and Miles, T. R. (1978) Visual information processing in dyslexic children. In M. M. Gruneberg, P. E. Morris and R. N. Sykes (eds.) *Practical Aspects of Memory* London, Academic Press.

Everatt, J., Steffert B. and Smythe I. (1999) An eye for the unusual: creative thinking in dyslexics. *Dyslexia: An International Journal of Research and Practice*, 5, 1, 28-47.

Fox, B. and Routh, D. (1984) Phonemic analysis and synthesis as word attack skills: *Journal of Educational Psychology*, 76, 1059-1064.

Frith, U. (1985) Beneath the surface of developmental dyslexia. In K.E. Patterson, J.C. Marshall and M. Coltheart (eds.), *Surface Dyslexia: Neuropsychological and Cognitive Analysis of Phonological Reading*. London, Lawrence Erlbaum.

Frith, U (1989) (ed.) *Cognitive Process in Spelling*. London, Academic Press.

Frith, U. (1997) Brain, mind and behaviour in dyslexia. In C. Hulme and M. Snowling, *Dyslexia: Biology, Cognition and Intervention*. London, Whurr.

Frith, C. and Frith, U. (1996) A biological marker for dyslexia. *Nature,* 382, 19-20.

Galaburda, A. M. (1993) *Dyslexia and Development - Neurobiological Aspects of Extraordinary Brains.* London, Harvard University Press.

Galaburda, A. M. and Livingstone, M. S. (1993) Evidence for a magnocellular defect in developmental dyslexia. In P. Tallal (ed.) *Annals of the New York Academy of Sciences,* 70-81.

Ganschow, L., Lloyd-Jones, J. and Miles, T. R. (1994) Dyslexia and musical notation. *Annals of Dyslexia,* 44, 185-202.

Gillingham, A. and Stillman, B. E. (1969) *Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship*. Cambridge, Mass. Educators Publishing Service.

Gilroy, D. E. and Miles, T. R. (1996) *Dyslexia at College*. London, Routledge.

Goulandris, N. (1994) Teaching spelling: bridging theory and practice. In G. D. A . Brown and N. C. Ellis (eds) *Handbook of Spelling: Theory, Process and Intervention*. Chichester, Wiley.

Goswami, U. (1988) Orthographic analogies and reading development. *Quarterly Journal of Experimental Psychology,* 40A, 239-268.

Hatcher, P. J. (1994) An integrated approach to encouraging the development of phonological awareness, reading and writing. In C. Hulme and M. Snowling (eds.) *Reading Development and Dyslexia*. London, Whurr.

Hickey, K. (1997) *A Language Training Course for Teachers and Learners*. London, Elisabeth Adams.

Hogben, J. H. (1997) How does a visual transient deficit affect reading? In: C. Hulme and M. Snowling (eds.), *Dyslexia: Biology, Cognition and Intervention*. London, Whurr.

Hornsby, B. and Shear, F. (1977, 1993) *Alpha to Omega*. Oxford, Heineman Educational Books.

Hornsby B. and Miles, T. R. (1980) The effects of a dyslexia-centred teaching programme. *British Journal of Educational Psychology*, 50, 236-242.

Hubicki, M. and Miles, T. R. (1991) Musical notation and multisensory learning. *Child Language Teaching and Therapy*, 7,1, 61-78.

Hulme, C and Snowling, M. (eds.) (1997) *Dyslexia: Biology, Cognition and Intervention.* London, Whurr.

Hulme, C. and Snowling, M. (eds.) (1994) *Reading Development and Dyslexia.* London, Whurr.

Hulme, C. (1981) *Reading Retardation and Multisensory Teaching*. London, Routledge.

Hynd G. W. and Hiemenz J.R. (1997) Dyslexia and gyral morphology variation. In C. Hulme and M. Snowling, *Dyslexia: Biology, Cognition and Intervention.* London, Whurr.

Kasviki, A. (1992) *The Diagnosis of Developmental Dyslexia in Greece*. M.Phil thesis, University of Wales, Bangor.

Katz, R. (1986) Phonological deficiencies in children with reading disability: evidence from an object naming task. *Cognition,* 22, 225-257.

Katz, R., Shankweiler, D. and Liberman, I., (1981) Memory for item order and phonetic recoding in the beginning reader. *Journal of Experimental Child Psychology*, 32, 3, 474-484.

Livingstone, M. S., Rosen, G. D., Drislane, F. W. and Galaburda, A. M. (1991) Psysiological and anatomical evidence for a magnocellular defect in dyslexia. *Proceedings of the National Academy of Sciences*, USA, 88, 7941-7.

Matějček, Z. (1998) Reading in Czech. Part II: Reading in Czech children with dyslexia. *Dyslexia: An International Journal of Research and Practice*, 4, 3, 155-168.

Mavrommati, D. D. (1995) *The Construction of the Dyslexia Remediation Programme* (*Η Κατάρτιση του Προγράμματος Αντιμετώπισης της Δυσλεξίας*). Athens, Ellenika Grammata.

Miles, E (1991) Visual dyslexia/auditory dyslexia: is this a valuable distinction to make? In M. Snowling and M. Thomson (eds.) *Dyslexia: Integrating Theory and Practice*. London, Whurr.

Miles, E. (1992) Reading and writing in mathematics. In T. R. Miles and E. Miles (eds.) *Dyslexia and Mathematics*. London, Routledge.

Miles, E. (1995) Can there be a single definition of dyslexia? *Dyslexia: An International Journal of Research and Practice*, 1, 1, 37-45.

Miles, E. (1997a) *The Bangor Dyslexia Teaching System*. London, Whurr.

Miles, E. (1997b) Implications for teachers of dyslexics of some recent phonological research. *Dyslexia: An International Journal of Research and Practice*, 3, 3, 157-163.

Miles, T. R. (1970) *On Helping the Dyslexic Child*. London, Methuen Educational.

Miles, T. R. (1993) *Dyslexia: the Pattern of Difficulties*. London, Whurr.

Miles, T.R.(1997) *The Bangor Dyslexia Test*. Wisbech, Cambs., Learning Development Aids.

Miles, T. R. and Ellis, N. C. (1981) A lexical encoding deficiency II: clinical observations. In G. T. Pavlidis and T. R. Miles (eds.), *Dyslexia Research and Its Applications to Education.* Chichester, Wiley.

Miles, T. R. and Miles, E. (1999) (2nd edition) *Dyslexia: A Hundred Years On.* Milton Keynes, Open University Press.

Miles, T. R. and Miles, E. (1975) *More Help for Dyslexic Children*. London, Methuen Educational.

Naidoo, S. (1981) Teaching methods and their rationale. In G. T. Pavlidis and T. R. Miles, *Dyslexia Research and its Applications to Education*. Chichester, Wiley.

Nicolson, R. I. and Fawcett, A. J. (1995) Dyslexia is more than a phonological deficit. *Dyslexia: An International Journal of Research and Practice*, 1,1,19-36.

Nicolson, R. I. & Fawcett, A. J. (1999) Developmental dyslexia: the role of the cerebellum. *Dyslexia: An International Journal of Research and Practice* (in press).

Nicolson, R. I., Fawcett, A. J., Berry, E. L. and Dean, P. (1997) Dyslexia: direct evidence of cerebellar impairment. *Poster at Orton Dyslexia Society International Conference*, Minneapolis, USA.

Olson, R. K., Wise, B., Conners, F., Rack, J. and Fulker, D. (1989) Specific deficits in component reading and language skills: genetic and environmental influences, *Journal of Learning Disabilities*, 22, 339-348.

Orton Dyslexia Society (1994) *Perspectives in Dyslexia,* 20, 5

Paivio, A. (1991) *Images in Mind: the Evolution of a Theory*. London, Harvester Wheatsheaf.

Paulesu, E., Frith, U., Snowling, M., Gallagher, A., Morton, J., Frackowiak, R. S. J. and Frith, C. D. (1996) Is developmental dyslexia a disconnection syndrome? evidence from PET scanning. *Brain*, 119, 143-157.

Porpodas, K. (1989) The phonological factor in reading and spelling Greek. In P. G. Aaron and R. M. Joshi (eds.), *Reading and Writing Disorders in Different Orthographic Systems.* London, Kluwer.

Porpodas, K. (1990) Processes used in children's reading and spelling of Greek words. *Perspectives on Dyslexia*, 2, 197-209.

Rack, J. P. (1994) Dyslexia: the phonological deficit hypothesis. In: A. J. Fawcett and R. I. Nicolson. *Dyslexia in Children: Multidisciplinary Perspectives*. London, Harvester Wheatsheaf.

Raven, J. C. (1962) *Coloured Progressive Matrices*. London, H. K. Lewis.

Rawson, M. B. (1970) The structure of English: the language to be learned. *Bulletin of the Orton Society,* 20, 118.

Scott, A. M. (1995) *Dyslexia? Your First Questions Answered.* Reading, British Dyslexia Association.

Siegel, L. S. and Himel, N. (1998) Socioeconomic status, age and the classification of dyslexics and poor readers: the dangers of using IQ scores in the definition or reading disability. *Dyslexia: An International Journal of Research and Practice*, 4, 2, 90-104.

Smith, S. D., Kimberling, W.J. and Pennington, B. F. (1991) Screening for multiple genes influencing dyslexia. In B. F. Pennington (ed.) *Reading Disabilities Genetic and Neurological Influences.* London, Kluwer.

Spring, C. and Capps, C. (1974) Encoding speed, rehearsal and probed recall of dyslexic boys. *Journal of Educational Psychology*, 66, 780-786.

Stackhouse, J. and Wells, B. (1997) How do speech and language problems affect literacy development? In C. Hulme and M. Snowling (eds.), *Dyslexia: Biology, Cognition and Intervention*: London, Whurr.

Stanovich, K. E. (1994) Annotation: does dyslexia exist? *Journal of Child Psychology and Psychiatry*, 35, 4, 579-595.

Stanovich, K. E. (1986) Mathew effects in reading: some consequences of individual difficulties in the acquisition of literacy. *Reading Research Quarterly*, 21, 360-407.

Stein, J. F. (1999) *Developmental Dyslexia: Its Neurological Basis*. Lecture given in Bangor, 6th May.

Stein, J. F. and Walsh, V. (1997) To see but not to read: the magnocellular theory of dyslexia. *Trends in Neurological Science* (TINS) 20, 4, 147-152.

Steinmetz, H. and Galaburda, A. M. (1991) Planum temporale asymmetry: in-vivo morphology affords a new perspective for neuro-behavioural research. In B. F. Pennington (ed.) *Reading Disabilities: Genetic and Neurological Influences*. London, Kluwer.

Stirling, E. G. and Miles, T. R. (1988) Naming ability and oral fluency in dyslexic adolescents. *Annals of Dyslexia*, 38, 51-72.

Thomson, M. and Watkins, E. J. (1990) *Dyslexia: A Teaching Handbook*. London, Whurr.

Treiman, R. (1985) Onsets and rimes as units of spoken syllables: evidence from children. *Journal of Experimental Child Psychology*, 39, 161-181.

Treiman, R. and Baron, J. (1983) Phonemic analysis training helps children benefit from spelling sound rules. *Memory and Cognition*, 11, 382-389.

Tsakris, P. (1970) The Intelligence of the Greek Children of School Age. Doctoral thesis, University of Athens.

Vellutino, F. R. (1979) *Dyslexia: Theory and Research*. Cambridge, Mass., MIT Press.

Wechsler, D. (1992) *The Wechsler Intelligence Scale for Children. (WISC-III)*. New York, Harcourt Brace Jovanovitch.

West T. G. (1997) *In the Mind's Eye*. New York, Prometheus Books.

Wimmer, H. (1993) Characteristics of developmental dyslexia in a regular writing system. *Applied Psycholinguistics*, 14, 1-33.

World Federation of Neurology (1968) *Report of Research Group on Dyslexia and World Literacy.* Dallas, Texas, World Federation of Neurology.

Yamada, J. (1995) A case study of developmental dyslexia in Japanese. *Dyslexia: An International Journal of Research and Practice,* 1,2, 120-122.

Zachos, J. (1991) *Greek Language and Language Material.* Athens, KΨM.

# APPENDICES

# APPENDIX 1

***First exploratory study:*** *the twenty Greek words taught to the children with their 'difficult' letters and their English translation*

| Greek words | 'Difficult' letters | English translation |
|---|---|---|
| νύχτα | υ | night |
| τυρί | υ | cheese |
| γυάλα | υ | fish-bowl |
| πτηνό | η | bird |
| φωτιά | ω | fire |
| φωλιά | ω | nest |
| δάχτυλο | υ | finger |
| τύμπανο | υ | drum |
| φυτό | υ | plant |
| ζυγαριά | υ | bathroom scale |
| μωρό | ω | baby |
| σύκο | υ | fig |
| αλυσίδα | υ | chain |
| κύκλος | υ | circle |
| κύπελο | υ | cup |
| ύπνος | υ | sleep |
| παγωτό | ω | ice-cream |
| μολύβι | υ | pencil |
| κυψέλη | υ | hive |
| χειμώνας | ει, ω | winter |

# APPENDIX 2

## Table 2.1[1]

***First exploratory study, first group of children:*** *age in months and number of correctly spelled words on the first and the second spelling test for each child (percentages in brackets)*

| Participants | Age in months | Number of correctly spelled words on the first spelling test (percentages in brackets) | Number of correctly spelled words on the second spelling test (percentages in brackets) |
|---|---|---|---|
| P1 | 122 | 20 (100%) | 20 (100%) |
| P2 | 126 | 20 (100%) | 20 (100%) |
| P3 | 121 | 20 (100%) | 20 (100%) |
| P4 | 124 | 20 (100%) | 20 (100%) |
| P5 | 137 | 20 (100%) | 20 (100%) |
| P6 | 132 | 20 (100%) | 20 (100%) |
| P7 | 135 | 20 (100%) | 20 (100%) |
| P8 | 138 | 20 (100%) | 20 (100%) |
| P9 | 136 | 20 (100%) | 20 (100%) |
| mean | 130.11 | 20 (100%) | 20 (100%) |
| sd | 6.45 | | |

[1] Where an Appendix contains more than one table the Appendix number is followed by the number of the table. Thus, Appendix 2, table 1 is described as Table 2.1.

## Table 2.2

***First exploratory study, second group of children:*** *age in months and number of correctly spelled words on the first and the second spelling test (percentages in brackets)*

| Participants | Age in months | Number of correctly spelled words on the 1st spelling test (percentages in brackets) | Number of correctly spelled words on the 2nd spelling test (percentages in brackets) |
|---|---|---|---|
| P1 | 120 | 5 (25%) | 2 (10%) |
| P2 | 124 | 7 (35%) | 4 (20%) |
| P3 | 123 | 3 (15%) | 0 (0%) |
| P4 | 133 | 9 (45%) | 2 (10%) |
| P5 | 132 | 6 (30%) | 2 (10%) |
| P6 | 134 | 5 (25%) | 1 (5%) |
| mean | 127.66 | 5.8 (29.1%) | 1.8 (9.16%) |
| sd | 5.49 | 1.86 | 1.21 |

# APPENDIX 3

***Second exploratory study*** **:** *number of correctly spelled words out of the 100 derivatives and compounds of the twenty original words (which had been taught in the first exploratory study) for each child*

| Participants | Number of correct words |
|---|---|
| P1 | 65 |
| P2 | 48 |
| P3 | 70 |
| P4 | 69 |
| P5 | 84 |
| P6 | 87 |
| P7 | 93 |
| P8 | 75 |
| P9 | 79 |
| mean | 74.4 |
| sd | 12.70 |

# APPENDIX 4

***Fourth exploratory study**: the 105 words which were taught to the children with their 'difficult' letters and their English translation.*

| Greek words | Difficult letters | English translation |
|---|---|---|
| νύχτα | υ | night |
| ημέρα | η | day |
| ήλιος | η | sun |
| αηδόνι | η | nightingale |
| κελαηδώ | η | to sing |
| φωλιά | ω | nest |
| Άνοιξη | οι | spring |
| φωτιά | ω | fire |
| φως | ω | light |
| παγωτό | ω | ice-cream |
| ύπνος | υ | sleep |
| γλυκό | υ | sweet /cake |
| ανήφορος | η | uphill |
| κατήφορος | η | downhill |
| άγκυρα | υ | anchor |
| ρύζι | υ | rice |
| μύγδαλο | υ | almond |
| φυλαχτό | υ | talisman |
| ζώνη | ω | belt |
| σκύλος | υ | dog |
| λύκος | υ | wolf |
| νύχι | υ | nail |

| | | |
|---|---|---|
| δάχτυλο | υ | finger |
| μπρούμυτα | υ | face down |
| ποδήλατο | η | bicycle |
| μολύβι | υ | pencil |
| μηχανάκι | η | motorcycle |
| κύπελο | υ | cup |
| σταφύλι | υ | grapes |
| σκουλήκι | η | worm |
| τυρί | υ | cheese |
| σπηλιά | η | cave |
| τρύπα | υ | hole |
| σφυρί | υ | hammer |
| στήθος | η | chest |
| μωρό | ω | baby |
| σώμα | ω | body |
| γλυπτό | υ | sculpture |
| κοχύλι | υ | sea-shell |
| κολοκύθι | υ | courgette |
| γυάλα | υ | fish-bowl |
| αθροίζω | οι | to add |
| ξύλο | υ | wood |
| κλωστή | ω | sewing threat |
| καλώδιο | ω | wire |
| κλωνάρι | ω | branch |
| κύκλος | υ | circle |
| καλημέρα | η | good morning |
| μυρίζω | υ | to smell |
| συρτάρι | υ | drawer |
| πυρσός | υ | firebrand |

| | | |
|---|---|---|
| τύμπανο | υ | drum |
| χωριό | ω | village |
| δάκρυ | υ | tear |
| ψηλά | υ | high |
| κολυμπώ | υ | to swim |
| αλυσίδα | υ | chain |
| μύγα | υ | fly |
| ξύστρα | υ | sharpener |
| ζυγαριά | υ | bathroom scale |
| έρωτας | ω | love |
| καρύδι | υ | nut |
| υγρό | υ | liquid |
| χήνα | η | goose |
| βρύση | υ | tap |
| κρύο | υ | cold |
| στήλη | η | column |
| θώρακας | ω | thorax |
| ήχος | η | sound |
| ίππος | ππ | horse |
| παράθυρο | υ | window |
| Αθήνα | η | Athens |
| σύκο | υ | fig |
| σφυρίχτρα | υ | whistle |
| πηγή | η | spring |
| χρυσό | υ | gold |
| νυφικό | υ | bride's dress |
| γέφυρα | υ | bridge |
| καμήλα | η | camel |
| λύρα | υ | lyre |

| | | |
|---|---|---|
| κλώσα | ω | broody hen |
| πυγολαμπίδα | υ | firefly |
| πτυχίο | υ | diploma |
| αλεξίπτωτο | ω | parachute |
| άγγελος | γγ | angel |
| μύλος | υ | flour mill |
| θάλασσα | σσ | sea |
| κυψέλη | υ | hive |
| συντριβάνι | υ | fountain |
| ψωμί | ω | bread |
| πύραυλος | υ | rocket |
| πετεινός | ει | cock |
| ρύγχος | υ | muzzle |
| χελώνα | ω | tortoise |
| χορός | ο | dance |
| πυρκαγιά | υ | fire |
| καμπύλη | υ | curve |
| μύρο | υ | aroma |
| ωκεανός | ω | ocean |
| βυθός | υ | bottom of the sea |
| ψώνια | ω | shopping |
| ρεβύθι | υ | chickpea |
| ύφασμα | υ | cloth |
| ρυάκι | υ | stream |
| λυχνάρι | υ | oil lamp |

# APPENDIX 5

## Table 5.1

***Fourth exploratory study***: *numbers of words for which pictograms had been created broken down by letter and sound (percentages in brackets).*

| 'Difficult' letters with their sounds | Number of words |
|---|---|
| υ /i/ | 59 (56.20%) |
| η /i/ | 19 (18.10%) |
| ει /i/ | 1 (0.95%) |
| οι /i/ | 2 (1.90%) |
| ω /o/ | 21 (20.00%) |
| αι /e/ | - |
| Double consonants | 3 (2.85%) |

## Table 5.2

***Fourth exploratory study***: *numbers of words for which pictograms had been created broken down by grammatical type (percentages in brackets)*

| Grammatical type | Number of words |
|---|---|
| Concrete nouns | 91 (86.6%) |
| Abstract nouns | 6 (5.7%) |
| Adjectives | 2 (1.9%) |
| Verbs | 4 (3.8%) |
| Adverbs | 2 (1.9%) |

# APPENDIX 6

## Table 6.1

***Fourth exploratory study, children taught in a group:*** *age in months, number of words taught, number of correctly spelled words in the spelling test and number of correctly spelled words in the ten dictated sentences (percentages in brackets).*

| Participants | Age in months | Number of taught words | Number of correctly spelled words in the spelling test (percentages in brackets) | Number of correctly spelled words in the ten dictated sentences (percentages in brackets) |
|---|---|---|---|---|
| P1 | 113 | 64 | 63 (98.43%) | 55 (91.60%) |
| P2 | 97 | 64 | 64 (100%) | 53 (88.33%) |
| P3 | 124 | 64 | 64 (100%) | 58 (96.66%) |
| P4 | 134 | 64 | 62 (96.87%) | 54 (90.00%) |
| P5 | 137 | 64 | 64 (100%) | 51 (85.00%) |
| mean | 121 | | 63.4 (99.06%) | 54.2 (90.31%) |
| sd | 14.65 | | 0.80 | 2.31 |

## Table 6.2

***Fourth exploratory study, children taught individually:*** *age in months, number of taught words, number of correctly spelled words in the spelling test and number of correctly spelled words in the ten dictated sentences (percentages in brackets).*

| Participants | Age in months | Taught words | Number of correctly spelled words in the spelling test (percentages in brackets) | Number of correctly spelled words in the10 sentences (percentages in brackets) |
|---|---|---|---|---|
| P6 | 117 | 97 | 95 (97.93%) | 53 (88.30%) |
| P7 | 122 | 95 | 95 (100%) | 58 (96.66%) |
| P8 | 127 | 96 | 96 (100%) | 60 (100%) |
| P9 | 121 | 102 | 100 (98.03%) | 55 (91.66%) |
| P10 | 125 | 88 | 88 (100%) | 59 (98.33%) |
| P11 | 120 | 99 | 98 (98.98%) | 56 (93.33%) |
| P12 | 125 | 101 | 101 (100%) | 58 (96.66%) |
| P13 | 135 | 105 | 105 (100%) | 54 (90.00%) |
| P14 | 138 | 97 | 97 (100%) | 55 (91.66%) |
| P15 | 128 | 92 | 90 (97.82%) | 59 (98.33%) |
| P16 | 139 | 96 | 95 (98.95%) | 54 (90.00%) |
| P17 | 134 | 90 | 88 (97.77%) | 52 (86.66%) |
| P18 | 138 | 93 | 91 (97.84%) | 51 (85.00%) |
| P19 | 133 | 87 | 84 (96.55%) | 56 (93.33%) |
| P20 | 147 | 84 | 84 (100%) | 59 (98.33%) |
| P21 | 158 | 85 | 85 (100%) | 59 (98.33%) |
| mean | 131.68 | - | (98.99%) | (93.53%) |
| sd | 10.49 | | | |

# APPENDIX 7

***Fifth exploratory study*: *the seventy words dictated to the children with their 'difficult' letters and English translation.***

| Greek words | 'Difficult' letters | English translation |
|---|---|---|
| τείχος | ει | wall |
| γλείφω | ει | to suck |
| θυμός | υ | anger |
| αφαίρεση | αι | subtraction |
| πειράζω | ει | to tease |
| ζημιάρης | η | messy |
| κόλλα | λλ | glue |
| μητέρα | η | mother |
| παράδεισος | ει | paradise |
| φεγγάρι | γγ | moon |
| ορειβάτης | ει | mountaineer |
| γρήγορος | η | quick |
| κηπουρός | η | gardener |
| τυφλός | υ | blind |
| άνθρωπος | ω | man |
| ώριμος | ω | mature |
| Ιησούς | η | Jesus |
| γυμνός | υ | naked |
| βήχω | η | to cough |
| πηδάω | η | to jump |
| δείχνω | ει | to show |
| λαχείο | ει | lottery |

| | | |
|---|---|---|
| ανθοπώλης | ω | florist |
| απειλώ | ει | to threaten |
| χαιρετώ | αι | to say goodbye |
| δανείζω | ει | to lend |
| χορωδία | ω | choir |
| Άνοιξη | οι | Spring |
| κλείνω | ει | to close |
| ιδρώτας | ω | sweat |
| κατοικία | οι | house |
| κλειδαράς | ει | locksmith |
| νήπιο | η | baby |
| σεισμός | ει | earthquake |
| παίζω | αι | to play |
| χήρα | η | widow |
| ζωγράφος | ω | painter |
| αδειάζω | ει | to empty |
| ισορροπία | ρρ | balance |
| ληστής | η | robber |
| μοιράζω | οι | to share |
| προτείνω | ει | to suggest |
| χλωμός | ω | pale |
| βλέμμα | μμ | look |
| θρηνώ | η | to mourn |
| χειρούργος | ει | surgeon |
| ζητιανος | η | burglar |
| φτωχός | ω | poor |
| πρώτος | ω | first |

| | | |
|---|---|---|
| αγγίζω | γγ | to touch |
| παίρνω | αι | to take |
| αρχαίος | αι | ancient |
| θεραπεία | ει | therapy |
| επείγον | ει | urgent |
| πυροσβέστης | υ | fire-man |
| εισπράκτορας | ει | conductor |
| παχύς | υ | fat |
| σκοτεινός | ει | dark |
| παράλυτος | υ | paraplegic |
| λείψανο | ει | corpse |
| ειδικός | ει | specialist |
| αλλάζω | λλ | to change |
| φύλακας | υ | guard |
| γεωργός | ω | farmer |
| αστείος | ει | funny |
| πρόσωπο | ω | face |
| μάγειρας | ει | cook |
| γείτονας | ει | neighbour |
| καταρράκτης | ρρ | waterfall |
| λύπη | υ | sadness |

# APPENDIX 8

## Table 8.1

***Fifth exploratory study***: *numbers of words taught to the children broken down by letter and sound (percentages in brackets).*

| Irregular letters with their sounds | Number of words (percentages in brackets) |
|---|---|
| υ /i/ | 8 (11.14%) |
| η /i/ | 12 (17.10%) |
| ει /i/ | 24 (34.20%) |
| οι /i/ | 3 (4.20%) |
| ω /o/ | 11 (15.70%) |
| αι /e/ | 5 (7.10%) |
| Double consonants | 7 (10.00%) |

## Table 8.2

***Fifth exploratory study***: *number of words taught to the children broken down by grammatical type (percentages in brackets).*

| Grammatical type | Number of words (percentages in brackets) |
|---|---|
| Concrete nouns | 34 (48.5%) |
| Abstract nouns | 7 (10.0%) |
| Adjectives | 11 (15.7%) |
| Verbs | 17 (24.2%) |
| Adverbs | 1 ( 1.4%) |

# APPENDIX 9

## Table 9.1

***Fifth exploratory study, children taught in a group:*** *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets)*

| Participants | Age in months | Number of taught words | Number of correctly spelled words in the spelling test (percentages in brackets) |
|---|---|---|---|
| P1 | 113 | 58 | 3 (5.17%) |
| P2 | 97 | 58 | 5 (8.62%) |
| P3 | 124 | 58 | 1 (1.72%) |
| mean | 111.33 | | 3 (5.17%) |
| sd | 11.08 | | 1.63 |

## Table 9.2

***Fifth exploratory study, children taught individually:*** *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets).*

| Participants | Age in months | Number of taught words | Number of correctly spelled words in the spelling test (percentages in brackets) |
|---|---|---|---|
| P6 | 117 | 61 | 5 ( 8.19%) |
| P7 | 122 | 59 | 2 ( 3.38%) |
| P8 | 127 | 62 | 7 (11.29%) |
| P9 | 121 | 66 | 2 ( 3.03%) |
| P10 | 125 | 57 | 4 ( 7.01%) |
| P11 | 120 | 63 | 3 ( 4.76%) |
| P12 | 125 | 65 | 5 ( 7.69%) |
| P15 | 128 | 58 | 7 (12.06%) |
| P16 | 139 | 53 | 4 ( 7.54%) |
| P17 | 134 | 59 | 6 (10.16%) |
| P19 | 133 | 63 | 6 ( 9.52%) |
| P21 | 158 | 56 | 7 (12.50%) |
| mean | 129.08 | | (8.90%) |
| sd | 10.63 | | |

# APPENDIX 10

## Table 10.1

***Sixth exploratory study, children taught in a group:*** *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets)*

| Participants | Age in months | Number of taught words | Number of correctly spelled words (percentages in brackets) |
|---|---|---|---|
| P1 | 127 | 51 | 48 (94.1%) |
| P2 | 125 | 51 | 51 (100%) |
| P3 | 134 | 51 | 46 (90.1%) |
| P4 | 136 | 51 | 46 (90.1%) |
| P5 | 135 | 51 | 44 (86.2%) |
| P6 | 138 | 51 | 49 (96.0%) |
| mean | 132.5 | | 47.3 (92.75%) |
| sd | 4.78 | | 2.28 |

## Table 10.2

***Sixth exploratory study, children taught individually***: *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets)*

| Participants | Age in months | Number of taught words | Number of correctly spelled words (percentages in brackets) |
|---|---|---|---|
| P7 | 126 | 59 | 54 (91.50%) |
| P8 | 123 | 64 | 64 (100%) |
| P9 | 127 | 65 | 65 (100%) |
| P10 | 125 | 65 | 61 (93.80%) |
| P11 | 133 | 63 | 61 (96.80%) |
| P12 | 134 | 61 | 52 (85.20%) |
| P13 | 135 | 67 | 61 (91.04%) |
| mean | 129 | | (94.04%) |
| sd | 4.50 | | |

# APPENDIX 11

## Table 11.1

***Seventh exploratory study, students of Primary School taught in a group:*** *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets)*

| Participants | Age in months | Number of taught words | Number of correctly spelled words (percentages in brackets) |
|---|---|---|---|
| 1ST GROUP | | | |
| P1 | 125 | 288 | 262 (90.97%) |
| P2 | 123 | 288 | 276 (95.83%) |
| P3 | 121 | 288 | 268 (93.05%) |
| P4 | 136 | 288 | 271 (94.09%) |
| P5 | 139 | 288 | 263 (91.31%) |
| P6 | 140 | 288 | 271 (94.09%) |
| mean | 130.66 | | 268 (93.22%) |
| sd | 7.84 | | 4.85 |
| | | | |
| 2ND GROUP | | | |
| P7 | 127 | 444 | 408 (91.89%) |
| P8 | 131 | 444 | 418 (94.14%) |
| P9 | 124 | 444 | 413 (96.84%) |
| P10 | 125 | 444 | 398 (89.63%) |
| P11 | 126 | 444 | 412 (92.79%) |
| P12 | 141 | 444 | 417 (93.91%) |
| P13 | 137 | 444 | 399 (89.86%) |

| | | | |
|---|---|---|---|
| P14 | 140 | 444 | 396 (89.18%) |
| P15 | 133 | 444 | 396 (89.18%) |
| P16 | 141 | 444 | 403 (90.76%) |
| mean | 132.5 | | 406 (91.81%) |
| sd | 6.51 | | 8.22 |

## Table 11.2

***Seventh exploratory study, students of Primary School taught individually:*** *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets).*

| Participants | Age in months | Number of taught words | Number of correctly spelled words (percentages in brackets) |
|---|---|---|---|
| P17 | 110 | 73 | 71 (97.26%) |
| P18 | 114 | 150 | 144 (96.00%) |
| P19 | 109 | 102 | 93 (91.17%) |
| P21 | 116 | 178 | 172 (96.62%) |
| P21 | 124 | 467 | 422 (90.36%) |
| P22 | 127 | 680 | 664 (97.64%) |
| P23 | 125 | 334 | 327 (97.90%) |
| P24 | 123 | 127 | 125 (98.42%) |
| P25 | 129 | 692 | 670 (96.82%) |
| P26 | 126 | 488 | 418 (85.65%) |
| P27 | 121 | 567 | 534 (94.17%) |
| P28 | 128 | 583 | 508 (87.13%) |
| P29 | 127 | 231 | 211 (91.34%) |
| P30 | 124 | 118 | 115 (97.45%) |
| P31 | 126 | 65 | 65 (100%) |
| P32 | 128 | 89 | 87 (97.75%) |
| P33 | 127 | 661 | 643 (97.20%) |
| P34 | 125 | 700 | 677 (96.71%) |
| P35 | 129 | 695 | 663 (95.39%) |
| P36 | 131 | 670 | 628 (93.73%) |
| P37 | 128 | 584 | 566 (96.91%) |

| | | | |
|---|---|---|---|
| P38 | 121 | 90 | 90 (100%) |
| P39 | 125 | 700 | 670 (96.71%) |
| P40 | 122 | 690 | 659 (95.50%) |
| P41 | 129 | 141 | 138 (97.87%) |
| P42 | 123 | 33 | 33 (100%) |
| P43 | 128 | 655 | 649 (99.08%) |
| P44 | 131 | 650 | 622 (95.69%) |
| P45 | 127 | 634 | 600 (94.63%) |
| P46 | 122 | 478 | 465 (97.28%) |
| P47 | 124 | 658 | 633 (96.20%) |
| P48 | 126 | 111 | 110 (99.09%) |
| P49 | 122 | 686 | 640 (93.29%) |
| P50 | 127 | 443 | 431 (97.29%) |
| P51 | 121 | 190 | 187 (98.42%) |
| P52 | 129 | 467 | 422 (90.36%) |
| P53 | 125 | 500 | 481 (96.20%) |
| P54 | 123 | 222 | 201 (90.54%) |
| P55 | 128 | 45 | 45 (100%) |
| P56 | 124 | 540 | 503 (93.14%) |
| P57 | 126 | 500 | 466 (93.20%) |
| P58 | 121 | 456 | 421 (92.32%) |
| P59 | 129 | 530 | 514 (96.98%) |
| P60 | 125 | 120 | 118 (98.33%) |
| P61 | 127 | 560 | 532 (95.00%) |
| P62 | 123 | 32 | 32 (100%) |
| P63 | 127 | 386 | 330 (85.49%) |
| P64 | 122 | 600 | 574 (95.66%) |

| | | | |
|---|---|---|---|
| P65 | 126 | 602 | 588 (97.67%) |
| P66 | 128 | 345 | 320 (92.75%) |
| P67 | 122 | 650 | 639 (98.30%) |
| P68 | 125 | 582 | 576 (98.96%) |
| P69 | 127 | 29 | 29 (100%) |
| P70 | 124 | 260 | 252 (96.92%) |
| P71 | 123 | 670 | 644 (96.11%) |
| P72 | 121 | 420 | 387 (92.14%) |
| P73 | 129 | 250 | 232 (92.80%) |
| P74 | 128 | 500 | 472 (94.40%) |
| P75 | 131 | 470 | 425 (90.42%) |
| P76 | 123 | 320 | 301 (94.06%) |
| P77 | 127 | 122 | 122 (100%) |
| P78 | 125 | 610 | 600 (98.36%) |
| P79 | 124 | 204 | 184 (90.19%) |
| P80 | 126 | 506 | 475 (93.87%) |
| P81 | 121 | 550 | 537 (97.63%) |
| P82 | 128 | 200 | 198 (99.00%) |
| P83 | 133 | 170 | 164 (96.47%) |
| P84 | 138 | 45 | 44 (97.77%) |
| P85 | 140 | 600 | 588 (98.00%) |
| P86 | 133 | 672 | 624 (92.85%) |
| P87 | 139 | 332 | 312 (93.97%) |
| P88 | 135 | 120 | 117 (97.50%) |
| P89 | 134 | 408 | 385 (94.36%) |
| P90 | 143 | 123 | 121 (98.37%) |
| P91 | 133 | 324 | 311 (95.98%) |

| | | | |
|---|---|---|---|
| P92 | 137 | 605 | 573 (94.71%) |
| P93 | 134 | 487 | 455 (93.42%) |
| P94 | 140 | 355 | 337 (94.92%) |
| P95 | 137 | 287 | 264 (91.98%) |
| P96 | 136 | 300 | 275 (91.66%) |
| P97 | 138 | 100 | 100 (100%) |
| mean | 126.93 | | (95.54%) |
| sd | 6.12 | | |

## Table 11.3

***Seventh exploratory study, students of Primary School with low intelligence level taught individually:*** *age in months, IQ, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets).*

| Participants | Age in months | IQ | Number of taught words | Number of correctly spelled words (percentages in brackets) |
|---|---|---|---|---|
| P98 | 126 | 82 | 370 | 254 (68.64%) |
| P99 | 140 | 86 | 508 | 230 (45.27%) |
| P100 | 134 | 94 | 250 | 238 (95.20%) |
| P101 | 137 | 80 | 200 | 164 (82.00%) |
| mean | 134.25 | 85.5 | | (72.77%) |
| sd | 5.21 | 5.36 | | |

## Table 11.4

***Seventh exploratory study, students of High School taught individually:*** *age in months, number of taught words and number of correctly spelled words in the spelling test (percentages in brackets)*

| Participants | Age in months | Number of taught words | Number of correctly spelled words (percentages in brackets) |
|---|---|---|---|
| P102 | 153 | 400 | 378 (94.50%) |
| P103 | 146 | 360 | 342 (95.00%) |
| P104 | 149 | 285 | 265 (92.98%) |
| P105 | 148 | 155 | 155 (100%) |
| P106 | 152 | 470 | 463 (98.50%) |
| P107 | 145 | 360 | 348 (96.60%) |
| P108 | 147 | 410 | 396 (96.60%) |
| P109 | 153 | 380 | 336 (88.42%) |
| P110 | 149 | 27 | 27 (100%) |
| P111 | 158 | 340 | 332 (97.64%) |
| P112 | 163 | 402 | 388 (96.51%) |
| P113 | 167 | 336 | 329 (97.91%) |
| P114 | 158 | 300 | 296 (98.66%) |
| P115 | 161 | 280 | 271 (96.78%) |
| P116 | 175 | 100 | 100 (100%) |
| P117 | 176 | 260 | 243 (93.46%) |
| P118 | 193 | 25 | 25 (100%) |
| P119 | 199 | 60 | 60 (100%) |
| P120 | 201 | 400 | 384 (96.00%) |
| P121 | 197 | 452 | 417 (92.25%) |
| P122 | 194 | 190 | 169 (88.94%) |

| | | | |
|---|---|---|---|
| P123 | 208 | 200 | 200 (100%) |
| P124 | 229 | 300 | 300 (100%) |
| mean | 170.47 | | (96.55%) |
| sd | 23.98 | | |

* The number of the words which were taught to the above participants varied according not only to the number of their misspelled words but also to the time which was spent in teaching them.

# APPENDIX 12

## Table 12.1

***Eighth exploratory study, group A - taught by the pictographic method:*** *age in months and number of correctly spelled words in the first and the second spelling test out of a possible 60 for each child*

| Participants | Age in months | Number of correctly spelled words in the 1st spelling test | Number of correctly spelled words in the 2nd spelling test |
|---|---|---|---|
| P1 | 123 | 59 | 54 |
| P2 | 119 | 58 | 58 |
| P3 | 125 | 55 | 52 |
| P4 | 126 | 57 | 55 |
| P5 | 122 | 56 | 56 |
| P6 | 129 | 58 | 56 |
| P7 | 124 | 58 | 58 |
| P8 | 128 | 57 | 56 |
| P9 | 129 | 57 | 57 |
| P10 | 127 | 56 | 55 |
| mean | 125.2 | 57.1 | 54.8 |
| sd | 3.09 | 1.13 | 1.73 |

## Table 12.2

***Eighth exploratory study, group B - taught by the traditional methods:*** *age in months and number of correctly spelled words in the first and the second spelling test out of a possible 60 for each child*

| Participants | Age in months | Number of correctly spelled words in the 1st spelling test | Number of correctly spelled words in the 2nd spelling test |
|---|---|---|---|
| P11 | 122 | 12 | 3 |
| P12 | 117 | 21 | 1 |
| P13 | 119 | 17 | 4 |
| P14 | 124 | 15 | 7 |
| P15 | 129 | 19 | 5 |
| P16 | 121 | 13 | 2 |
| P17 | 132 | 18 | 6 |
| P18 | 135 | 24 | 5 |
| P19 | 140 | 22 | 4 |
| P20 | 137 | 14 | 5 |
| mean | 127.6 | 17.5 | 4.2 |
| sd | 7.69 | 3.82 | 1.72 |

* A t-test showed a significant difference between the means of the number of the correctly spelled words of the two groups for both measures ($t=29.76$, $p<0.001$ for the first and $t=63.23$, $p<0.001$ for the second.

# APPENDIX 13

***Main Research**: the 100 words which were dictated to the participants in the main research with their irregular letters and their English translation*

| Greek words | Irregular letters | English translation |
|---|---|---|
| θύελλα | υ, ε, λλ | storm |
| άνθρωπος | ω, ο | man |
| κλείνω | ει, ω | close |
| κίνδυνος | ι, υ, ο | danger |
| πρώτος | ω, ο | first |
| γοητεία | ο, η, ει | charm |
| μυρωδιά | υ, ω, ι | smell |
| εννέα | ε, νν, ε | nine |
| μυρίζω | υ, ι, ω | smell |
| σύκο | υ, ο | fig |
| παχύς | υ | fat |
| κρύβω | υ, ω | hide |
| απειλώ | ει, ω | to threaten |
| κυπαρίσσι | υ, ι, σσ, ι | cypress tree |
| εκείνο | ε, ει | that |
| αλεύρι | ευ, ι | flour |
| ανησυχώ | η, υ, ω | to worry |
| συμμορία | υ, μμ, ο, ι | gang |
| ευχή | ευ, η | wish |
| αυλή | ευ, η | yard |
| καιρός | αι, ο | weather |
| σύννεφο | υ, νν, ε, ο | cloud |

| | | |
|---|---|---|
| γωνία | ω, ι | corner |
| Ποσειδώνας | ο, ει, ω | Posidonas |
| αίσθημα | αι, η | feeling |
| φύλακας | υ | guard |
| ημέρα | η, ε | day |
| παγωτό | ω | ice-cream |
| μυωπία | υ, ω, ι | short-sight |
| καλλυντικά | λλ, υ, ι | cosmetics |
| δηλητηριώδης | η, η, η, ι, ω, η | poisonous |
| σύκο-σήκω | υ, ο - η, ω | fig - get up |
| διάλειμμα | ι, ει, μμ | break |
| πολύ | ο, υ | very |
| παράθυρο | υ, ο | window |
| χρυσό | υ, ο | gold |
| θόρυβος | ο, υ, ο | noise |
| ορυχείο | ο, υ, ει | mine |
| δύο | υ, ο | two |
| ζώνη | ω, η | belt |
| πάτωμα | ω | floor |
| τύραννος | υ, νν, ο | tyrant |
| συνεργείο | υ, ε, ει | garage |
| ισορροπία | ι, ο, ρρ, ο, ι | balance |
| αστυνόμος | υ, ο, ο | policeman |
| ντύνω | υ, ω | dress |
| δουλειά | ει | job |
| σωλήνας | ω, η | tube |
| προκυμαία | ο, υ, αι | mole |

| | | |
|---|---|---|
| αιμορραγία | αι, ο, ρρ, ι | bleeding |
| λειτουργία | ει, ι | divine service |
| ταχύτητα | υ, η | speed |
| αδειάζω | ει, ω | empty |
| προσπάθεια | ο, ει | attempt |
| τολμηρός | ο, η, ο | daring |
| γλυκό | υ, ο | sweet |
| φυσώ | υ, ω | blow |
| πρωί | ω, ι | morning |
| ήλιος | η, ι, ο | sun |
| σύλληψη | υ, λλ, η, η | arrest |
| Ευρωπαίος | ευ, ω, αι, ο | European |
| συγυρίζω | υ, υ, ι, ω | to tidy up |
| προσκύνημα | ο, υ, η | worship |
| δυστύχημα | υ, υ, η | accident |
| φωτιά | ω, ι | fire |
| Άνοιξη | οι, η | Spring |
| αρραβώνας | ρρ, ω | engagement |
| αποτυπώματα | ο, υ, ω | finger prints |
| κρύσταλλο | υ, λλ | crystal |
| πίθηκος | ι, η, ο | monkey |
| σκουλήκι | η, ι | worm |
| πρόσωπο | ο, ω, ο | face |
| μαγείρισσα | ει, ι, σσ | cook |
| δαντελωτός | ε, ω, ο | lace |
| ειδοποιώ | ει, ο, οι, ω | to notify |
| γειτόνισσα | ει, ο, ι, σσ | neighbour |

| | | |
|---|---|---|
| ξυπόλυτος | υ, ο, υ, ο | barefooted |
| καπνοπωλείο | ο, ω, ει | tobacconist's |
| αραιό | αι, ο | thin |
| καινούριο | αι, ι, ο | new |
| χειρότερος | ει, ο, ε, ο | worst |
| κρύβω | υ, ω | hid |
| γυναίκα | υ, αι | woman |
| κομμάτι | ο, μμ, ι | piece |
| κρυμμένος | υ, μμ, ε, ο | hidden |
| σημείωμα | η, ει, ω | note |
| συνδυασμός | υ, υ, ο | combination |
| καλλιέργεια | λλ, ι, ε, ει | cultivation |
| χειρουργείο | ει, ει, ο | operation room |
| συζητώ | υ, η, ω | to discuss |
| σημάδι | η, ι | sign |
| κομμωτήριο | ο, μμ, ω, η, ι, ο | hairdresser's |
| σημαία | η, αι | flag |
| ορειβάτης | ο, ει, η | mountain climber |
| πανηγύρι | η, υ, ι | festival |
| αλήθεια | η, ει | truth |
| λεωφορείο | ε, ω, ει, ο | bus |
| μαιευτήριο | αι, ευ, η, ι, ο | maternity clinic |
| εμπρησμός | ε, η, ο | fire-raising |
| ανελκυστήρας | ε, υ, η | elevator |

# APPENDIX 14

***Main research:*** *distribution of numbers of the correctly spelled words for the 748 pupils with grouped frequencies (1-3, 4-6, etc).*

| Number of correctly spelled words | Number of students | Percentage |
|---|---|---|
| 1-3 | 14 | 1.9% |
| 4-6 | 15 | 2.0% |
| 7-9 | 12 | 1.6% |
| 10-12 | 17 | 2.3% |
| 13-15 | 18 | 2.4% |
| 16-18 | 8 | 1.1% |
| 19-21 | 9 | 1.2% |
| 22-24 | 13 | 1.7% |
| 25-27 | 14 | 1.9% |
| 28-30 | 25 | 3.4% |
| 31-33 | 21 | 2.8% |
| 34-36 | 28 | 3.8% |
| 37-39 | 28 | 3.8% |
| 40-42 | 30 | 4.3% |
| 43-45 | 35 | 4.6% |
| 46-48 | 38 | 5.1% |
| 49-51 | 38 | 5.1% |
| 52-54 | 24 | 3.2% |
| 55-57 | 36 | 4.8% |
| 58-60 | 47 | 6.3% |
| 61-63 | 34 | 4.5% |
| 64-66 | 35 | 4.6% |

| | | |
|---|---|---|
| 67-69 | 34 | 4.5% |
| 70-72 | 27 | 3.7% |
| 73-75 | 25 | 3.3% |
| 76-78 | 29 | 3.8% |
| 79-81 | 22 | 2.9% |
| 82-84 | 29 | 3.8% |
| 85-87 | 14 | 1.9% |
| 88-90 | 12 | 1.6% |
| 91-93 | 9 | 1.2% |
| 94-96 | 5 | 0.6% |
| 97-99 | 3 | 0.3% |

# APPENDIX 15

## Table 15.1

***Main research, first group:*** *number of positive indicators ('pluses') on the BDT for each participant*

| Participants | BDT |
|---|---|
| P1 | 7 |
| P2 | 6 |
| P3 | 6 |
| P4 | 7 |
| P5 | 7 |
| P6 | 7 |
| P7 | 6 |
| P8 | 10 |
| P9 | 6 |
| P10 | 8 |
| P11 | 6 |
| P12 | 7 |
| P13 | 6 |
| P14 | 5 |
| P15 | 9 |
| P16 | 7 |
| P17 | 7 |
| P18 | 6 |
| P19 | 9 |
| P20 | 5 |
| P21 | 7 |
| P22 | 8 |
| P23 | 7 |
| P24 | 6 |

## Table 15.2

***Main research, second group:*** *number of positive indicators ('pluses') on the BDT for each participant*

| Participants | BDT |
|---|---|
| P25 | 7 |
| P26 | 6 |
| P27 | 6 |
| P28 | 6 |
| P29 | 6 |
| P30 | 7 |
| P31 | 7 |
| P32 | 8 |
| P33 | 6 |
| P34 | 6 |
| P35 | 6 |
| P36 | 6 |
| P37 | 10 |
| P38 | 7 |
| P39 | 8 |
| P40 | 7 |
| P41 | 7 |
| P42 | 7 |
| P43 | 6 |
| P44 | 9 |
| P45 | 6 |
| P46 | 7 |
| P47 | 6 |
| P48 | 10 |

## Table 15.3

***Main research, untreated group:*** *number of positive indicators ('pluses') on the BDT for each participant*

| Participants | BDT |
|---|---|
| P49 | 7 |
| P50 | 6 |
| P51 | 6 |
| P52 | 6 |
| P53 | 7 |
| P54 | 6 |
| P55 | 10 |
| P56 | 8 |
| P57 | 8 |
| P58 | 6 |
| P59 | 9 |
| P60 | 6 |
| P61 | 6 |
| P62 | 6 |
| P63 | 6 |
| P64 | 6 |
| P65 | 9 |
| P66 | 6 |
| P67 | 5 |
| P68 | 7 |
| P69 | 7 |
| P70 | 7 |
| P71 | 8 |
| S72 | 8 |

# APPENDIX 16

***Main research*: *one-way ANOVA for table 7.2***

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 1.44 | 2 | 0.72 | 0.03 | ns |
| Within groups | 1464.21 | 69 | 21.22 | | |
| Total | 1465.65 | 71 | | | |

# APPENDIX 17

**Table 17.1**

***Main research:*** *one way ANOVA for table 10.2 (a)*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 6449.00 | 2 | 3224.50 | 529.47 | <0.001 |
| Within groups | 401.99 | 66 | 6.09 | | |
| Total | 6850.99 | 68 | | | |

**Table 17.2**

***Main research:*** *one way ANOVA for table 10.2 (b)*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 5074.60 | 2 | 2537.3 | 409.24 | <0.001 |
| Within groups | 415.98 | 67 | 6.20 | | |
| Total | 5490.58 | 69 | | | |

**Table 17.3**

***Main research:*** *post hoc comparisons (Scheffé) between the means of the number of the correctly spelled words of the 1st group, the 2nd group and the untreated group for the words in SET A*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| 1st group | - | | |
| 2nd group | 26.92 ($p<0.001$) | - | |
| Untreated group | 29.22 ($p<0.001$) | 2.3 (ns) | - |

**Table 17.4**

***Main research:*** *post hoc comparisons (Scheffé) between the means of the number of the correctly spelled words of the 1st group, the 2nd group and the untreated group for the words in SET B*

| | 1st group | 2nd group | Untreated group |
|---|---|---|---|
| 1st group | - | | |
| 2nd group | 29.93 ($p<0.001$) | - | |
| Untreated group | 6.03 ($p<0.001$) | 35.96 ($p<0.001$) | - |

# APPENDIX 18

**Table 18.1**

***Main research :*** *one-way ANOVA for table 10.5*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 7.66 | 2 | 3.83 | 0.72 | ns |
| Within groups | 239.31 | 45 | 5.31 | | |
| Total | 246.97 | 47 | | | |

**Table 18.2**

***Main research :*** *one-way ANOVA for table 10.6*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 21.57 | 2 | 10.78 | 1.31 | ns |
| Within groups | 359.82 | 44 | 8.17 | | |
| Total | 381.39 | 46 | | | |

**Table 18.3**

***Main research :*** *one-way ANOVA for table 10.7*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 14.51 | 2 | 7.25 | 0.49 | ns |
| Within groups | 654.96 | 45 | 14.55 | | |
| Total | 669.47 | 47 | | | |

**Table 18.4**

***Main research :*** *one-way ANOVA for table 10.8*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 1.89 | 2 | 0.94 | 0.10 | ns |
| Within groups | 394.77 | 45 | 8.77 | | |
| Total | 396.66 | 47 | | | |

**Table 18.5**

***Main research :*** *one-way ANOVA for table 10.13*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 7.72 | 3 | 2.57 | 0.47 | ns |
| Within groups | 239.25 | 44 | 5.43 | | |
| Total | 246.97 | 47 | | | |

**Table 18.6**

***Main research :*** *one-way ANOVA for table 10.14*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 39.84 | 3 | 13.28 | 1.67 | ns |
| Within groups | 341.56 | 43 | 7.94 | | |
| Total | 381.40 | 46 | | | |

**Table 18.7**

***Main research :*** *one-way ANOVA for table 10.15*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 49.39 | 3 | 16.46 | 1.16 | ns |
| Within groups | 620.08 | 44 | 14.09 | | |
| Total | 669.47 | 47 | | | |

**Table 18.8**

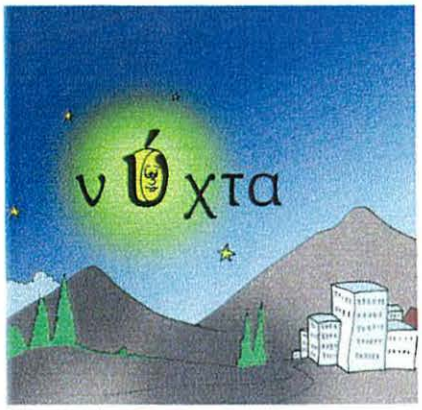
***Main research :*** *one-way ANOVA for table 10.16*

| Source of variance | Sum of squares | Degrees of freedom | Mean squares | F | P |
|---|---|---|---|---|---|
| Between groups | 33.66 | 3 | 11.22 | 1.36 | ns |
| Within groups | 363.00 | 44 | 8.25 | | |
| Total | 396.66 | 47 | | | |

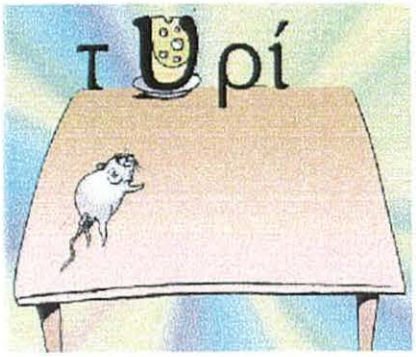
# APPENDIX 19

## Table 19.1

***First exploratory study:*** *the pictographic representations of the twenty words which were taught to the participants with the Greek words and their English translation.*

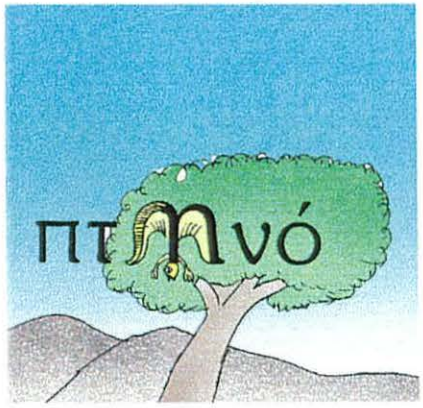



νύχτα (night)



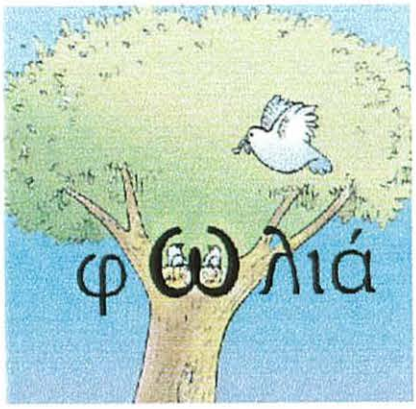

τυρί (cheese)

γυάλα (fish-bowl)




πτηνό (bird)

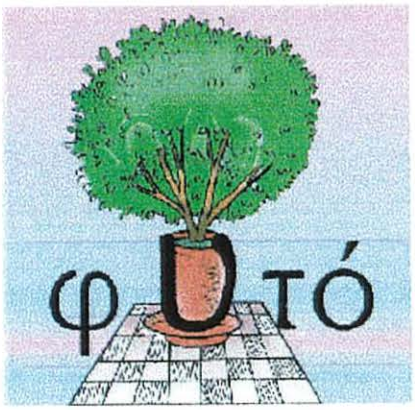
φωτιά (fire)




φωλιά (nest)

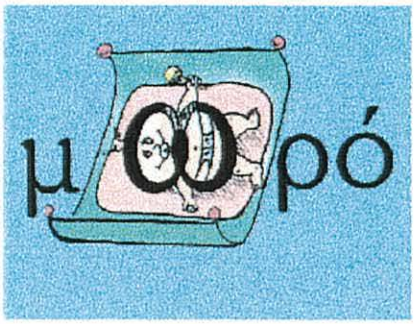
δάχτυλο (finger)

τύμπανο (drum)

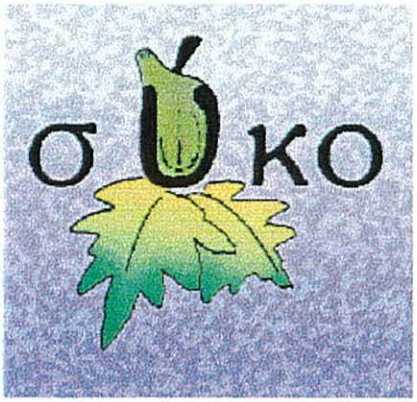



φυτό (plant)

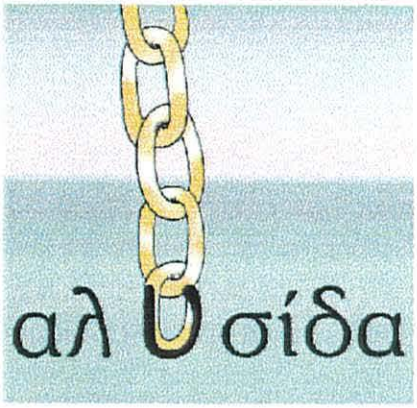
ζυγαριά (bathroom scale)




μωρό (baby)



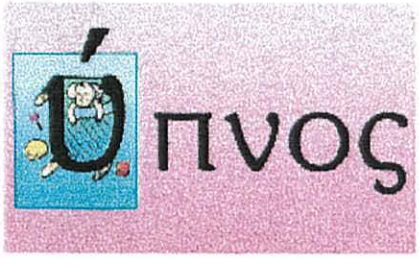

σύκο (fig)




αλυσίδα (chain)

κύκλος (circle)

κύπελο (cup)




ύπνος (sleep)

παγωτό (ice-cream)

μολύβι (pencil)

κυψέλη (hive)

χειμώνας (winter)

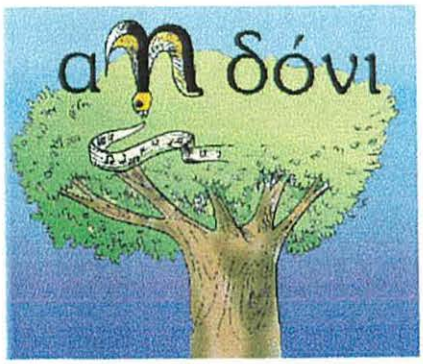
## Table 19.2

***Fourth exploratory study**: the pictographic representations of the 105 words which were taught to the participants with the Greek words and their English translation.*

νύχτα (night)

ημέρα (day)

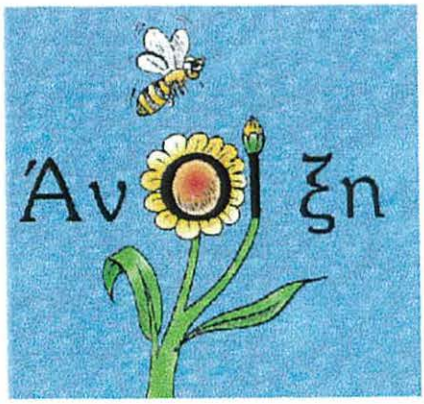
ήλιος (sun)



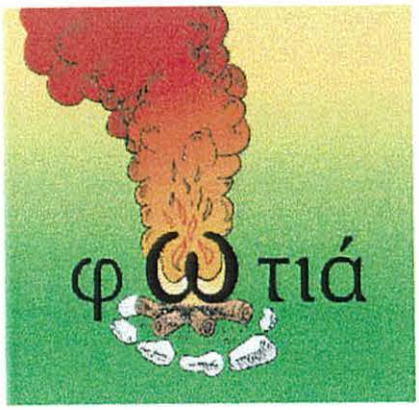

αηδόνι (nightingale)

κελαηδώ (to sing)

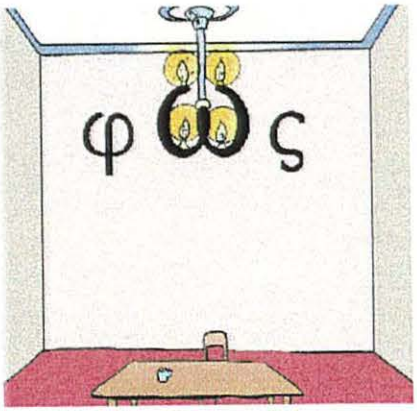
φωλιά (nest)




άνοιξη (spring)




φωτιά (fire)




φως (light)

παγωτό (ice cream)

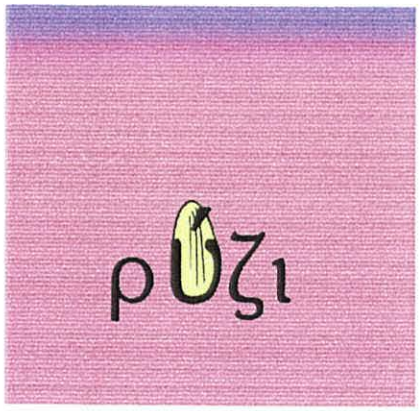
ύπνος (sleep)

γλυκό (sweet, cake)

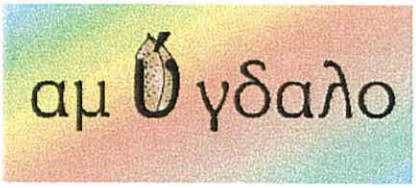
ανήφορος (uphill)

κατήφορος (downhill)

άγκυρα (anchor)




ρύζι (rice)



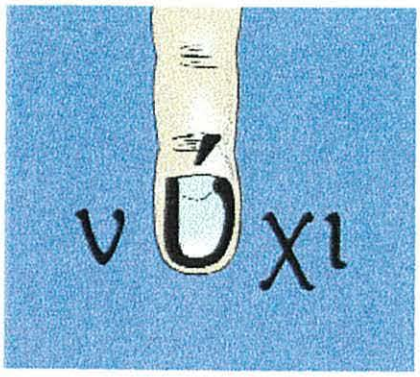

αμύγδαλο (almond)

φυλαχτό (talisman)

ζώνη (belt)

σκύλος (dog)

λύκος (wolf)

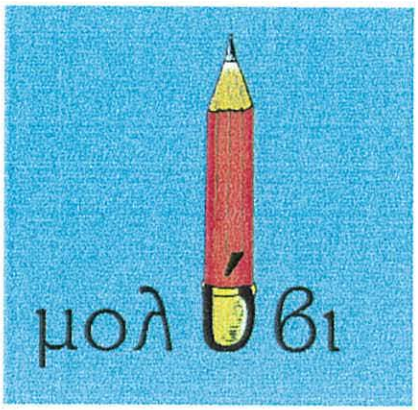



νύχι (nail)

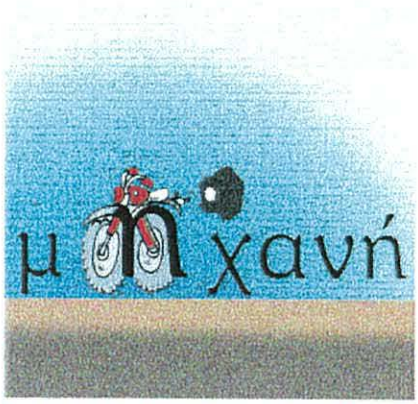
δάχτυλο (finger)

μπρούμυτα (face down)

ποδήλατο (bicycle)




μολύβι (pencil)

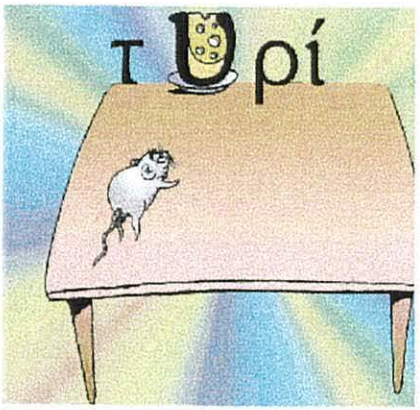



μηχανή (motorcycle)

κύπελλο (cup)

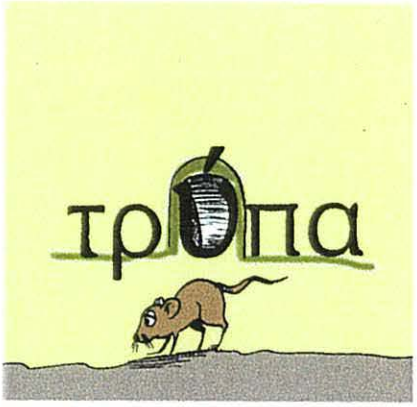
σταφύλι (grapes)

σκουλήκι (worm)

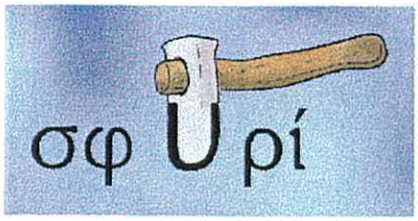



τυρί (cheese)

σπηλιά (cave)

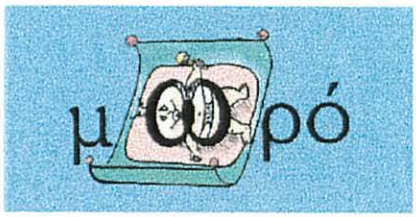



τρύπα (hole)




σφυρί (hammer)

στήθος (chest)




μωρό (baby)

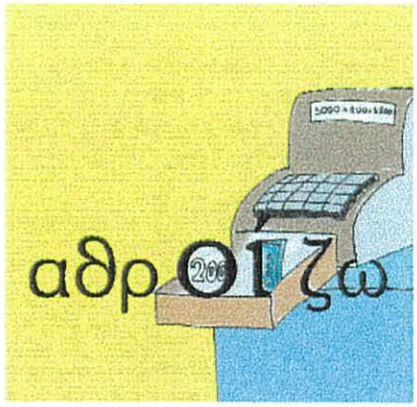
σώμα (body)

γλυπτό (sculpture)

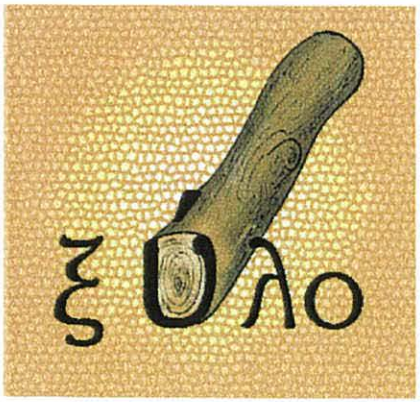
κοχύλι (sea-shell)

κολοκύθι (courgette)

γυάλα (fish bowl)



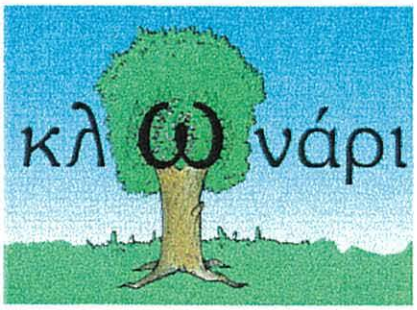

αθροίζω (to add)




ξύλο (wood)

κλωστή (sewing threat)

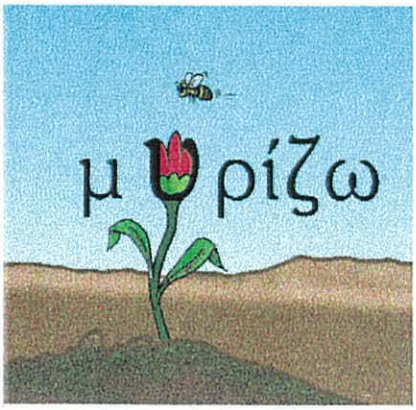
καλώδιο (wire)




κλωνάρι (branch)

κύκλος (circle)

καλημέρα (goodmorning)




μυρίζω (to smell)

συρτάρι (drawer)

πυρσός (firebrand)

τύμπανο (drum)

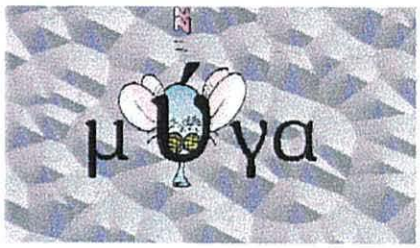
χώρος (space)

δάκρυ (tear)

ψηλά (high)

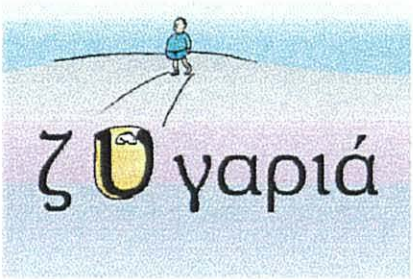
κολυμπώ (to swim)

αλυσίδα (chain)

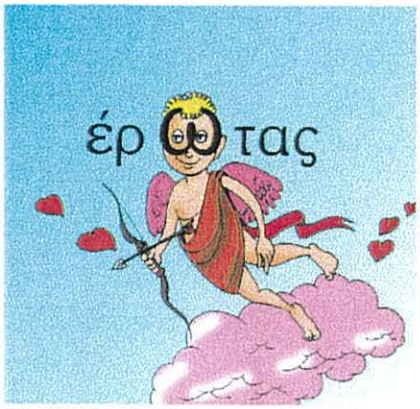



μύγα (fly)

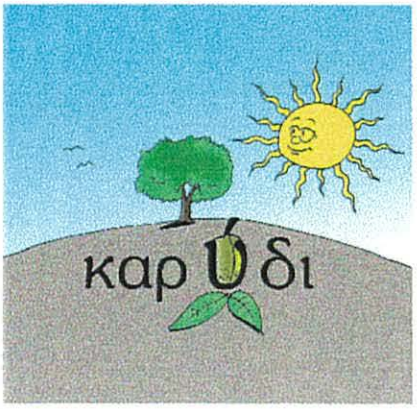
ξύστρα ( sharpener)



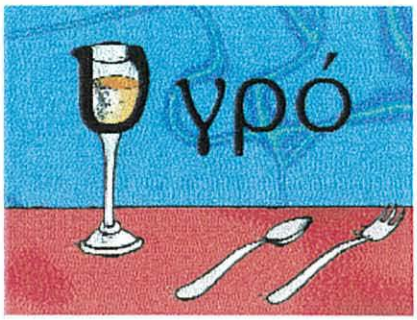

ζυγαριά (bathroom scale)



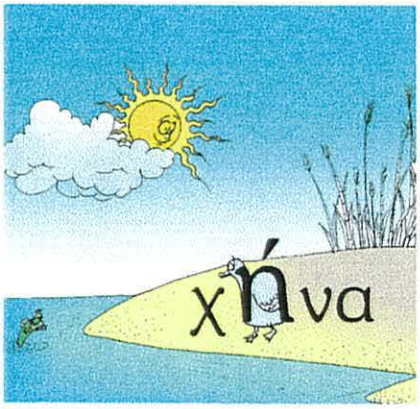

έρωτας (love)



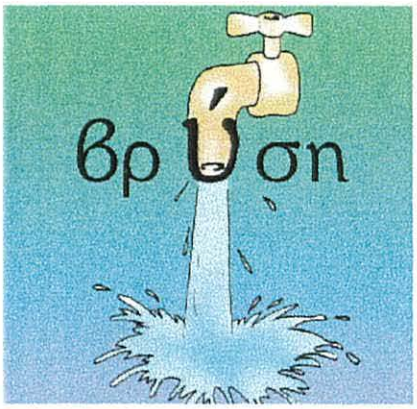

καρύδι (nut)



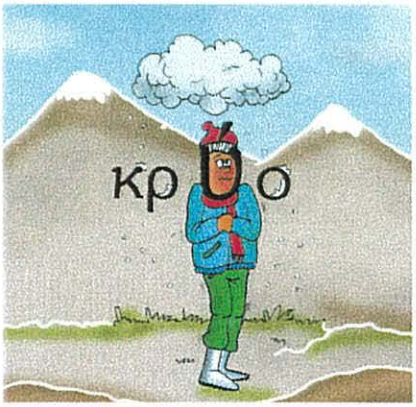

υγρό (liquid)



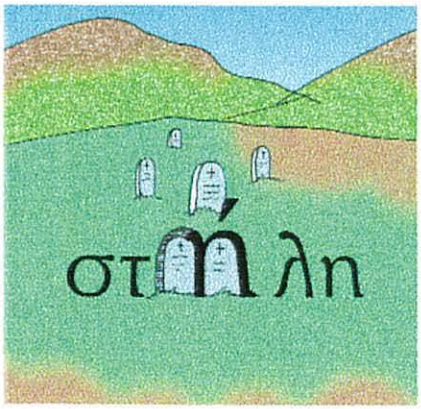

χήνα (goose)




βρύση (tap)



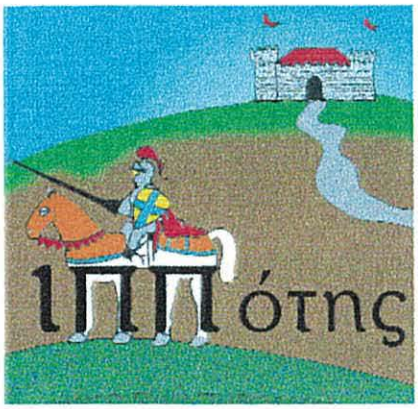

κρύο (cold)




στήλη (column)

θώρακας (thorax , chest)

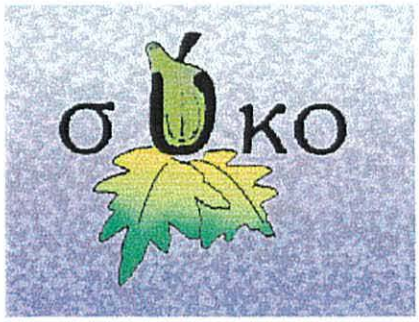
ήχος (sound)




ιππότης (horse)

παράθυρο (window)

Αθήνα (Athens)




σύκο (fig)

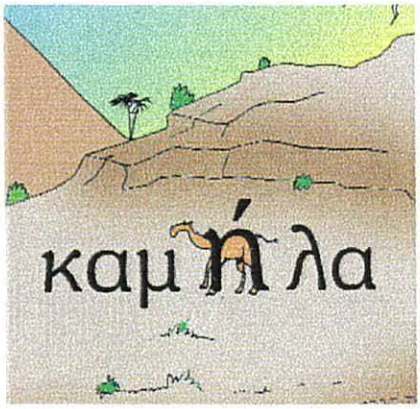
σφυρίχτρα (whistle)

πηγή (spring)

χρυσό (gold)

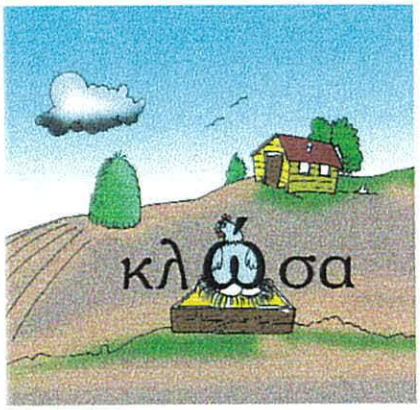
νύφη (bride)

γέφυρα (bridge)




καμήλα (camel)

λύρα (lyre)



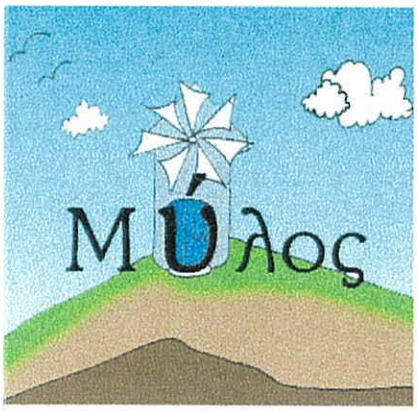

κλώσα (broody hen)

πυγολαμπίδα (firefly)

πτυχίο (diploma)

αλεξίπτωτο (parachute)

άγγελος (angel)




μύλος (floormill)

θάλασσα (sea)

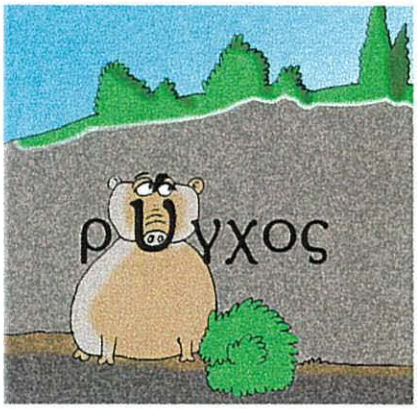
κυψέλη (hive)

συντριβάνι (fountain)

ψωμί (bread)

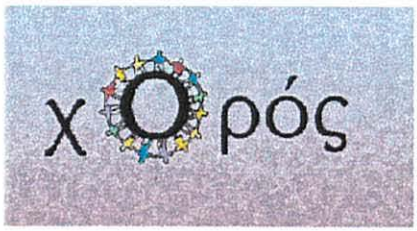
πύραυλος (rocket)

πετεινός (cock)




ρύγχος (muzzle)

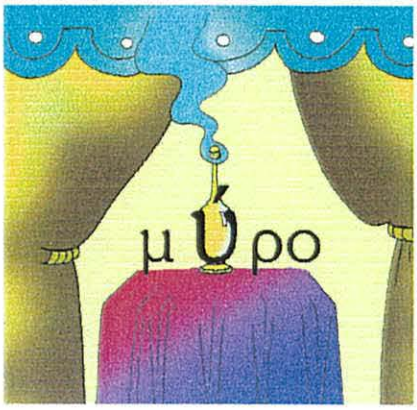
χελώνα (tortoise)




χορός (dance)

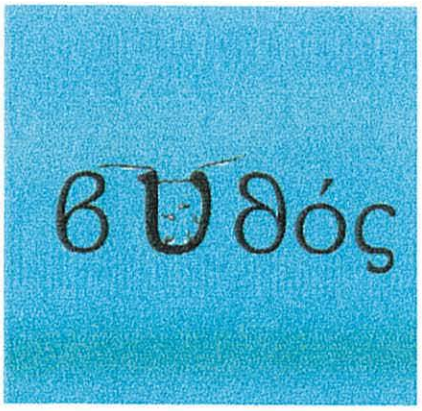
πυρκαγιά (fire)

καμπύλη (curve)

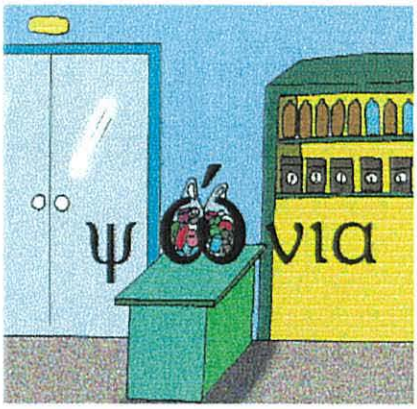



μύρο (aroma)

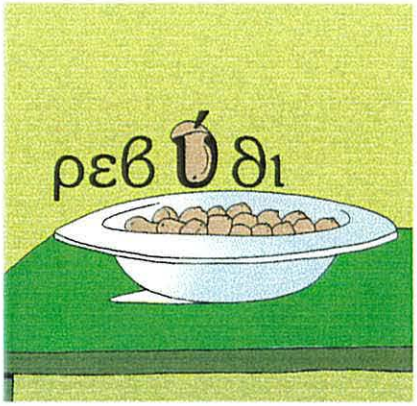
ωκεανός (ocean)



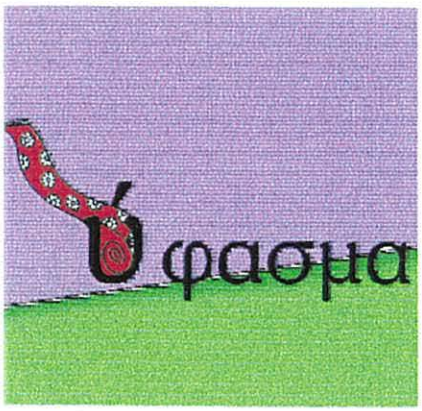

βυθός (bottom of the sea)



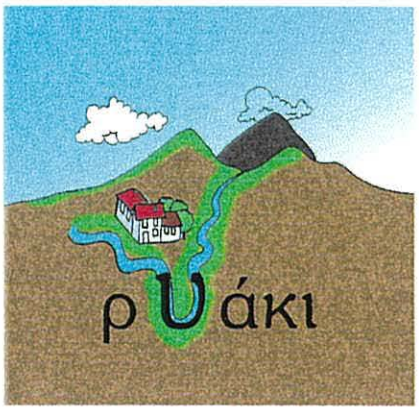

ψώνια (shopping)




ρεβύθι (chickpea)




ύφασμα (cloth)

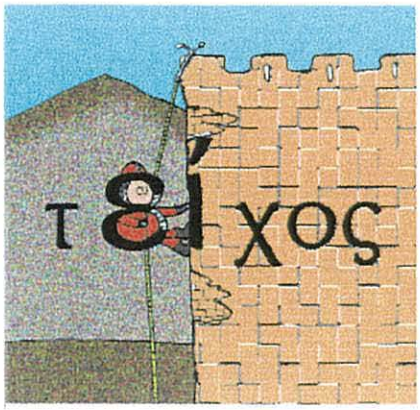



ρυάκι (stream)

λυχνάρι (oil lamp)

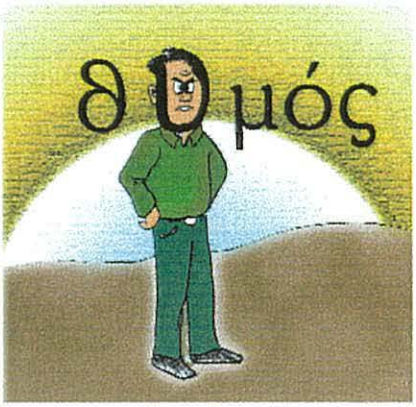
## Table 19.3

***Sixth exploratory study:*** *the pictographic representations of the seventy words which were taught to the participants with the Greek words and their English translation.*



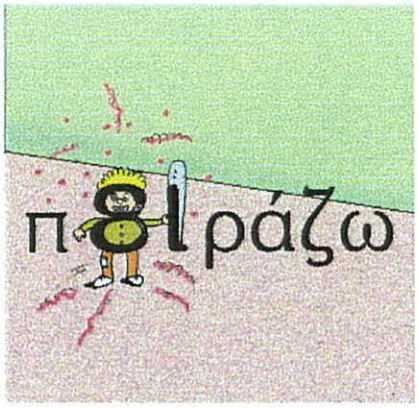

τείχος (wall)

γλείφω (to suck)

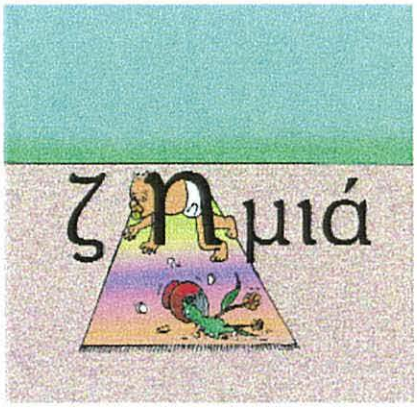



θυμός (anger)

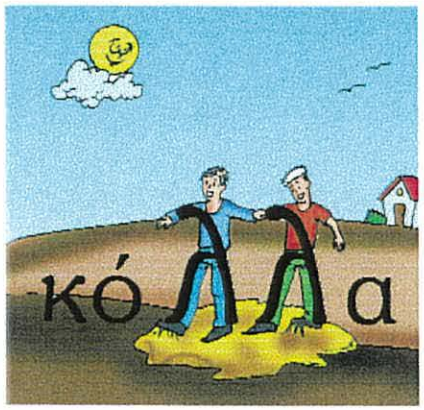
αφαίρεση (substraction)




πειράζω (to tease)




ζημιά (messy)

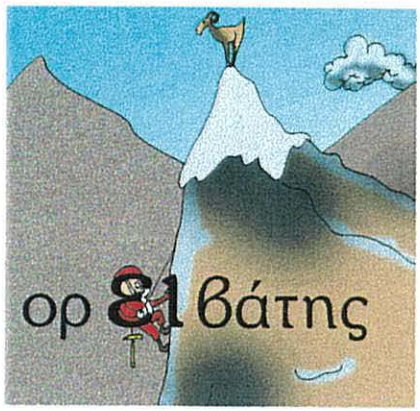



κόλλα (glue)

μητέρα (mother)

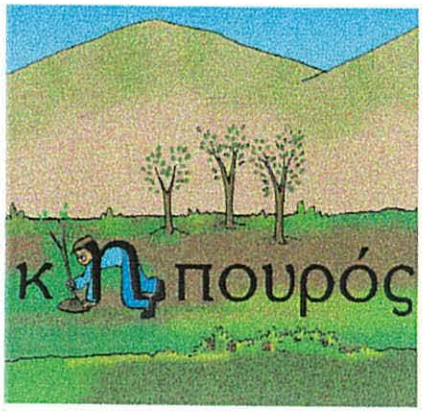
παράδεισος (paradise)

φεγγάρι (moon)



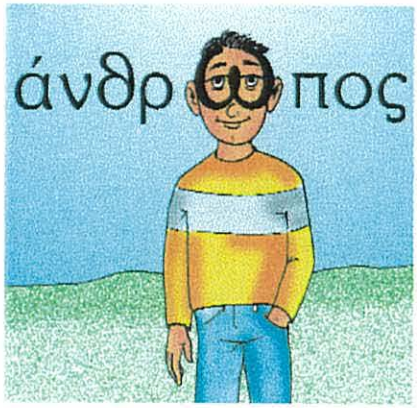

ορειβάτης (mountaineer)

γρήγορος (quick)

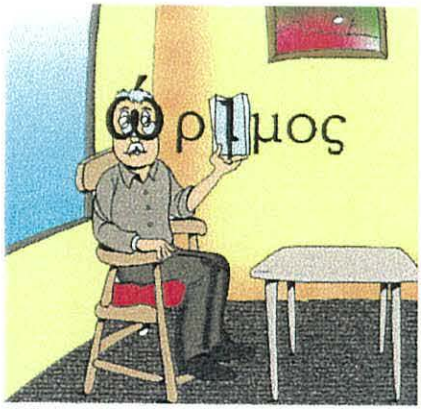



κηπουρός (gardener)

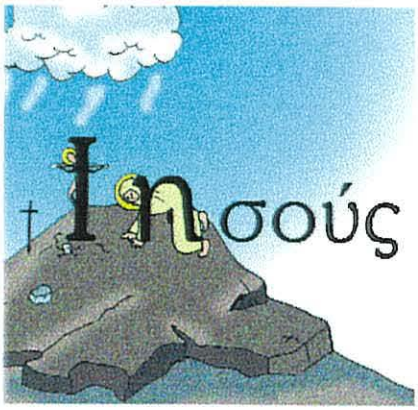
τυφλός (blind)



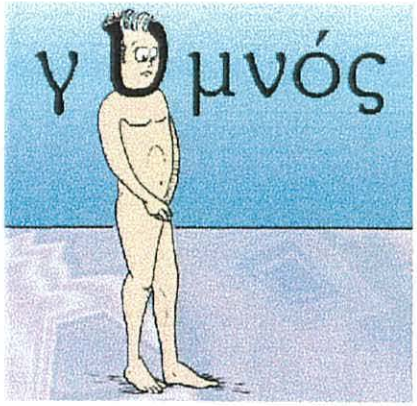

άνθρωπος (man)




ώριμος (nature)



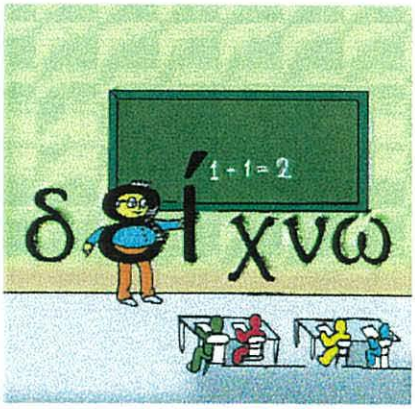

Ιησούς (Jesus)




γυμνός (naked)

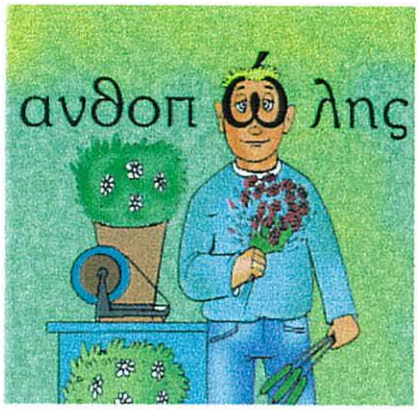
βήχω (to cough)

πηδάω (to jump)



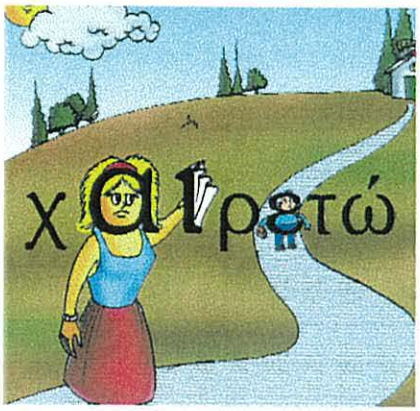

δείχνω (to show)

λαχείο (lottery)




ανθοπώλης (florist)

απειλώ (to threaten)




χαιρετώ (to say good bye

δανείζω (to lend)

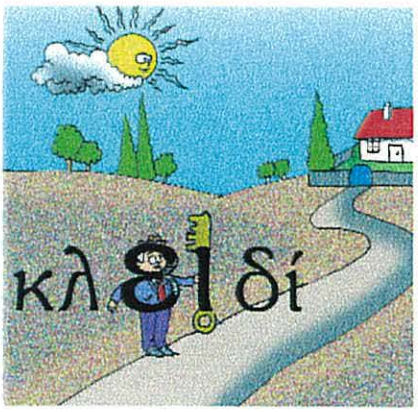
χορωδία (choir)

Άνοιξη (Spring)

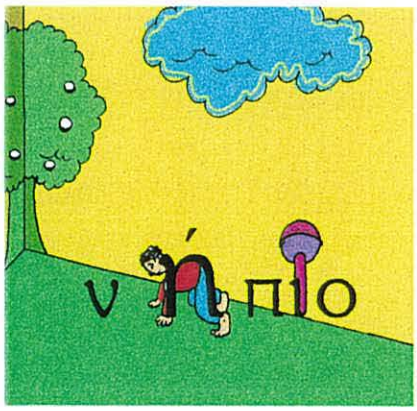
κλείνω (to close)

ιδρώτας (sweat)

κατοικία (house)



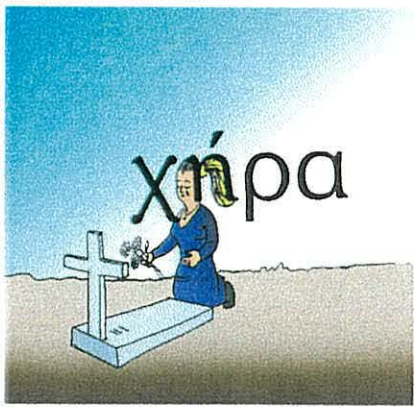

κλειδί (key)



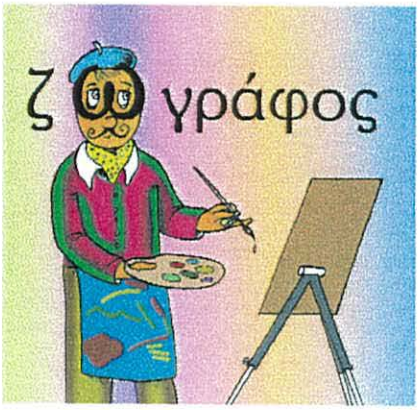

νήπιο (baby)

σεισμός (earthquake)

παίζω (to play)

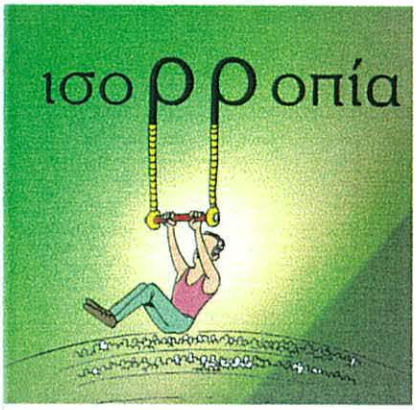



χήρα (widow)

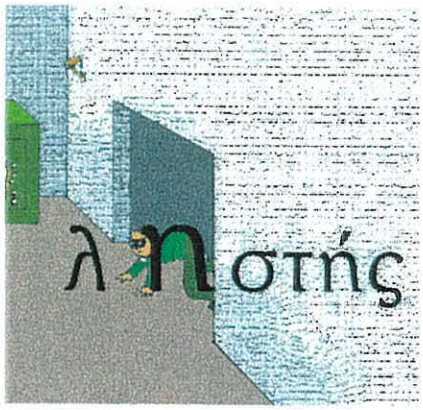



ζωγράφος (painter)

αδειάζω (to empty)



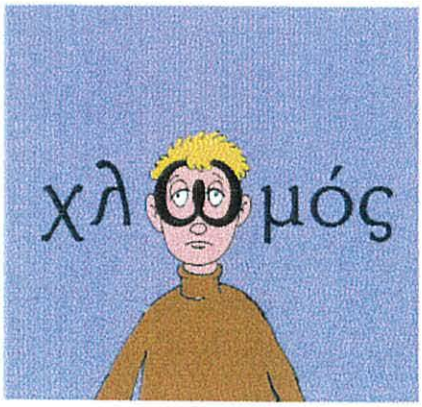

ισορροπία (balance)




ληστής (robber)

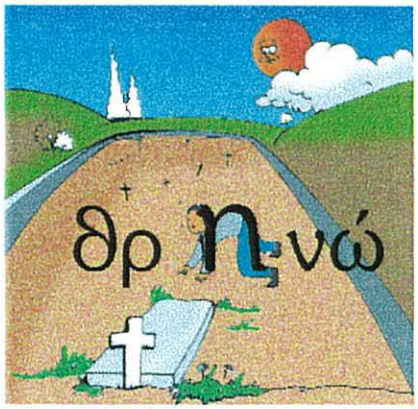
μοιράζω (to share)

προτείνω (to propose)

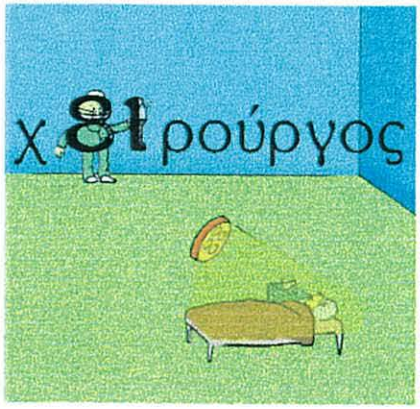



χλωμός (pale)

βλέμμα (look)

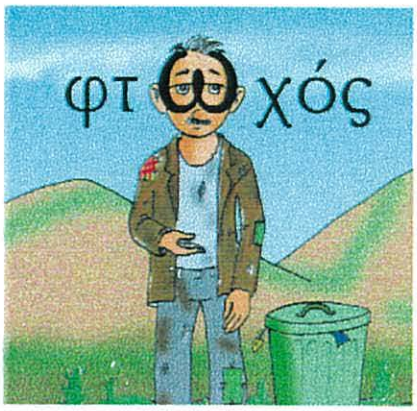



θρηνώ (to mourn)



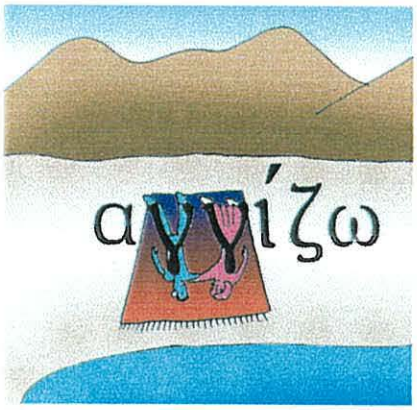

χειρούργος (surgeon)

ζητιάνος (burglar)



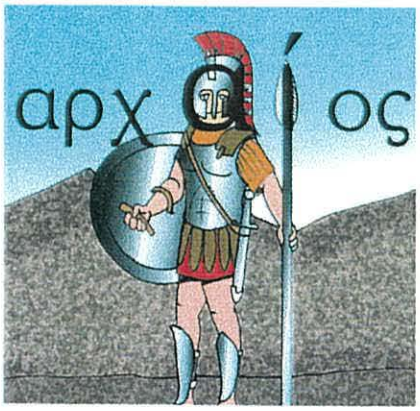

φτωχός (poor)

πρώτος (first)

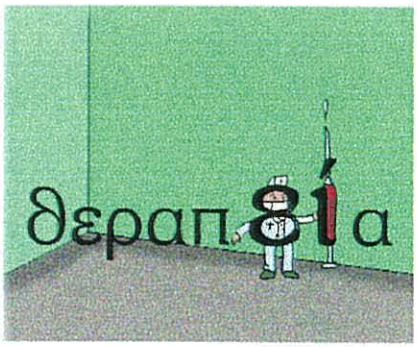



αγγίζω (to touch)

παίρνω (to take)




αρχαίος (ancient)




θεραπεία (therapy)

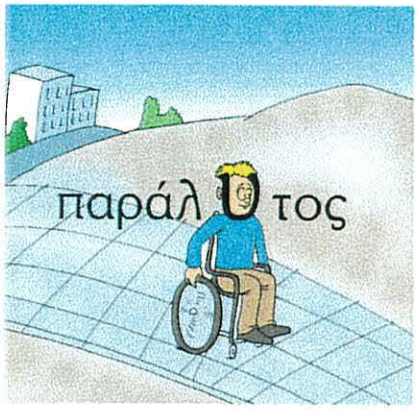
επείγον (urgent)

πυροσβέστης (fire-man)

εισπράκτορας (conductor)

παχύς (fat)

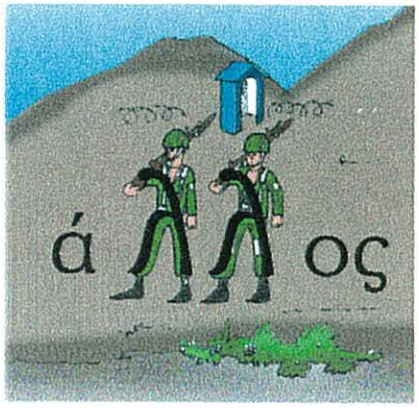
σκοτενά (surgeon)




παράλυτος (paraplegic)

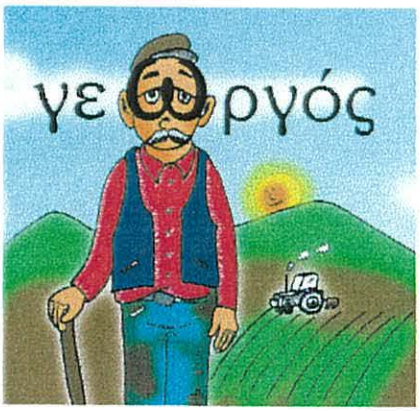
λείψανο (corpse)

ειδικός (specialist)




άλλος (another)

φύλακας (guard)

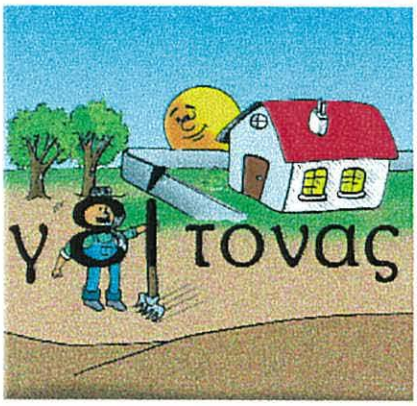



γεωργός (farmer)

αστείος (funny)

πρόσωπο (face)

μάγειρας (cook)




γείτονας (neighbour)

καταρράκτης (waterfall)

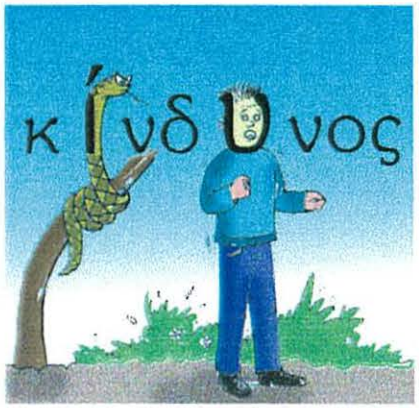
λύπη (sadness)

## APPENDIX 20

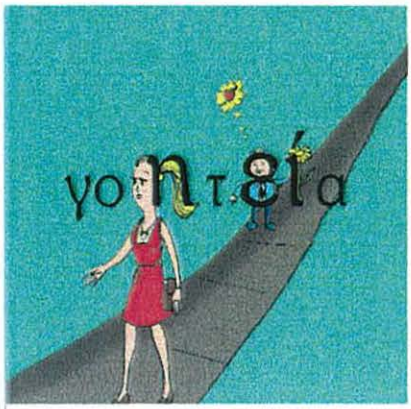
***Main research:*** *the pictographic representations of the fifty words which were taught to the participants with the Greek words and their English translation.*

SET A (25 words)

θύελλα (storm)




κίνδυνος (danger)



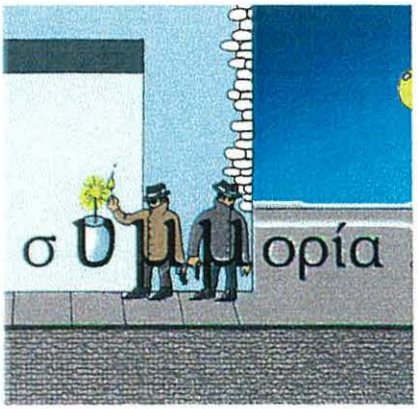

γοητεία (charm)

μυρωδιά (smell)

απειλώ (to theaten)

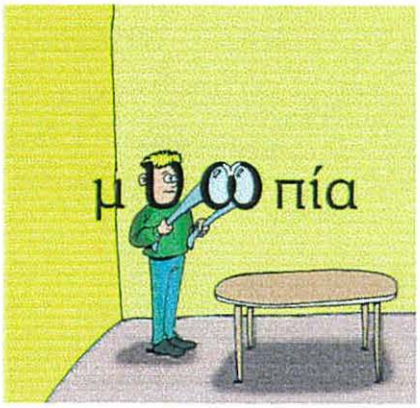
κυπαρίσσι (cypress tree)

ανησυχώ (to worry)




συμμορία (gang)

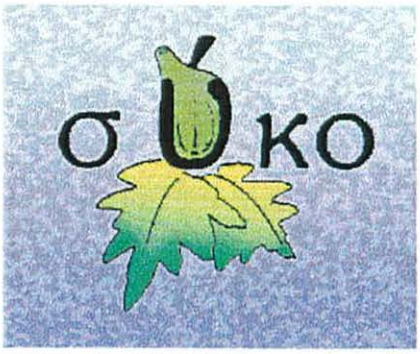
Ποσειδώνας (Posidonas)




μυωπία (short-sight)

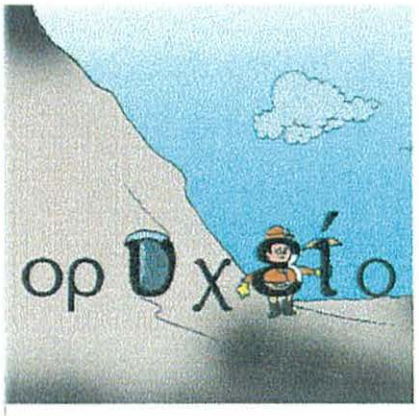
καλλυντικά (cosmetics)

δηλητηριώδες (poisonous)

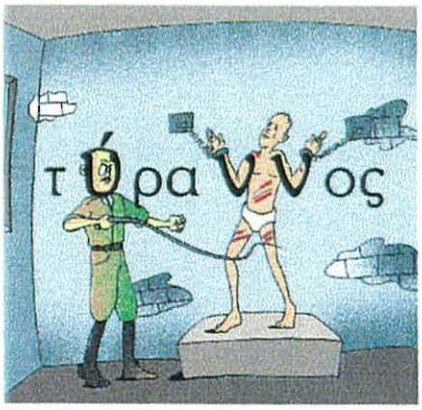



σύκο (fig)

διάλειμμα (break)

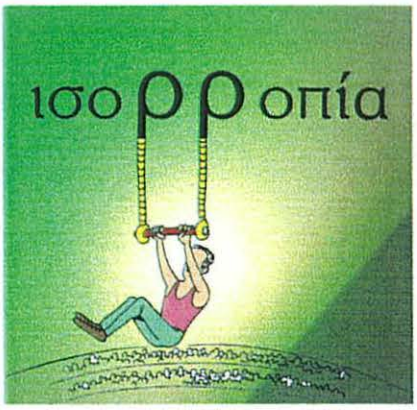



ορυχείο (mine)




τύραννος (tyrant)

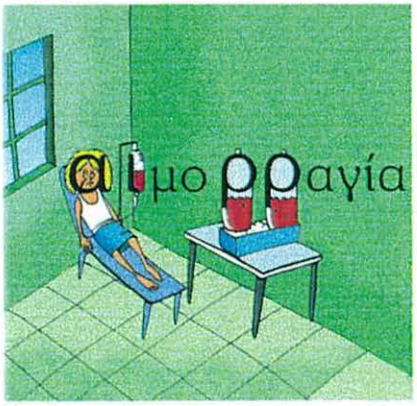
συνεργείο (garage)




ισορροπία (balance)

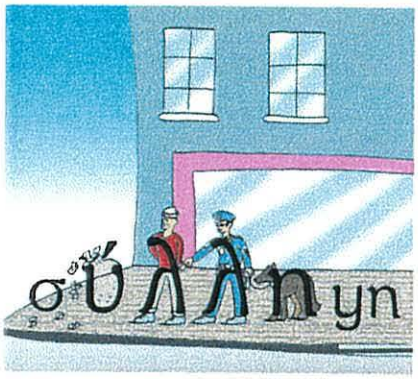
σωλήνας (tube)

προκυμαία (mole, quay)



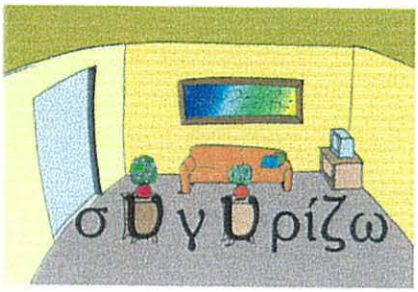

αιμορραγία (breeding)

λειτουργία (divine service)




σύλληψη (arrest)

Ευρωπαίος (European)




συγυρίζω ((to tidy up)

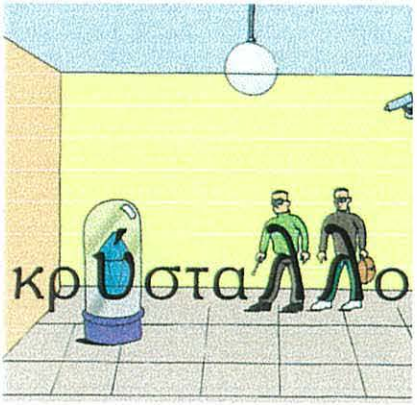
SET B (25words)

προσκύνημα (worship)

δυστύχημα (accident)

αρραβώνας (engagement)

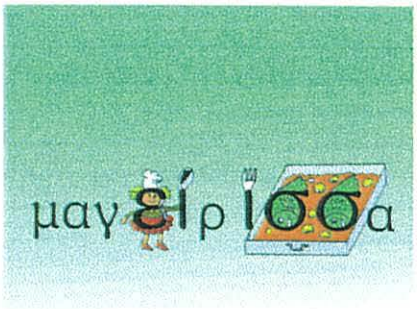
αποτύπωμα (finger prints)



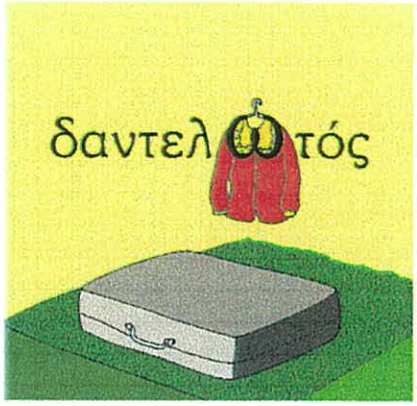

κρύσταλλο (crystal)

πίθηκος (monkey)

σκουλήκι (worm)

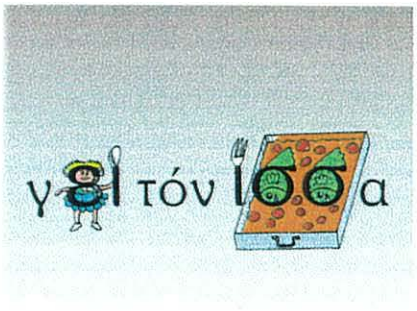



μαγείρισσα (cook)




δαντελωτός (lace)

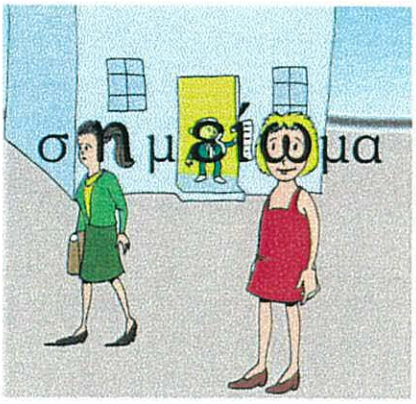
ειδοποιώ (to notify)




γειτόνισσα (neighbour)

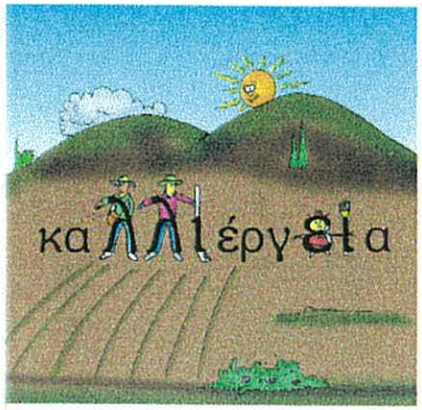
ξυπόλυτος (barefooted)

κρυμμένος (hidden)

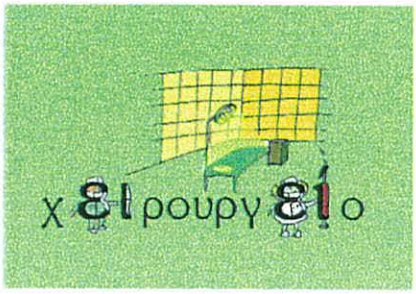



σημείωμα (note)

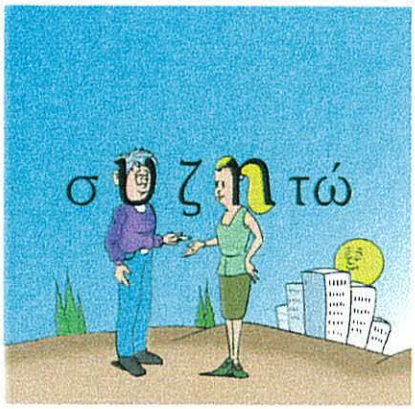
συνδυασμός ( combination)



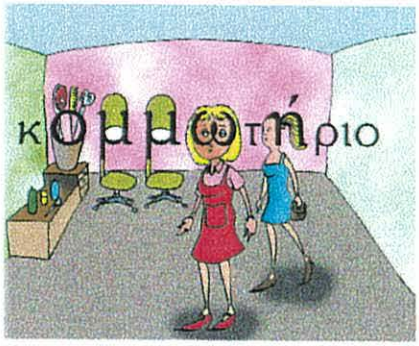

καλλιέργεια (cultivation)



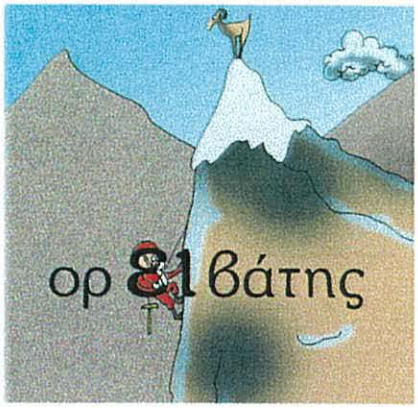

χειρουργείο (operation room)



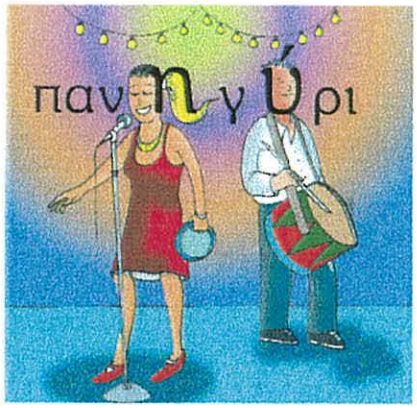

συζητώ (to discuss)




κομμωτήριο (hairdresser's)

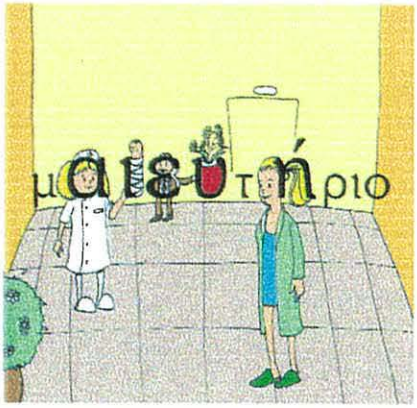



ορειβάτης (mountain climber)



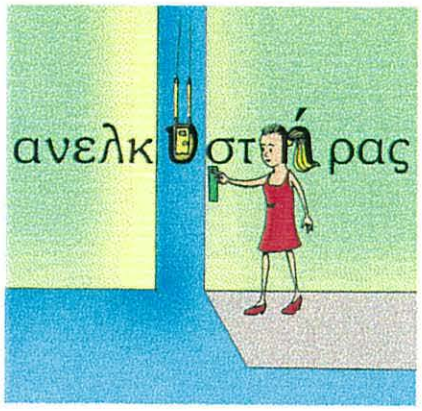

πανηγύρι (festival)

λεωφορείο (bus)




μαιευτήριο (maternity clinic)

εμπρησμός (fire-raising)




ανελκυστήρας (elevator)

## APPENDIX 21

***The 703 words:*** *the Greek words with their English translation and their pictographic representations.*

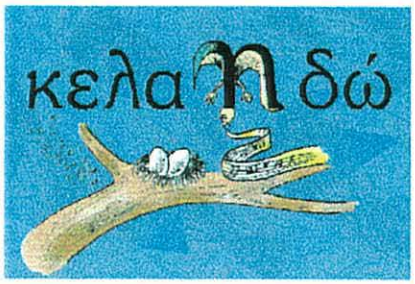
φύλακας (guard)

ήλιος ( sun)

ημέρα ( day)

καλησπέρα (good evening)

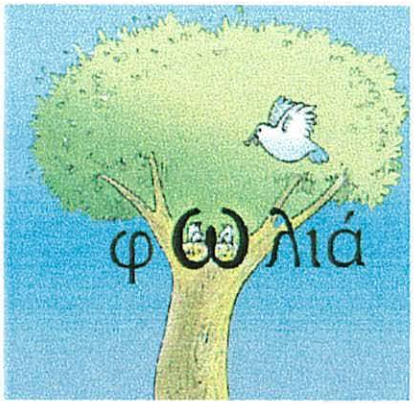
αηδόνι (nightingale)



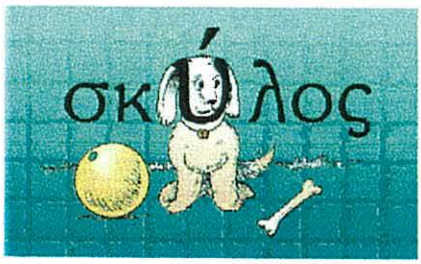

κελαηδώ (sing)

ανήφορος (uphill)

κατήφορος (downhill)

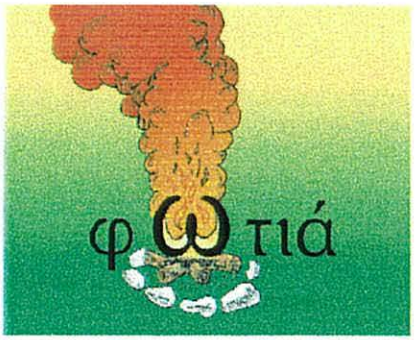



φωλιά (nest)

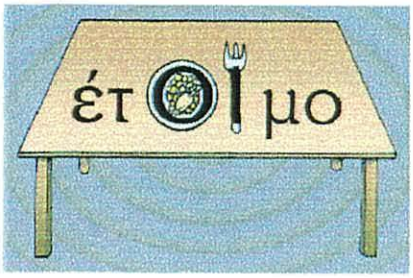



σκύλος (dog)

λύκος (wolf)




φωτιά (fire)

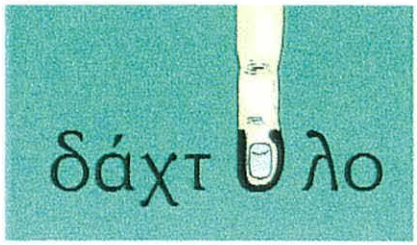



έτοιμο (ready)

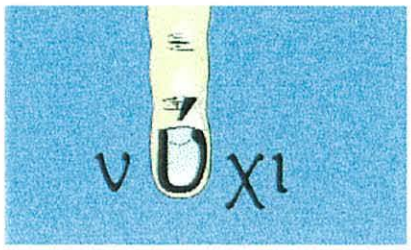
παγωτό (ice-cream)

ύπνος (sleep)

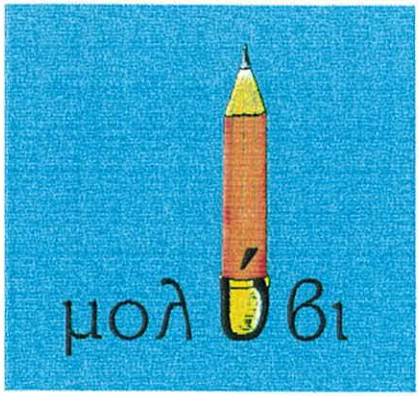
γλυκό (sweet)



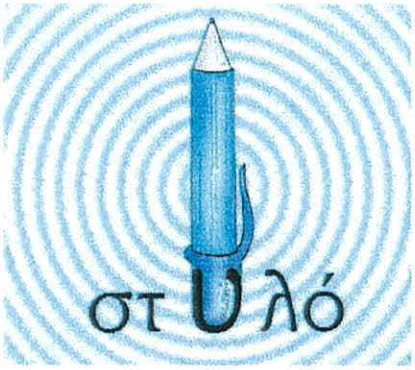

δάχτυλο (finger)



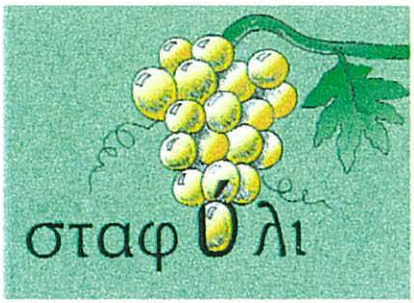

νύχι (nail)




μολύβι (pencil)




στυλό (pen)

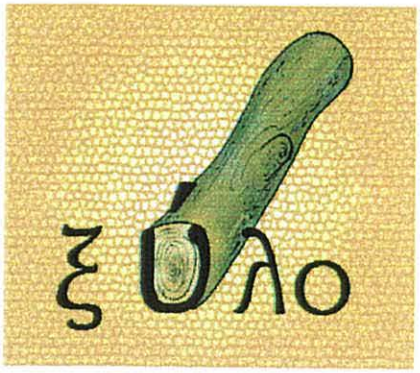



σταφύλι (grape)

γυάλα (fish-bowl)

κύκλος (circle)

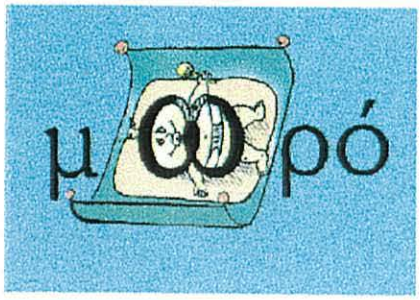
κυκλάμινο (cyclamen)




ξύλο (wood)

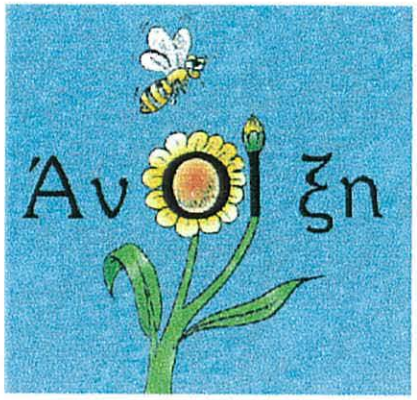
κλωνάρι (branch)

θάλασσα (sea)




μωρό (baby)

υγρό (liquid)




Άνοιξη (Spring)

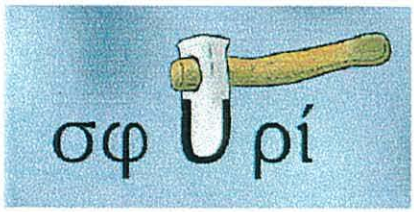
παράθυρο (window)

πρόσωπο (face)

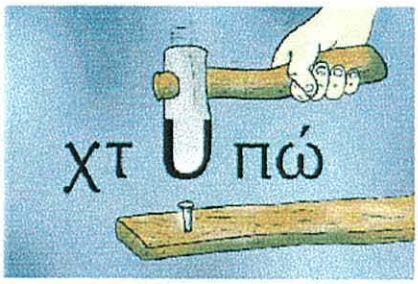
σύκο (fig)

χώρος (space)

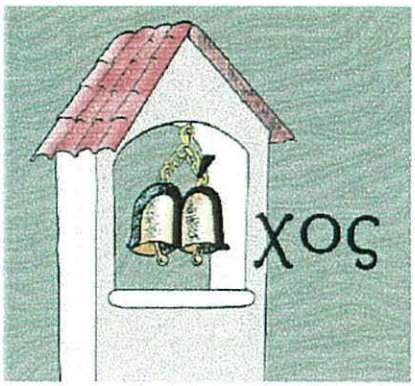
χορός (dance)




σφυρί (hammer)



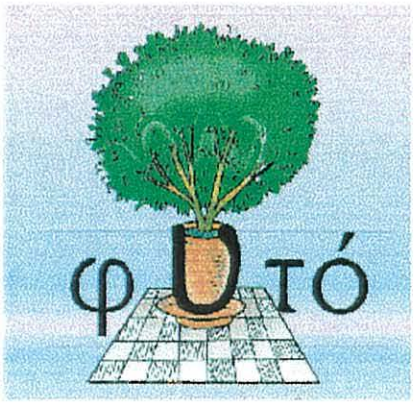

χτυπώ (hit)




ήχος (sound)

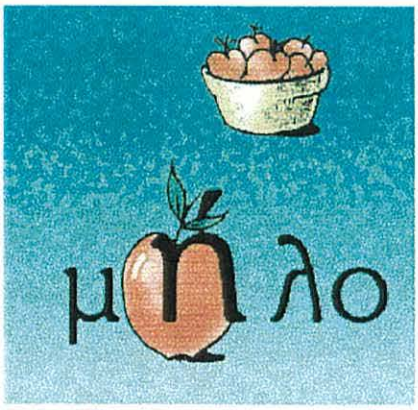
πολύ (very)

νησάκι (island)




φυτό (plant)

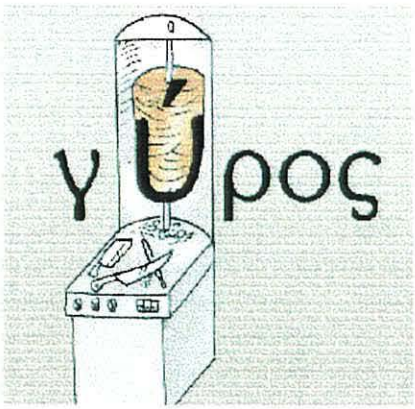
Αθήνα (Athens)




μήλο (apple)

στήθος (breast)

λυγίζω (to bend)

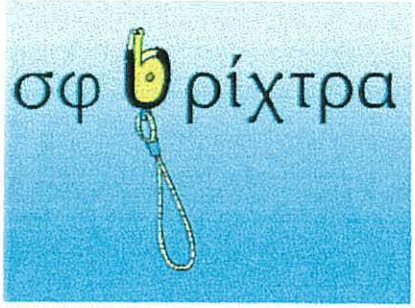



γύρος (round-gyro)

χρυσό (gold)

ψωμί (bread)

κολοκύθι (pumpkin)

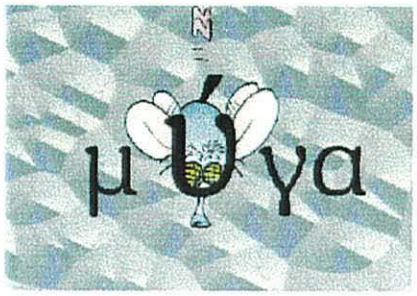



σφυρίχτρα (whistle)

κύμα (wave)

κοχύλι (sea-shell)

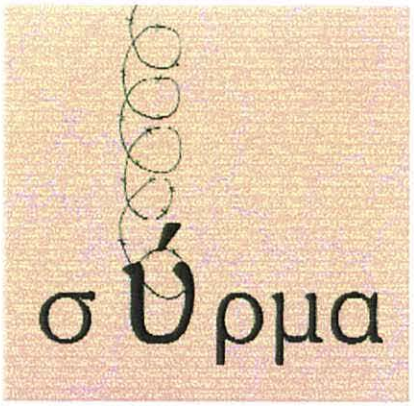
πηγή (sping of water)



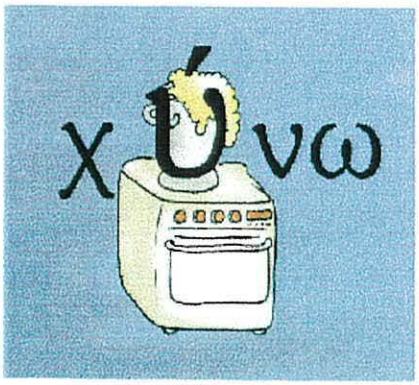

μύγα (fly)

πύργος (tower)

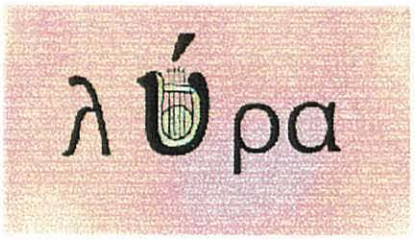
ζύμη (knead)




σύρμα (wire)




χύνω (boil over)



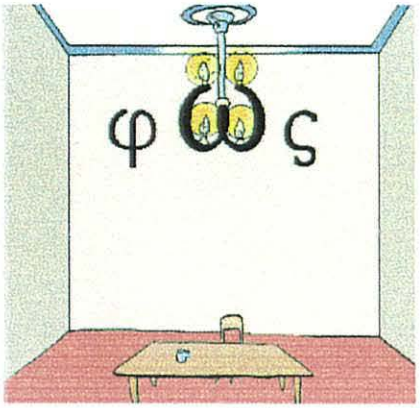

λύρα (lyre)

κλωστή (sewing-thread)

πολυβόλο (machine-gun)

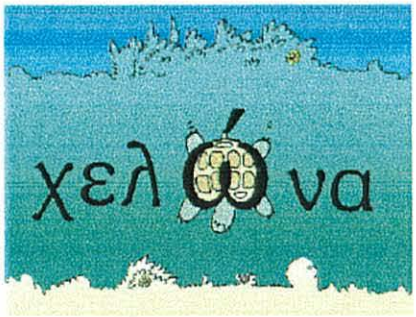
φύση (nature)

θόρυβος (noise)

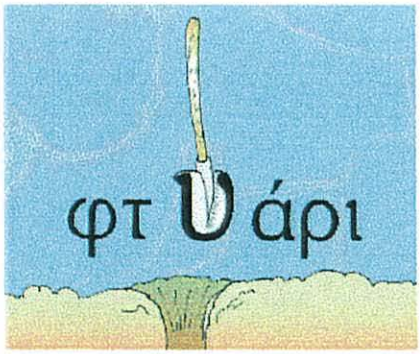


φως (light)

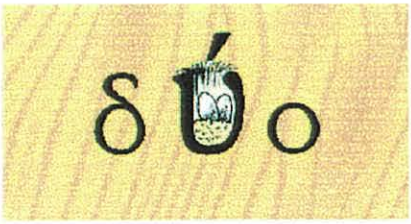
ξύστρα (sharpener)



χελώνα (tortoise)

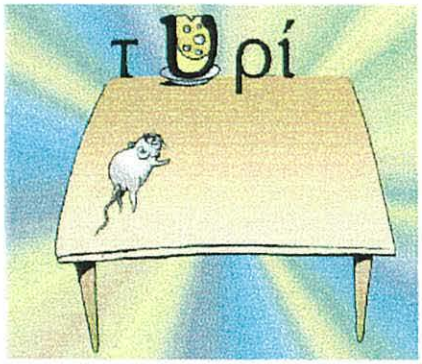


φτυάρι (spade)

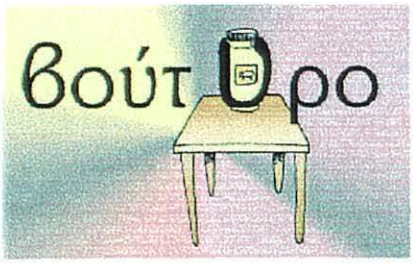


δύο (two)

μέλισσα (bee)

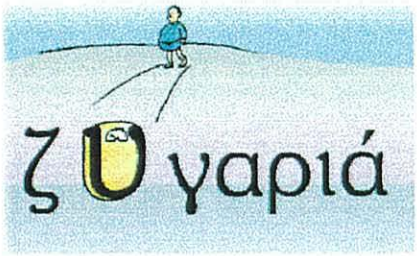


τυρί (cheese)



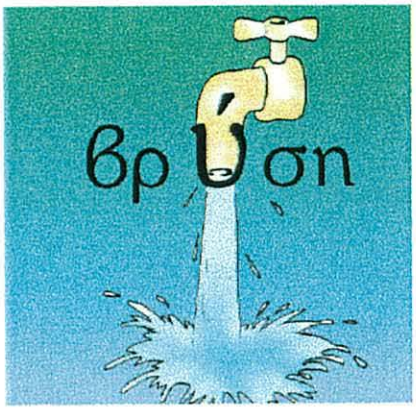
βούτυρο (butter)

ζώνη (belt)




ζυγαριά (scale)

αλυσίδα (chain)




βρύση (tap)

λυχνάρι (oil lamp)

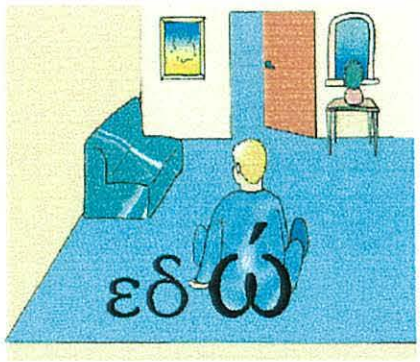
γέφυρα (bridge)

αμύγδαλο (almond)

καλώδιο (wire)

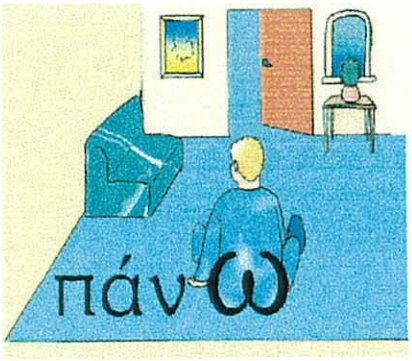
στύλος (pole)

σκουλήκι (worm)

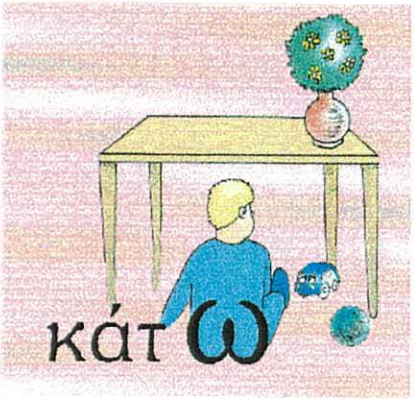



εδώ (here)

έξω (outside)

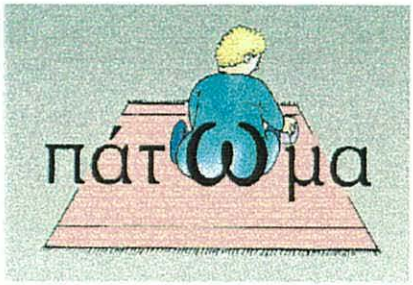



πάνω (up)

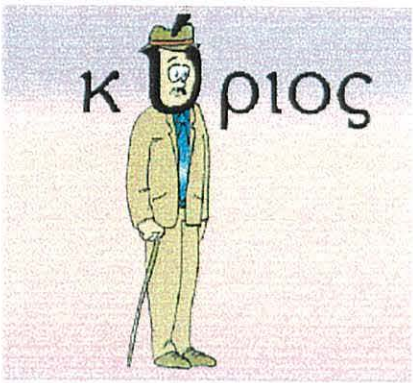



κάτω (down)

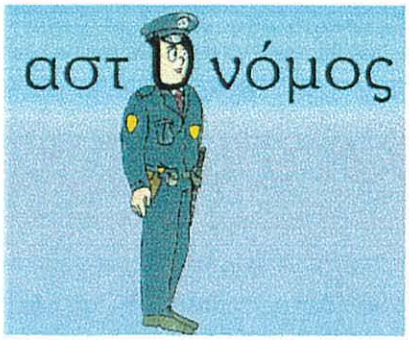
πίσω (back)



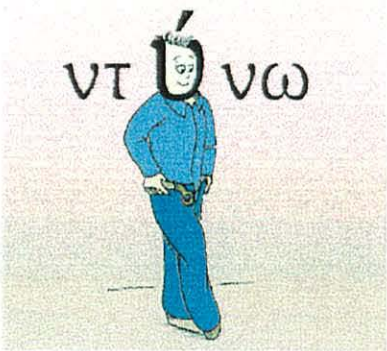

πάτωμα (floor)



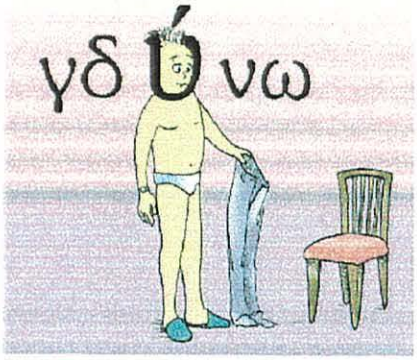

κύριος (Mister)



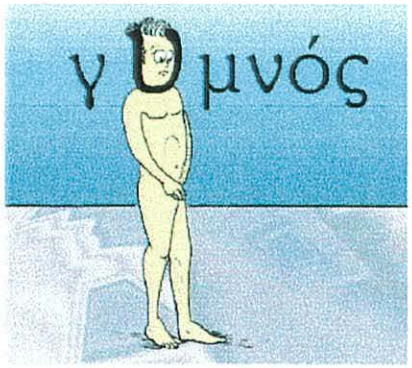

αστυνόμος (policeman)




ντύνω (dress)

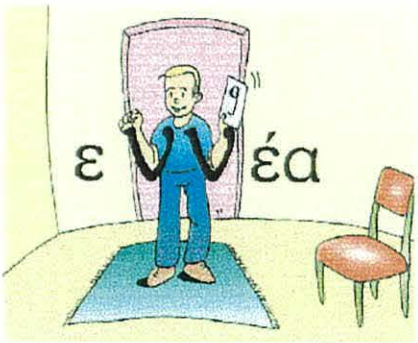



γδύνω (undress)




γυμνός (naked)

τυφλός (blind)




εννέα (nine)

τέσσερα (four)

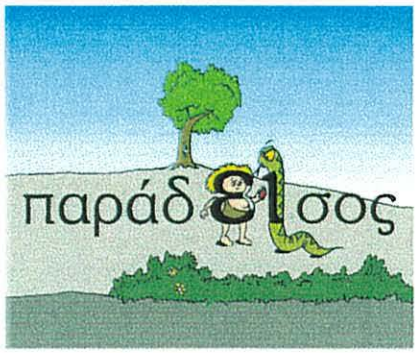
χρώματα (colours)

λύνω (solve)

κληματαριά (grapes tree)

άγγελος (angel)

νύχτα (night)

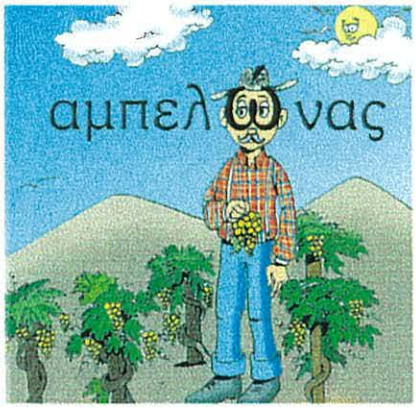



παράδεισος (heaven)

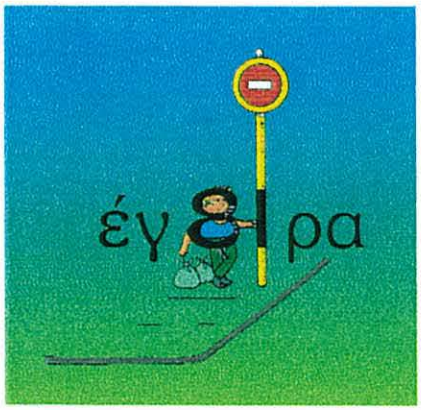
πίσω (back)

θα στείλω (will send)

έμεινα (Istayed)

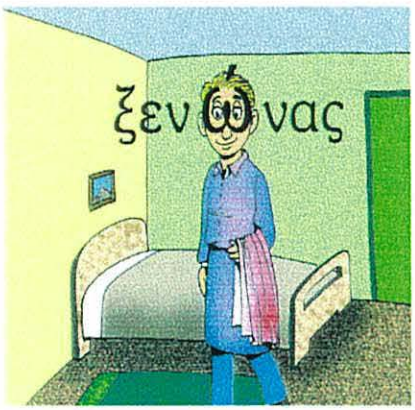



αμπελώνας (vineyard)




έγειρα (droop)

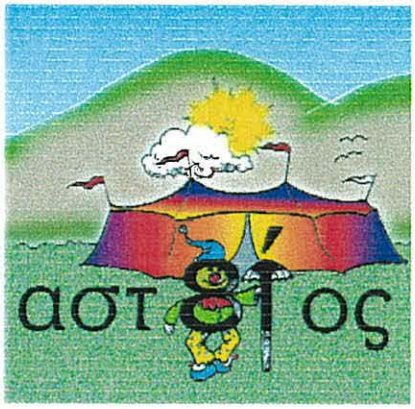
ειδοποιώ (to notify)




ξενώνας (quest room)

θυμός (anger)

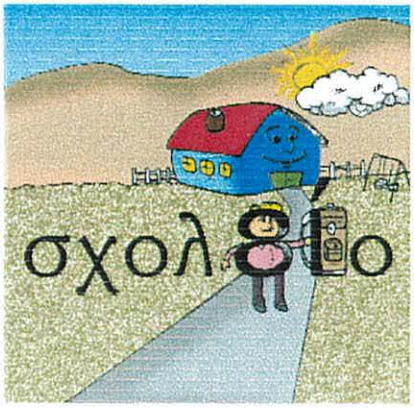
πεινάω (hungry)



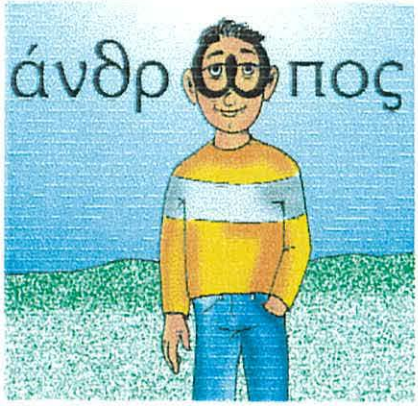

αστείος (funny)

δουλειά (work)

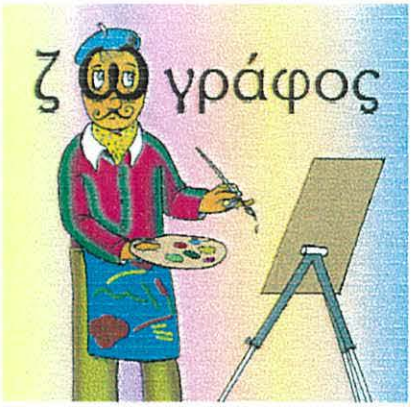
χρειάζομαι (need)



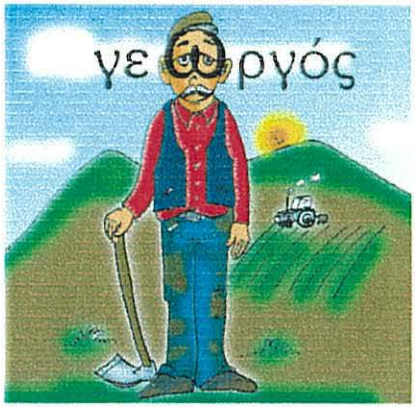

σχολείο (school)




άνθρωπος (man)

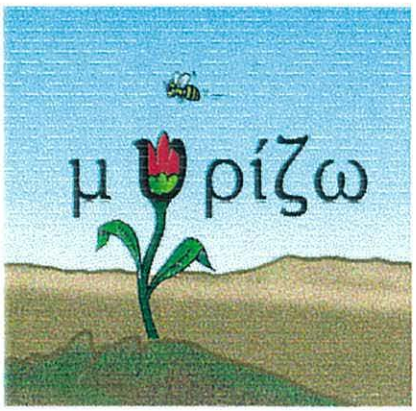



ζωγράφος (painter)



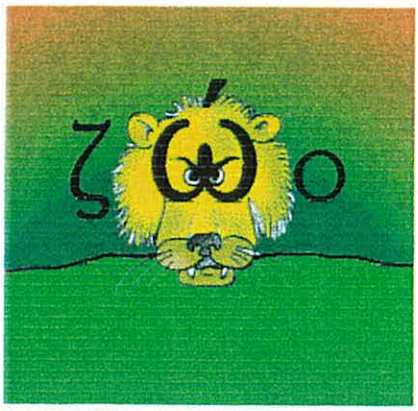

γεωργός (farmer)

πελώριος (huge)



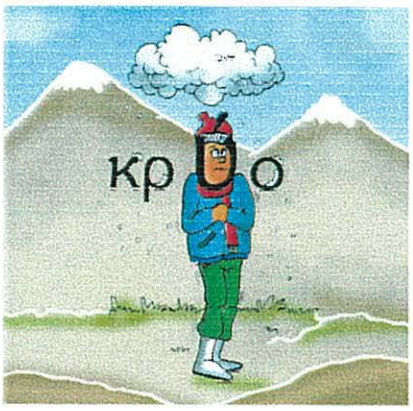

μυρίζω (smell)

μυρωδιά (smell)




ζωο (animal)

ζωντανός (alive)

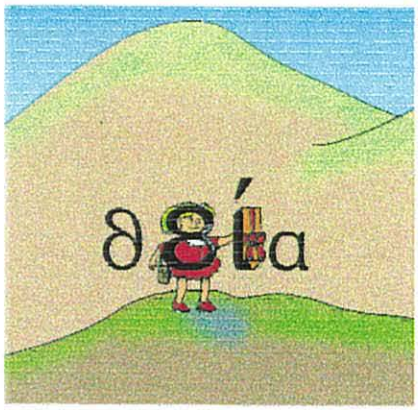



κρύο (cold)

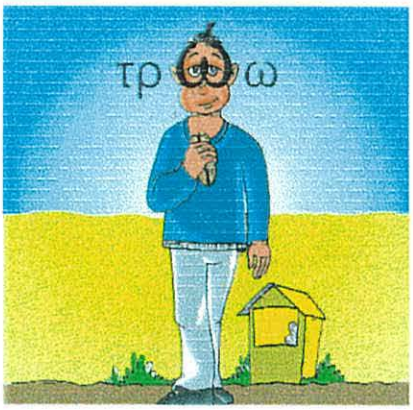
ψυχρό (cold)

κλείνω (close)

θείος (uncle)



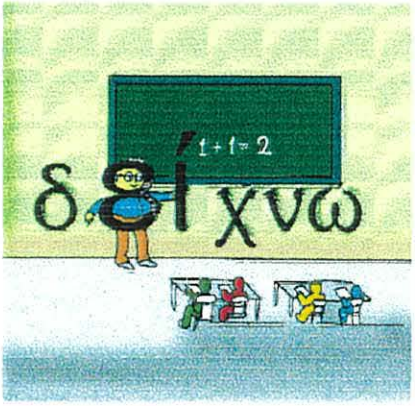

θεία (aunt)




τρώω (eat)

μεγαλύτερος (the bigger)

γειμώνας (winter)



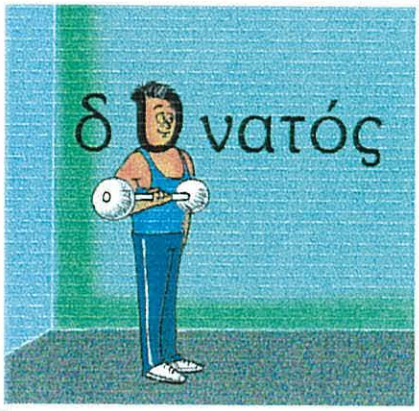

δείχνω (show)

μητέρα (mother)

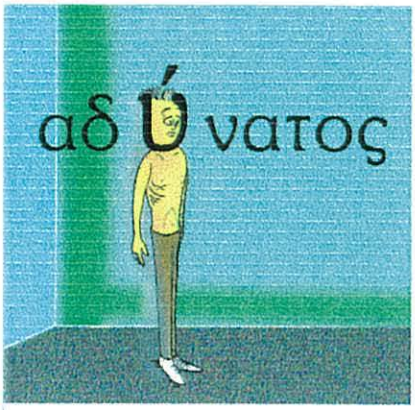
λύπη (sad)

λυπημένος (sad)

συζήτηση (discussion)




δυνατός (strong)




αδύνατος (skinny)

πρώτος (first)

καλύτερος (the best)

φωνάζω (shoot)

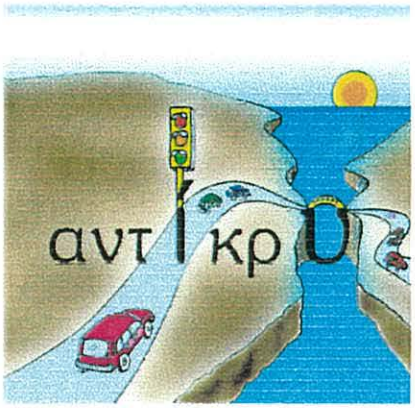
κολυμπώ (to swim)

κολυμβητήριο (swimming pool)

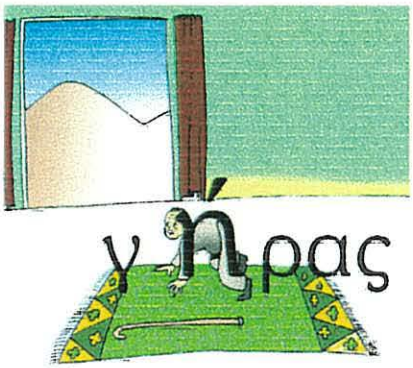
παίρνω (take)

περνώ (pass)

αρχαίος (ancient)

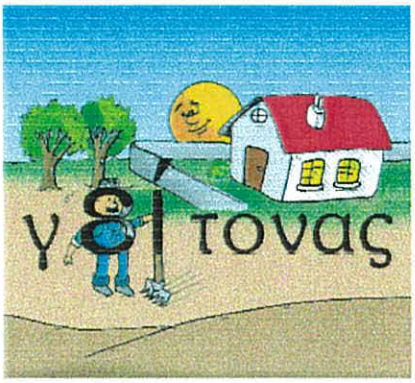



αντίκρυ (at the opposite side)

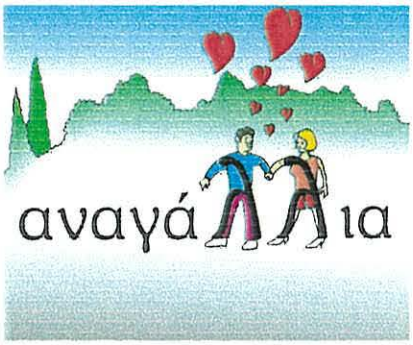



γήρας (old)

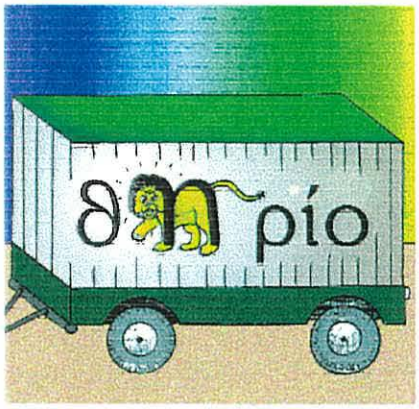
σύλληψη (arrest)



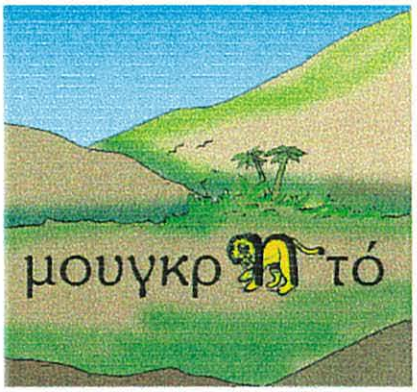

γείτονας (neigbour/man)




αναγάλλια (joy)




θηρίο (wild animal)

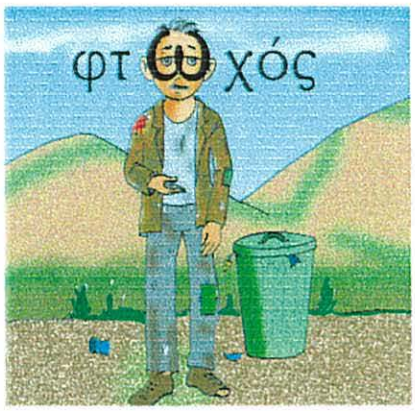



μουγκρητό (roar)

κηπουρός (gardener)

χαμηλά (down, low)

ψηλά (high)



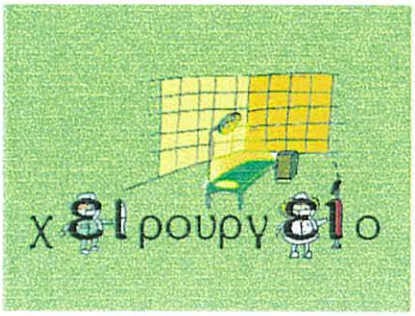

φτωχός (poor)

φτώχεια (poverty)

ρηχά (swallow)

καλοκαίρι (summer)

χειρούργος (surgeon)




χειρουργείο (operation room)

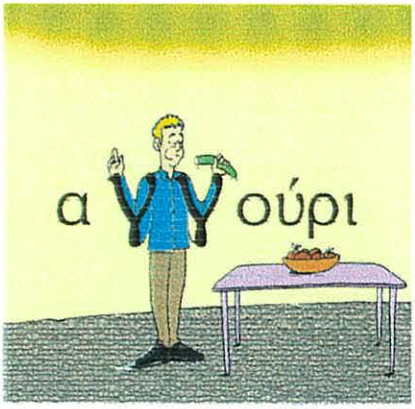
πηγαίνω (go)

πλησιάζω (come near)

ήρθα (I came)

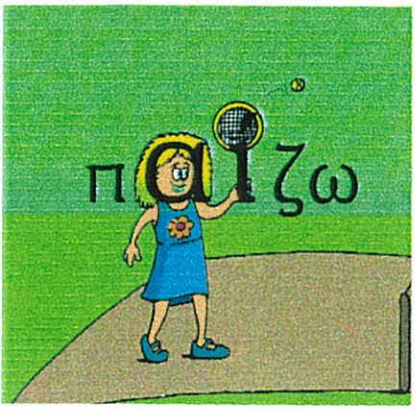
κρόσσια (fringe)

οικογένεια (family)

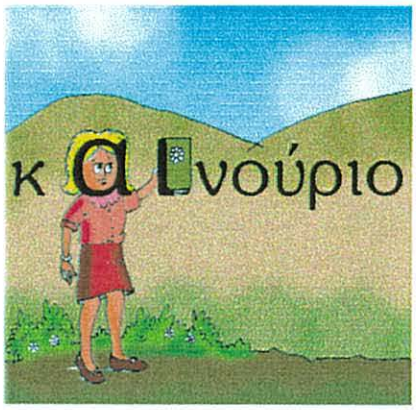



αγγούρι (cucumber)

εισπράττω (collect)

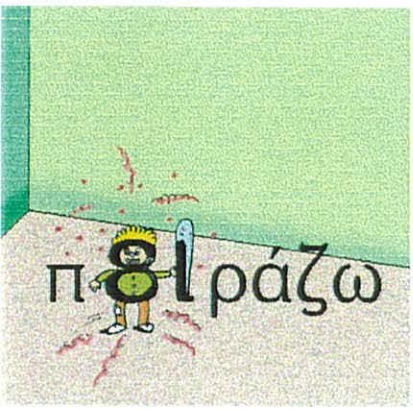


παίζω (play)



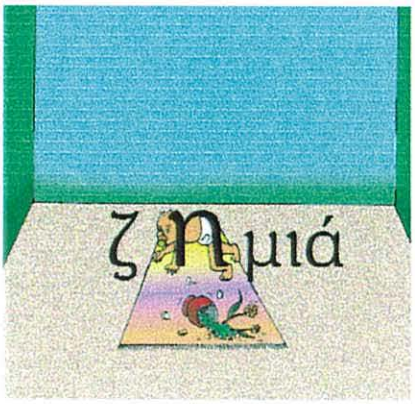
καινούριο (new)

πήρα (I took)

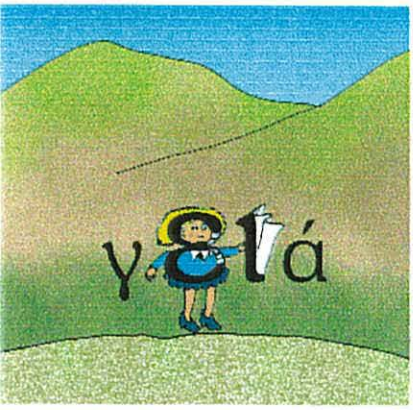


πειράζω (tease)

βρήκα (I found)



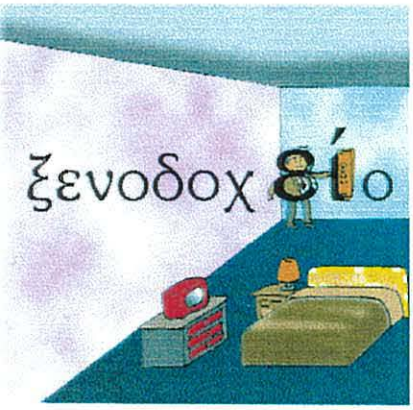
ζημιά (damage)



γειά (buy)

ιατρείο (surgery's)

νοσοκομείο (hospital)



ξενοδοχείο (hotel)

φαρμακείο (pharmacist's)

κουρείο (barber's shop)

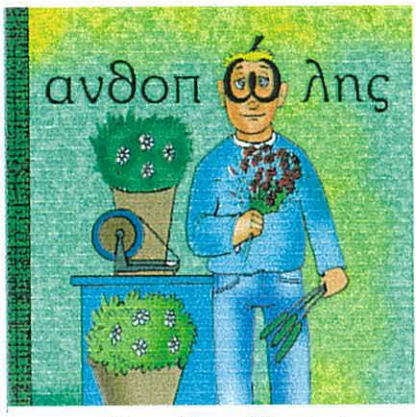
ζαχαροπλαστείο (confectionary)

μουσείο (museum)

συνεργείο (car repair, garage)

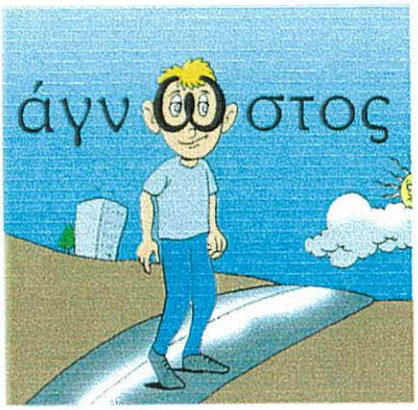
ωδείο (music school)

τελωνείο (custom)

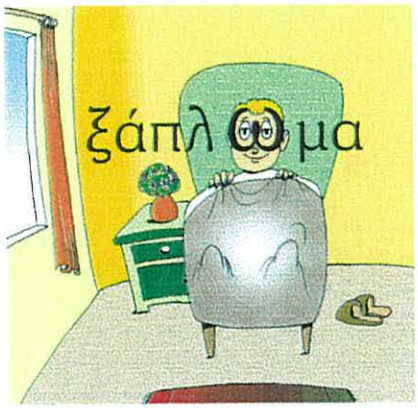



ανθοπώλης (florist)

βιβλιοπώλης (book seller)

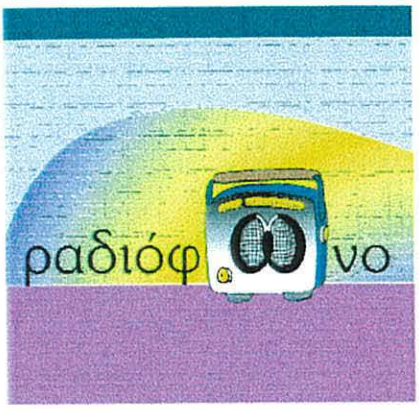



άγνωστος (unknown)



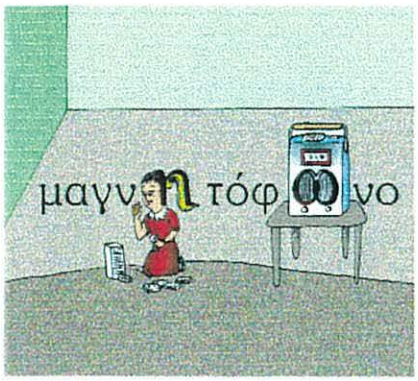

ξάπλωμα (lying down)

παντοπωλείο (grocery)

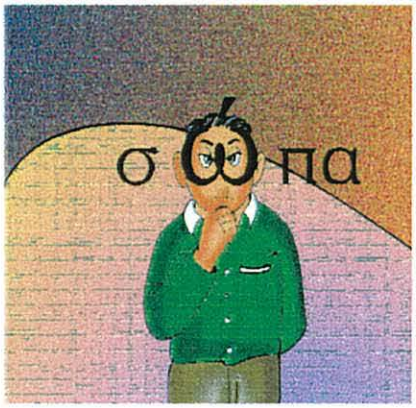



ραδιόφωνο (radio)

κασσετόφωνο (cassete recorder)

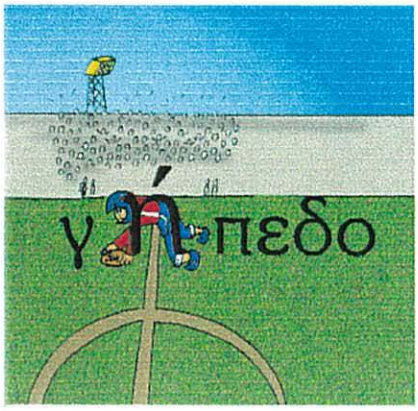


μαγνητόφωνο (tape recorder)



σώπα (be quiet)

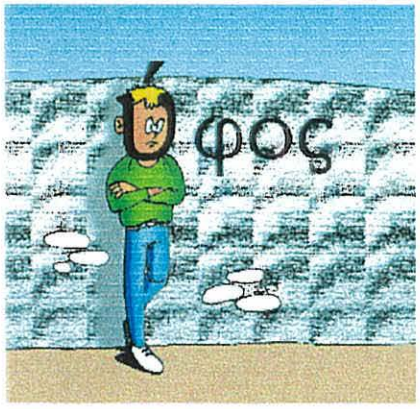
αίνιγμα (enigma)



γήπεδο (sports field)

δώσε (give)

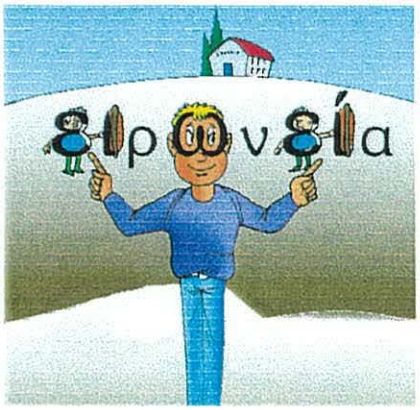
πληροφορία (information)



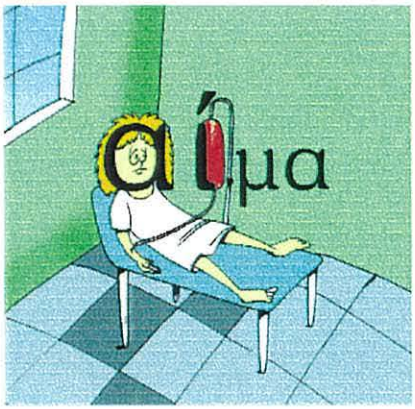
ύφος (style)

κλαίω (cry)

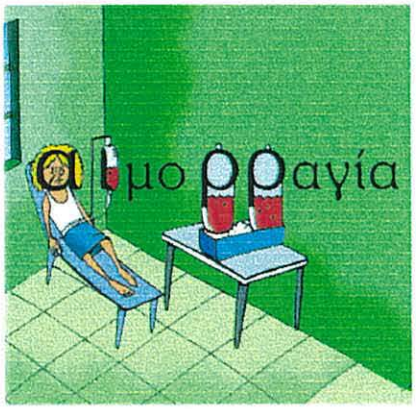
είρωνας (sarcastic)



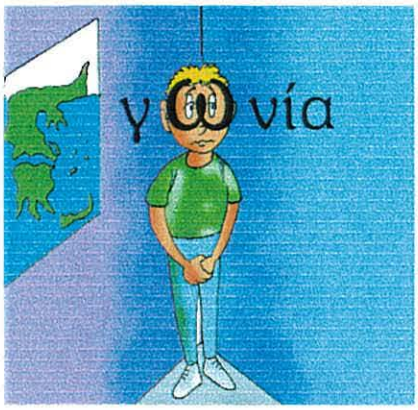
ειρωνία (irory, sarcasm)



αίμα (blood)



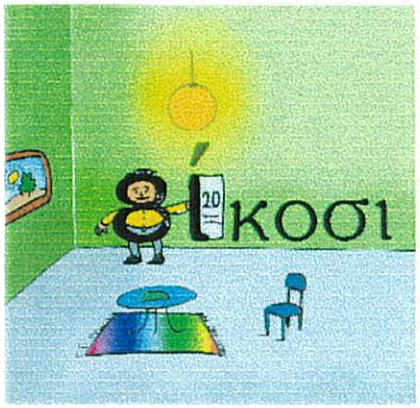
αιμοραγία (bleeding)



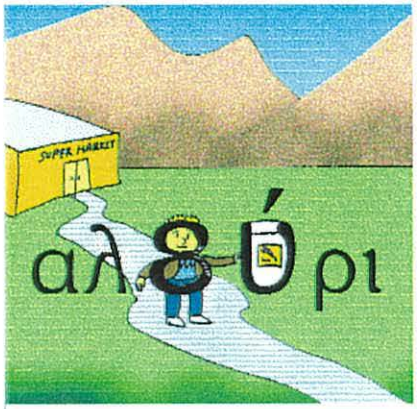
γωνία (corner)

γλυπτό (sculpture)

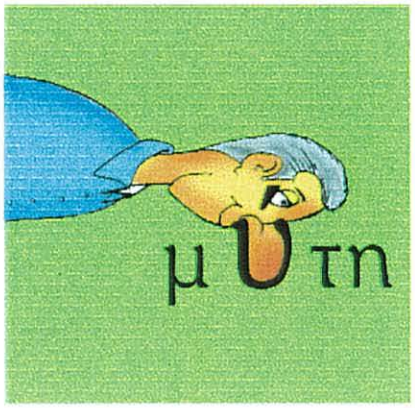
υπόλοιπο (remaining)



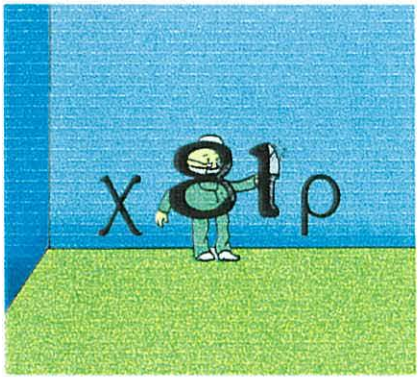
είκοσι (twenty)



αλεύρι (flour)

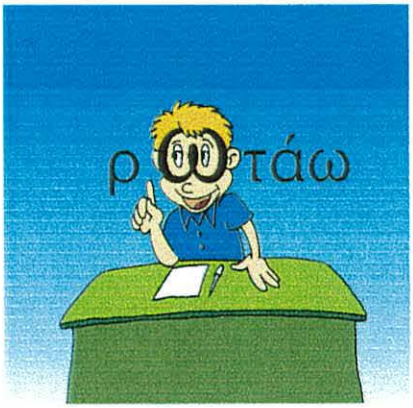


μύτη (nose)



χειρ

γνωστός (known)

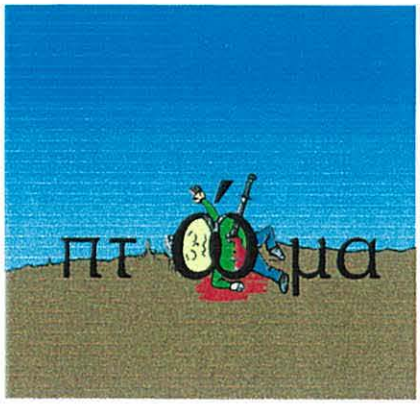


ρωτάω (ask)

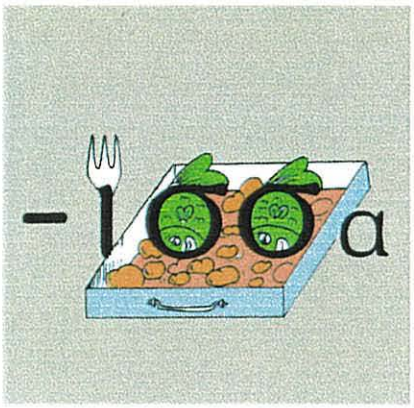
συζητώ (discuss)

δώρο (present)

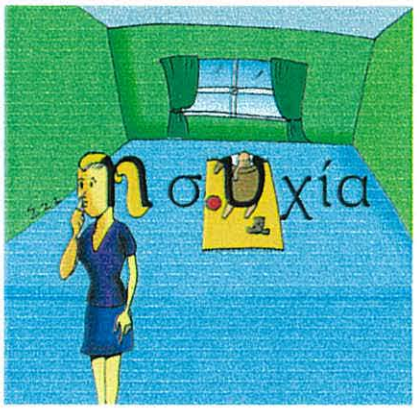
σώμα (body)




πτώμα (dead body)




-ισσα (prefix:-issa)




ησυχία (quiet)

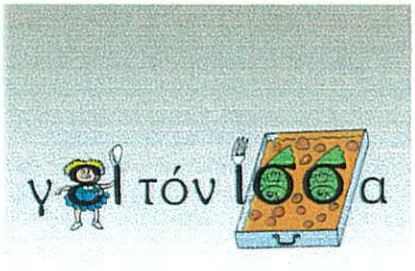
κοιμίζω (sleep)

σήκω (stand up)

ανθοπωλείο (flower shop)

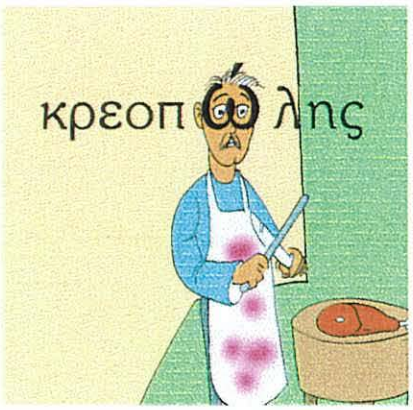
βιβλιοπωλείο (book shop)

κρεοπωλείο (butcher's)




γειτόνισσα (neighbour/woman)

καπνοπώλης (tobaconist)




κρεοπώλης (butcher)

μάγειρας (cook/man)

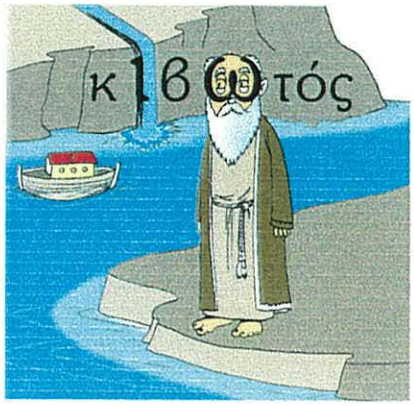
μαγείρισσα (cook/woman)

καθυστερώ (delay)

παντοπώλης (grocer)

κυψέλη (hive)

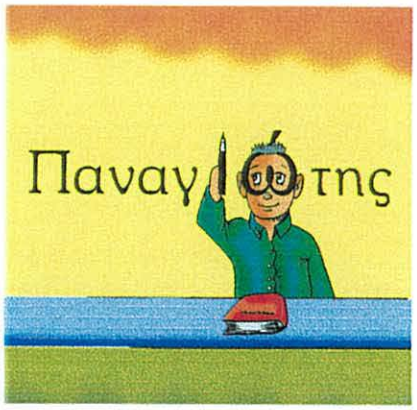
πετεινός (cock)



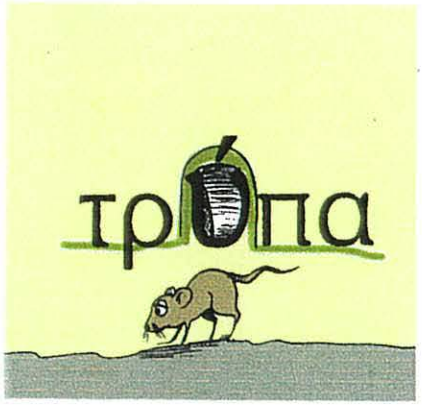

κιβωτός (Noah's Ark)

ακρωτήρι (cape)

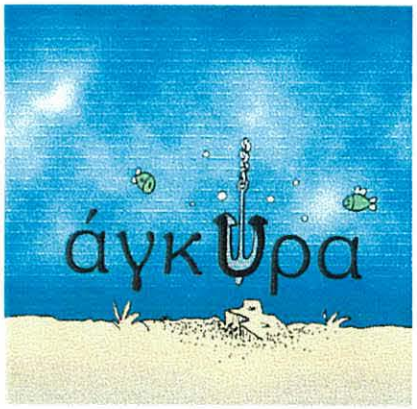
σήμα (sign)




Παναγιώτης (Panagiotis)

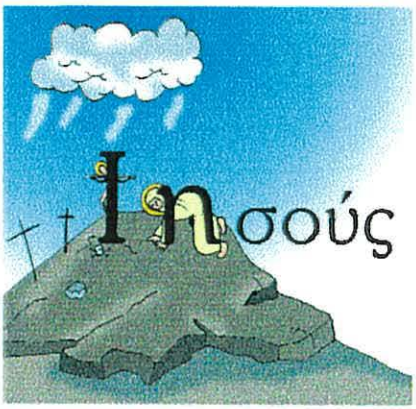



τρύπα (hole)

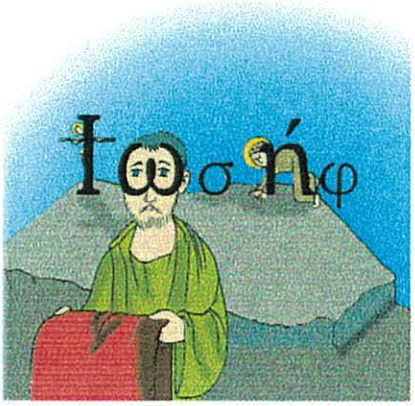



άγκυρα (anchor)

δακρύζω (to tear)




Ιησούς (Jesus)



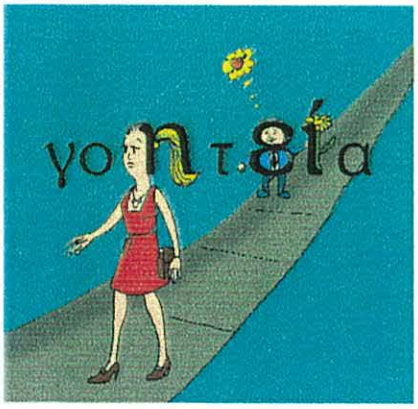

Ιωσήφ (Joseph)

αραιό (thin)

σφήνα (wedge)

σεισμός (earthquake)

ταχύτητα (speed)

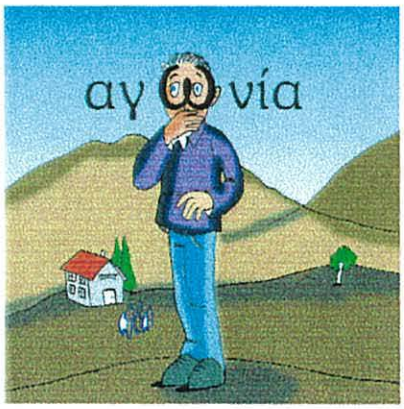



γοητεία (charm)

όμοιος (similar, the same)

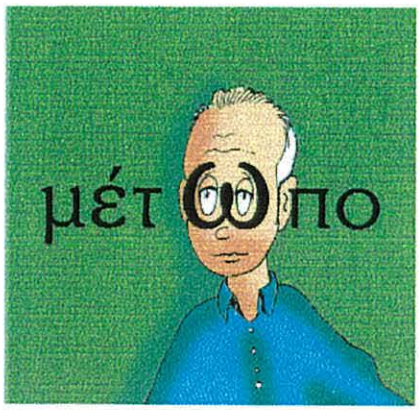
υπηρετώ (serve)

πρησμένος (swelled)



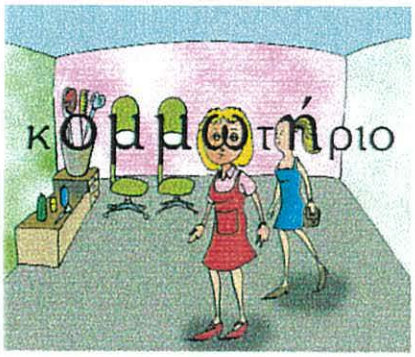

αγωνία (agony)

πολιτεία (city)



μέτωπο (forehead)

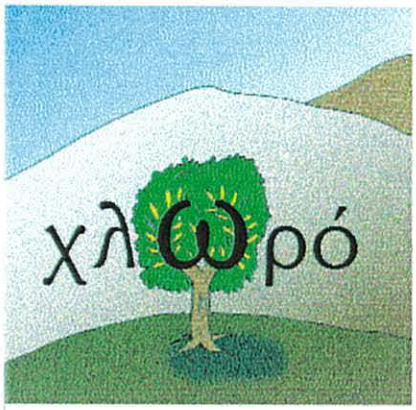
Ομόνοια (Omonia-a Greek square)



κομμωτήριο (hair-dresser's)

τιμωρία (punishment)

πειρατής (pirate)



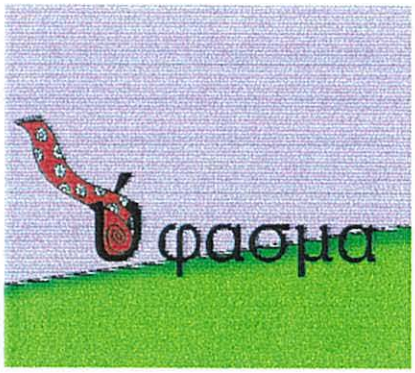
χλωρό (green, fresh)

γύπας (vulture)

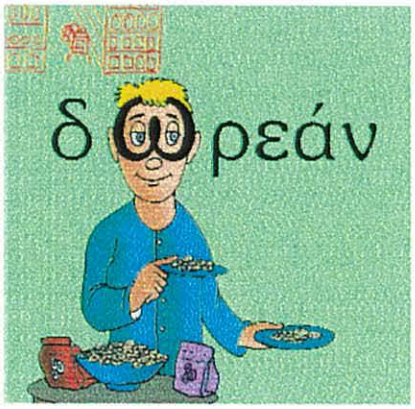
σύγγραφέας (writer)

σύμμαχος (ally)

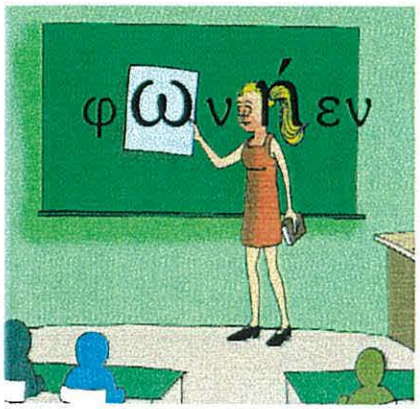
εκατομμύριο (million)



ύφασμα (cloth)



δωρεάν (for free)

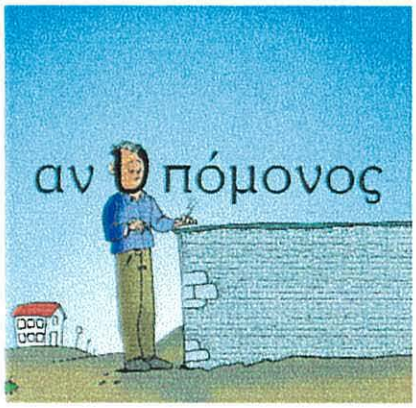



φωνήεν (vowel)

κατάπληκτος (astonished)

αστυφύλακες (polismen)

συλλαμβάνω (arrest)



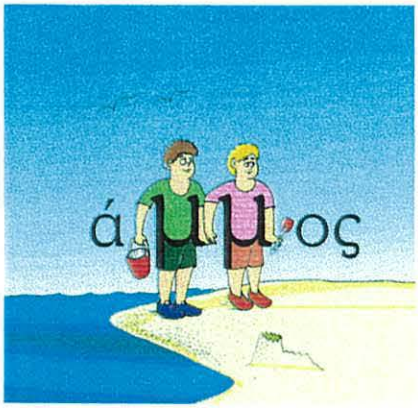

ανυπόμονος (impatient)

τραύμα (cut)

αλείφω (spread)

αλοίφή (ointment)

περικεφαλαία (helment)

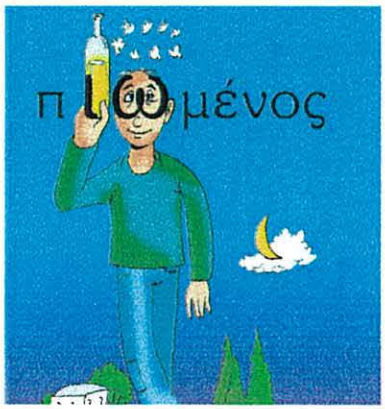



άμμος (sand)

πυρετός (fever)

προσπάθεια (trial)

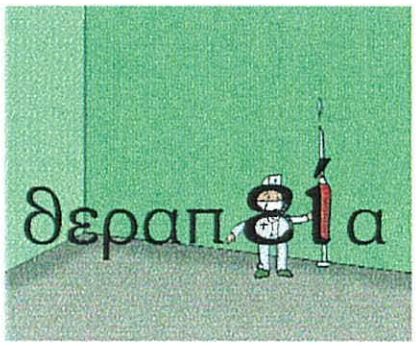
μεθυσμένος (drunk)



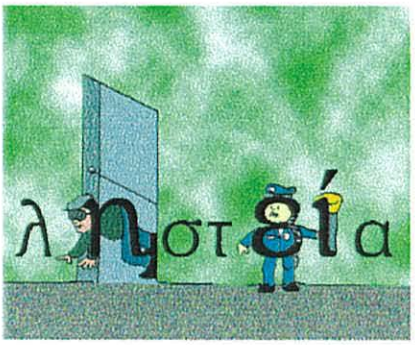

πιωμένος (drunk)

προκομμένος (hard-working)

υγεία (health)

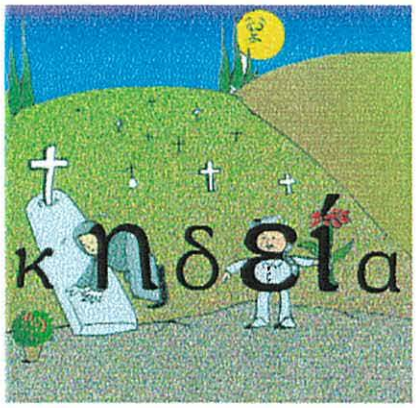



θεραπεία (therapy, cure)



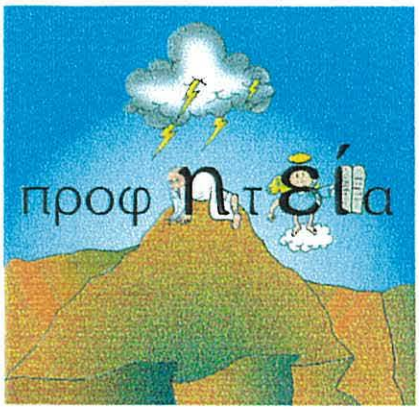

ληστεία (robbery)

συνοδεία (escort)




κηδεία (funeral)

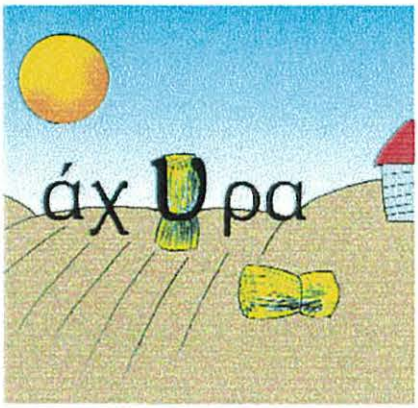
λατρεία (endore)




προφητεία (prophesy)

νοθεία (adulteration)

καλύβα (cabin)



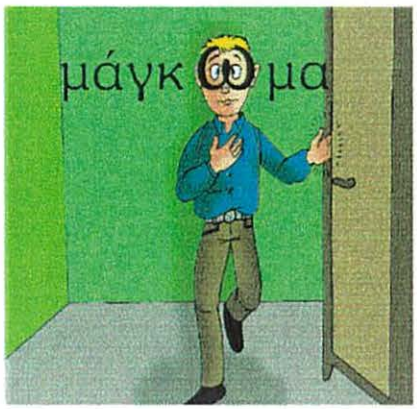

άχυρα (straw)

στρώμα (mattress)

μάτωμα (bleeding)

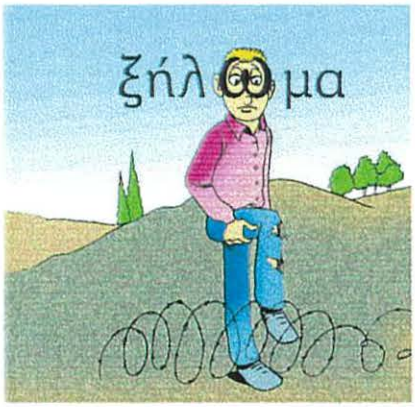
τέντωμα (stretch)

δάγκωμα (bite)




μάγκωμα (gripping)

πάπλωμα (quilt)

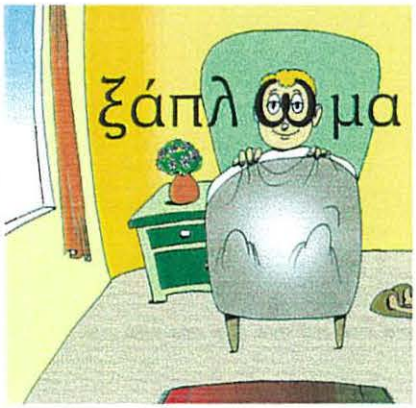



ξήλωμα (unpick)

βούρκωμα (cloudy)

φούσκωμα (distension)

μπούκωμα (filling one's mouth)

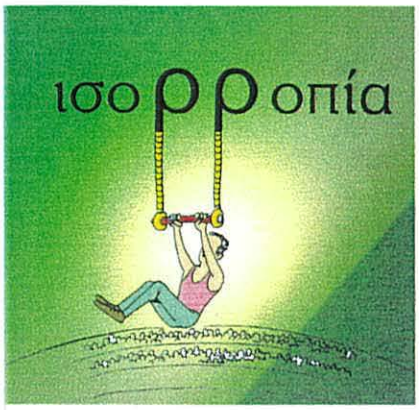



ξάπλωμα (lying down)

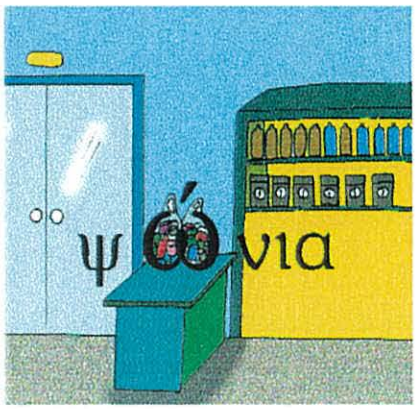
λέρωμα (dirtying)

ηθοποιός (actress)

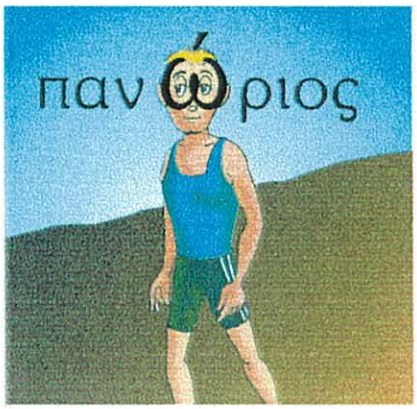
εικόνα (icon)




ισορροπία (balance)

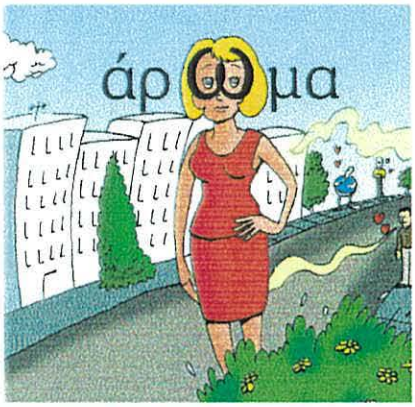



ψώνια (shoppings)




πανώριος (very handsome)

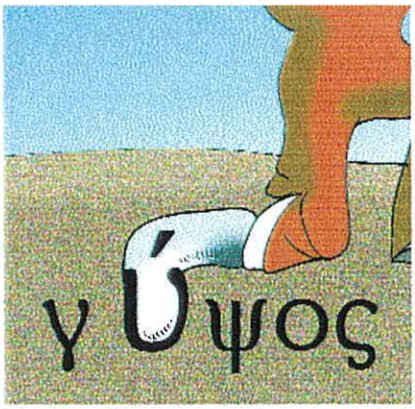
μεσημβρία (moon)



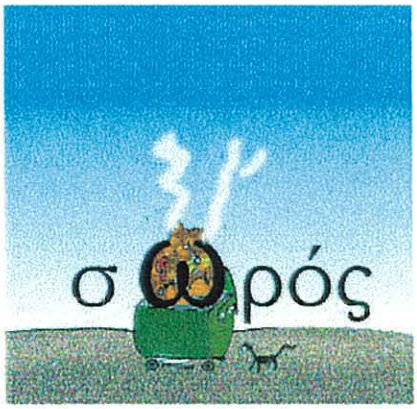

άρωμα (aroma)

ήξερα (I knew)

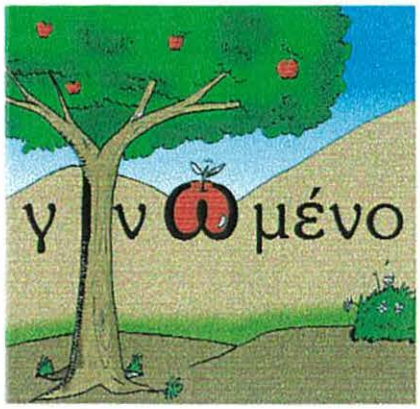
είδος (item, commodity)



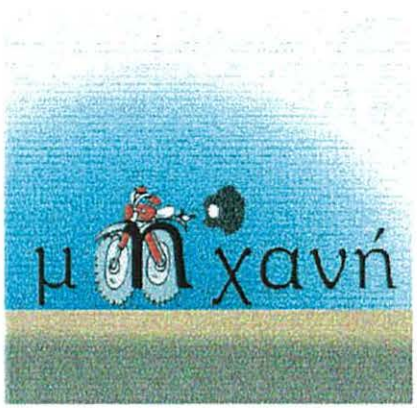

γύψος (cast)




σωρός (heap)



γινωμένο (ripe)

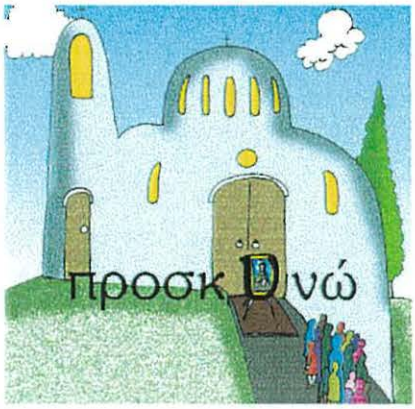


μηχανή (motorcycle)

λείο (smooth)

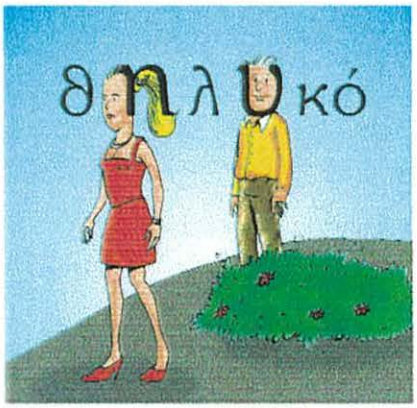
δώδεκα (twelve)

μοιράζω (divide)



προσκυνώ (kneel)

προσκύνημα (worship)

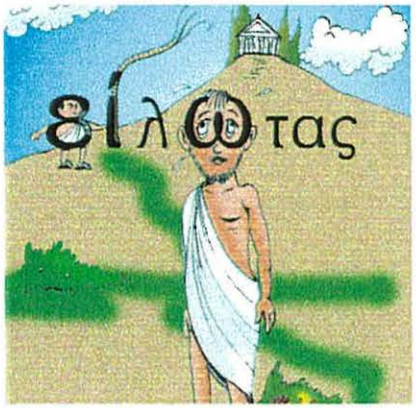


θηλυκό (female)

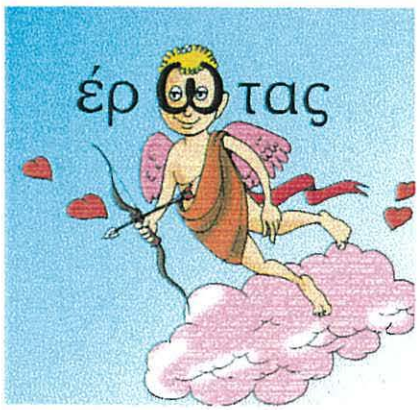
άσχημος (ugly)

θυγατέρα (daughter)

γουρλωτά (staring)

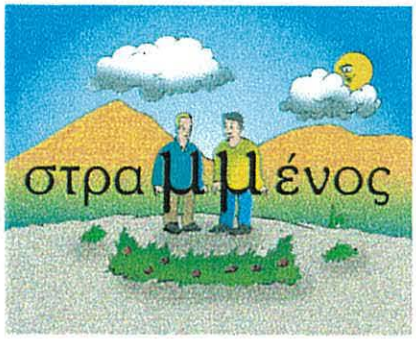


είλωτας (slave)

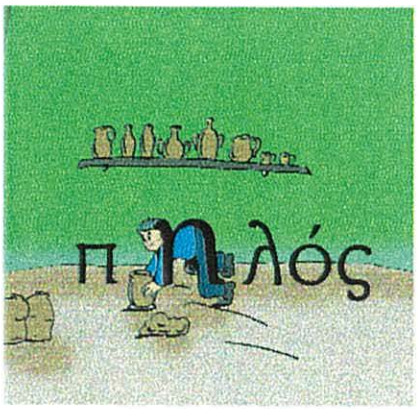



έρωτας (love)

κλαδωτό (full of branches)




στραμμένος (turned)

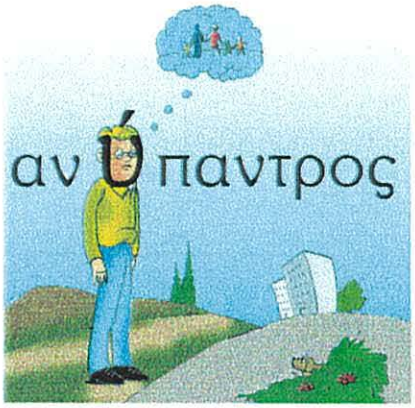



πηλός (potter's clay)

προτείνω (propose)

φυλαχτό (talisman)

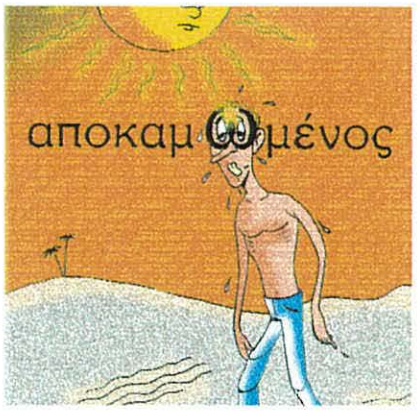
μελωδία (music)



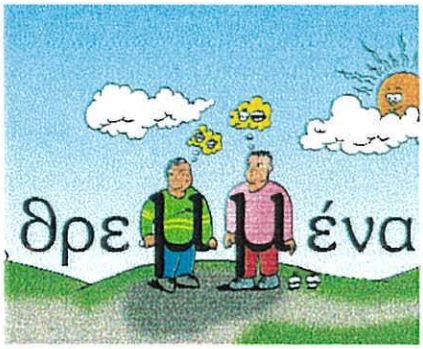

ανύπαντρος (single, unmarried)

λειτουργία (holy service)

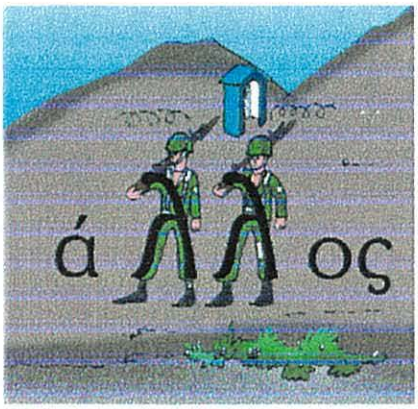
ασφυξία (suffocation)



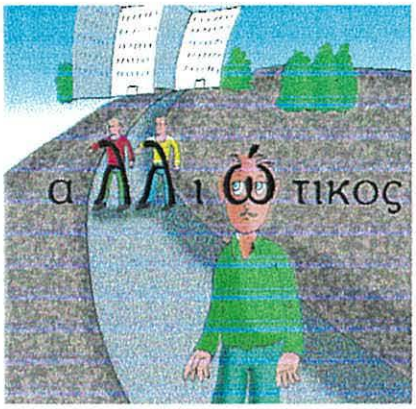

αποκαμωμένος (excausted)



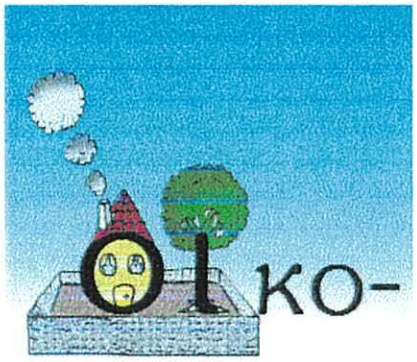

θρεμμένα (weel fed)



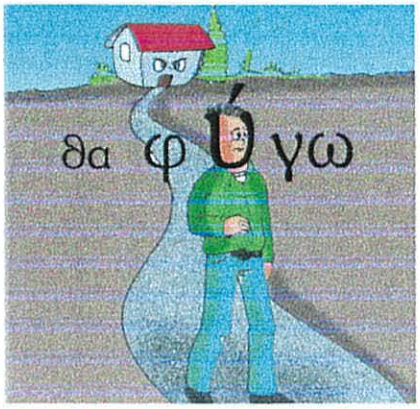

άλλος (the other, the next)



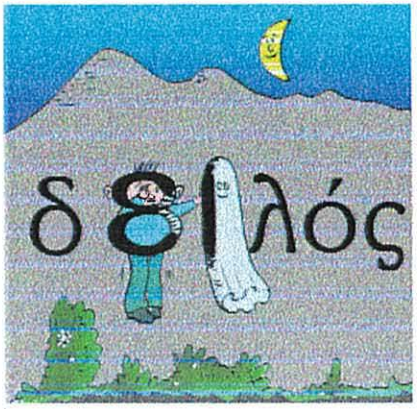

αλλιώτικος (different)



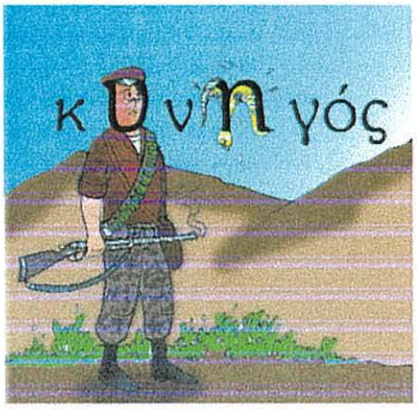

οικο- (prefix - "iko")



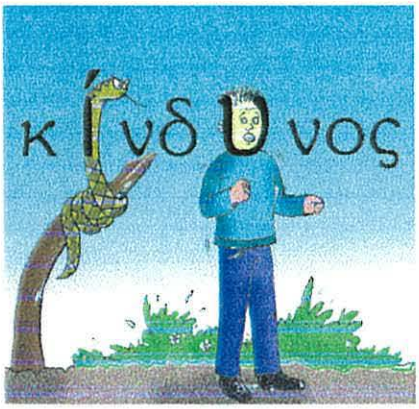

θα φύγω (I will leave)



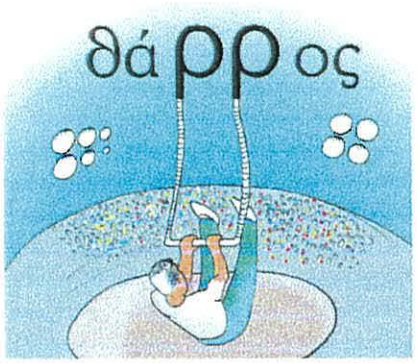

δειλός (coward)




κυνηγός (hunter)

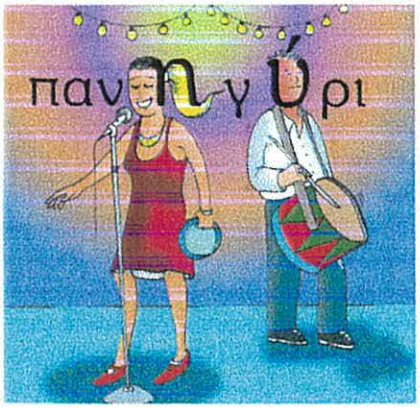



κίνδυνος (danger)



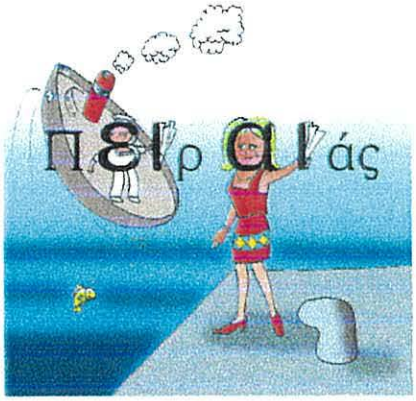

θάρρος (courage)

ζωύφιο (insect)




πανηγύρι (festival)

ήρωας (hero)

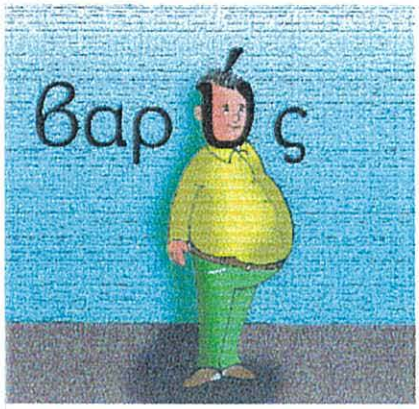



Πειραιάς (Pireas)

αιχμάλωτος (captive)

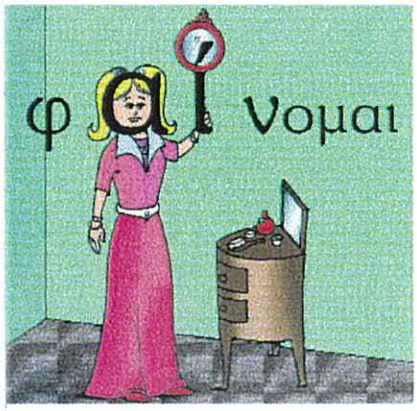
σκοινί (rope)

σκηνή (tent)

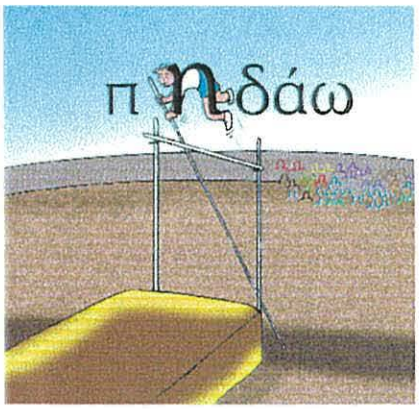



βαρύς (heavy)

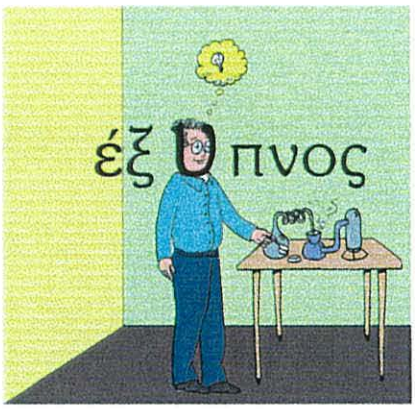
παχύς (fat)



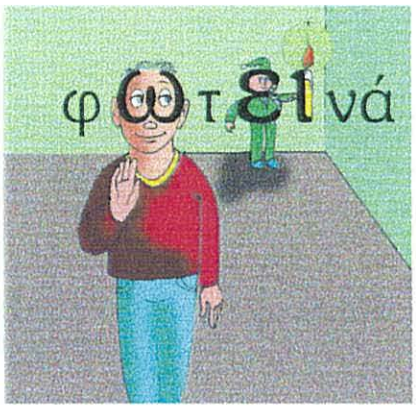

φαίνομαι (appear)




πηδάω (jump)




έξυπνος (clever)




φωτεινά (light)

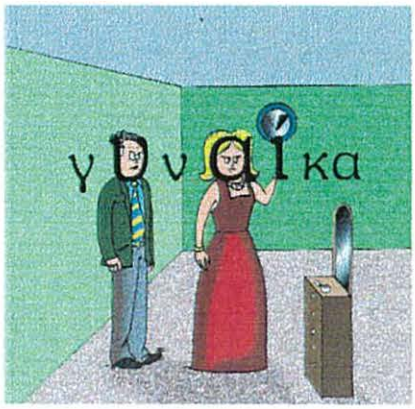
σκοτεινά (dark)

δωμάτιο (room)

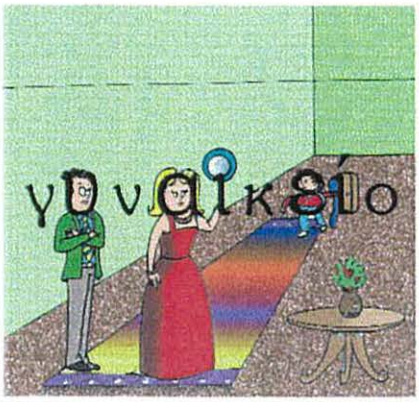
θυμάμαι (remember)

ειρήνη (peace)

φύλλο (leaf)

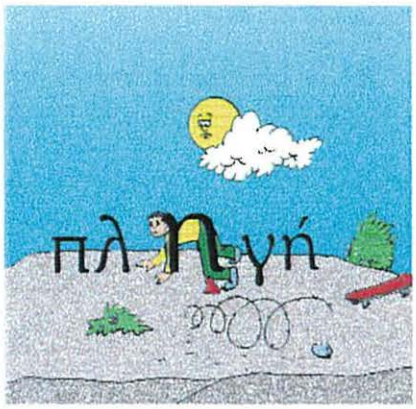



γυναίκα (woman)

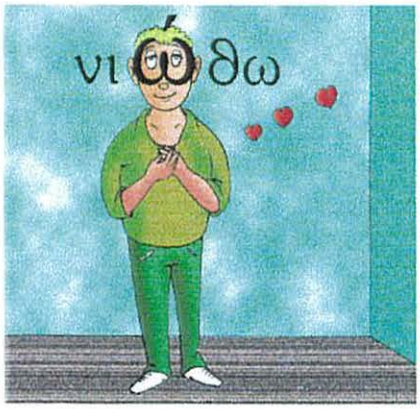



γυναικείο (woman's)

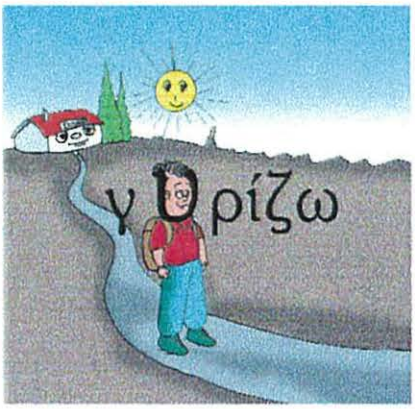
ιδρώτας (sweat)



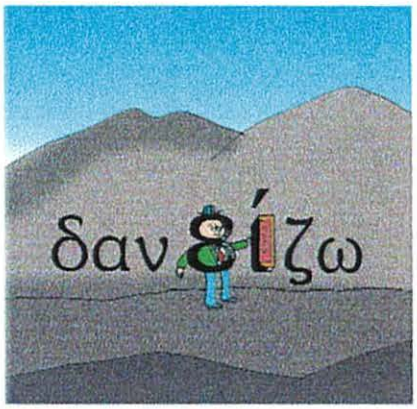

πληγή (spring)




νιώθω (feel)

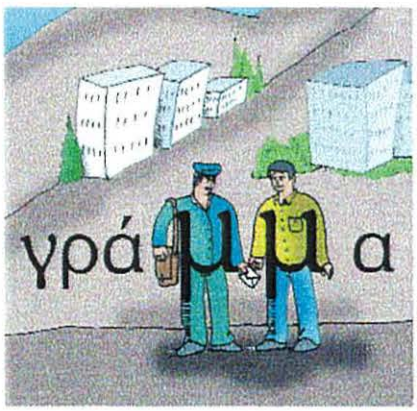



γυρίζω (return)




δανείζω (lend)

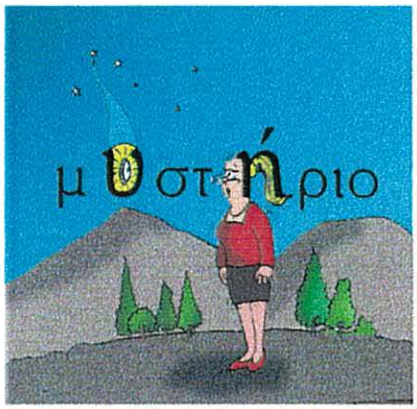
κιβώτιο (box)



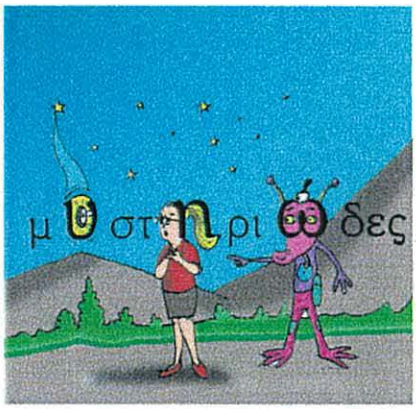

γράμμα (letter)

σημαία (flag)

μυστικό (secret)



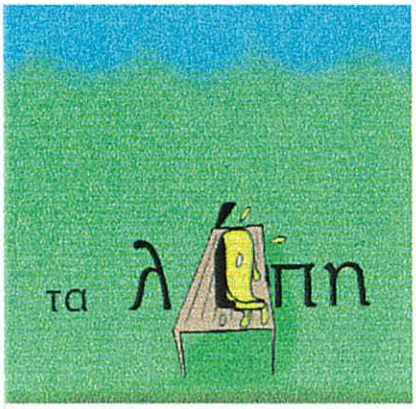

μυστήριο (mystery)



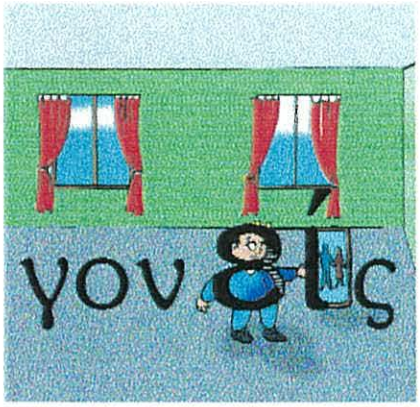

μυστηριώδες (mystery)

πυγολαμπίδα (firefly)

λείπει (he is not here)

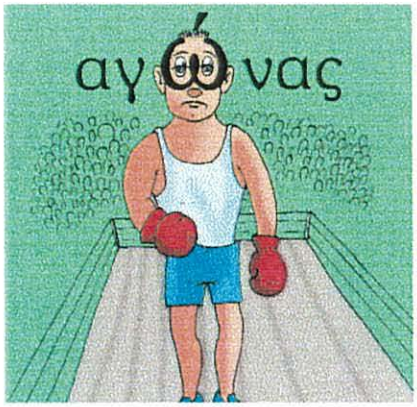



λίπη (grease)

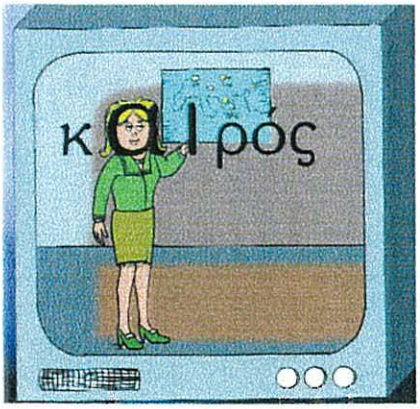



γανείς (parents)

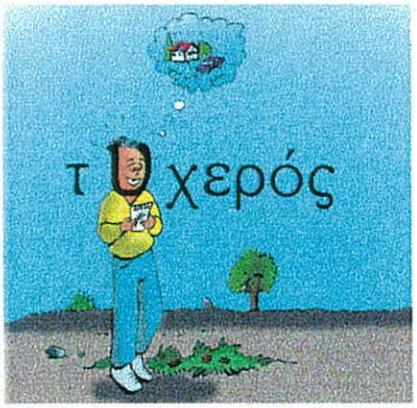
όνειρο (dream)




αγώνας (game, fight)

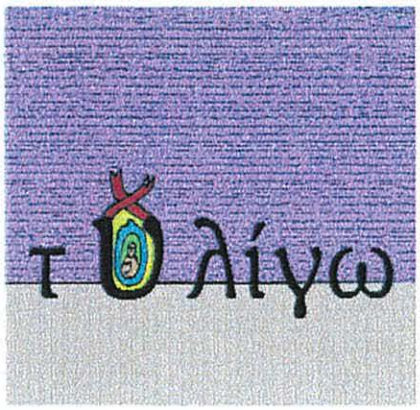



καιρός (weather)




τυχερός (lucky)

έδειρα (hit)

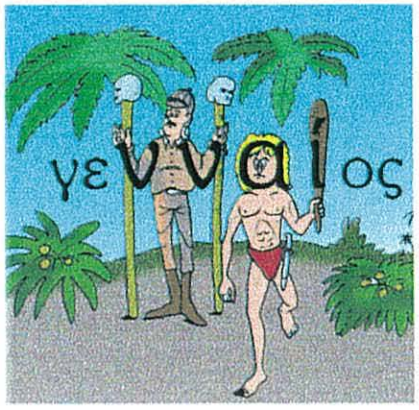



τυλίγω (wrap)

λαχείο (lottery)

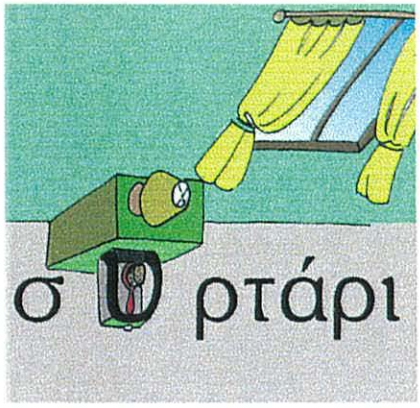
ζηλιάρα (jealous/woman)

πυρκαγιά (fire)

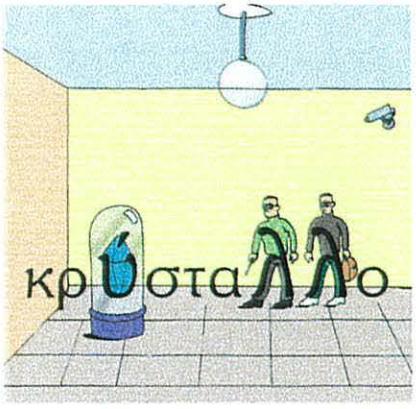



γενναίος (brave)

ευγενικός (gentle)



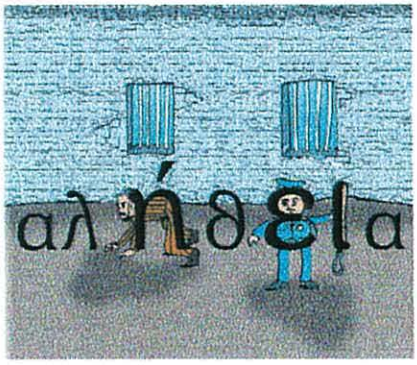

συρτάρι (drawer)



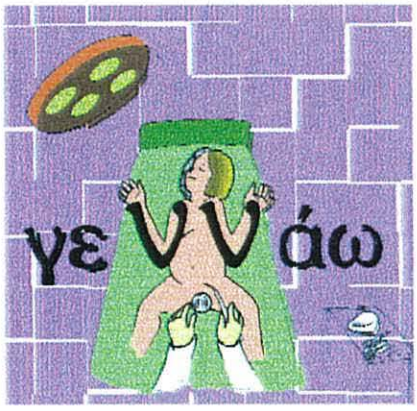

κρύσταλλο (crystal)

κόκκινο (red)

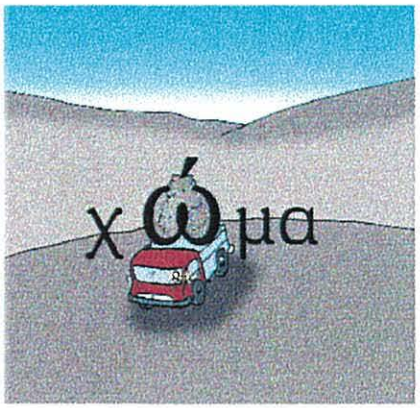
μυρμήγκι (ant)



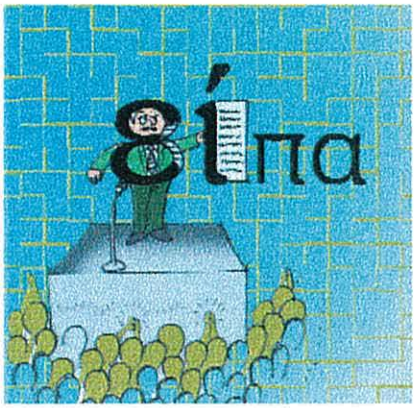

αλήθεια (truth)




γεννάω (born)



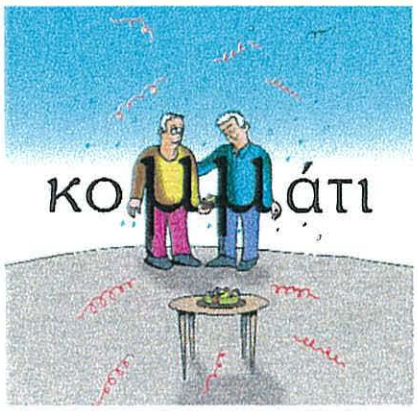

χώμα (soil, ground)




είπα (I said)

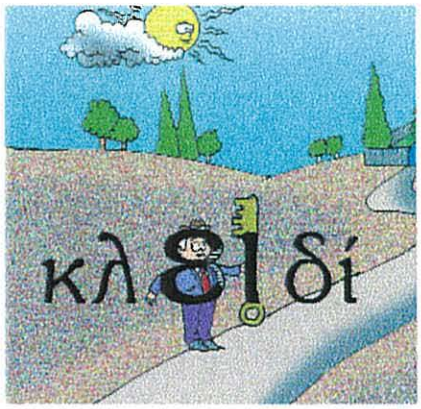
αδειάζω (empty)

βλέμμα (look)




κομμάτι (piece)

σπρώχνω (push)

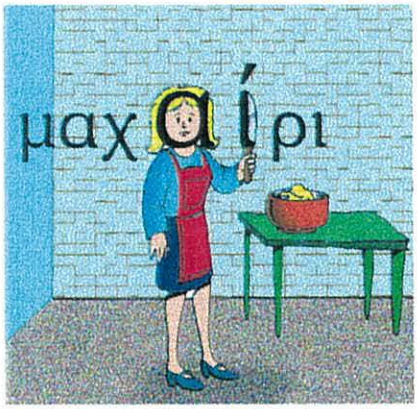



κλειδί (key)

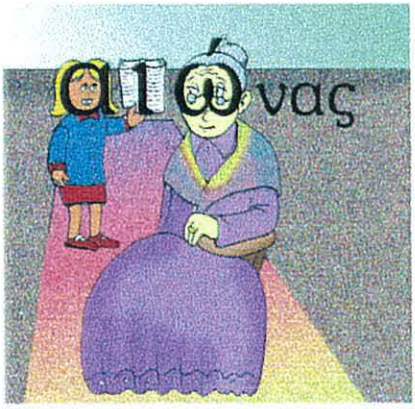
γλείφω (lick)

πλατεία (square)

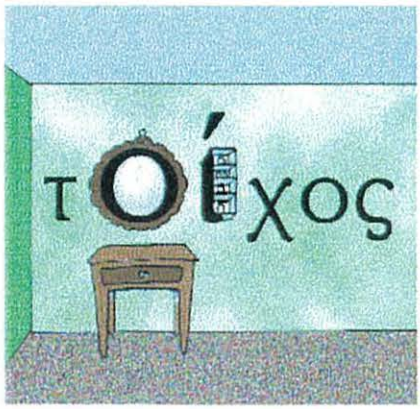
πλυντήριο (washing machine)



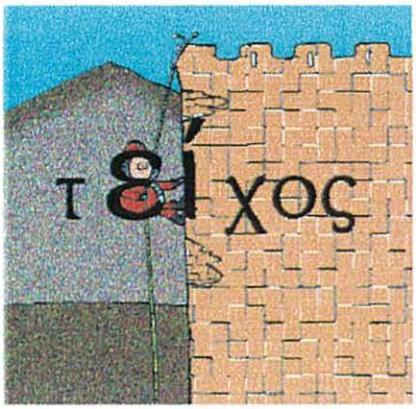

μαχαίρι (knife)




αιώνας (century)

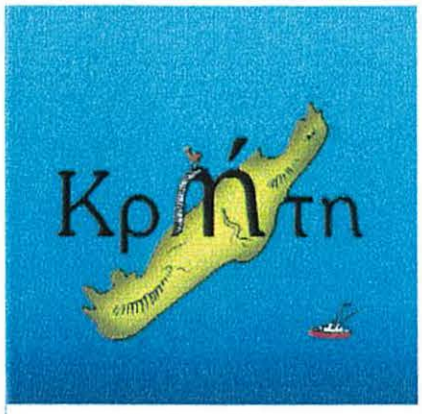



τοίχος (wall)

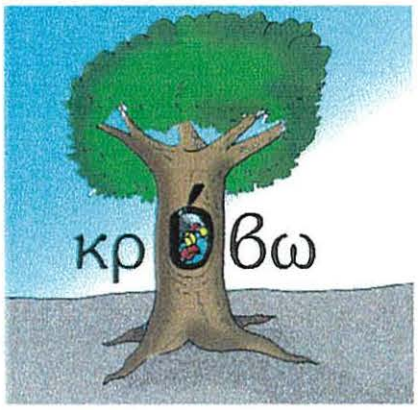



τείχος (wall)

ερείπιο (ruin)

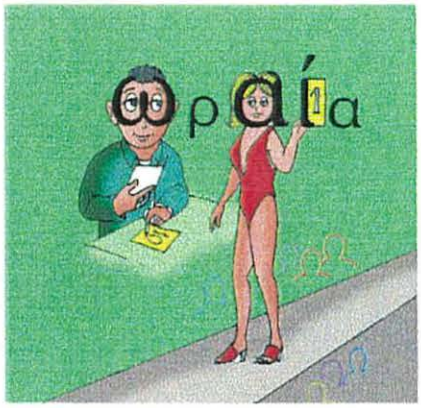



Κρήτη (Crete)

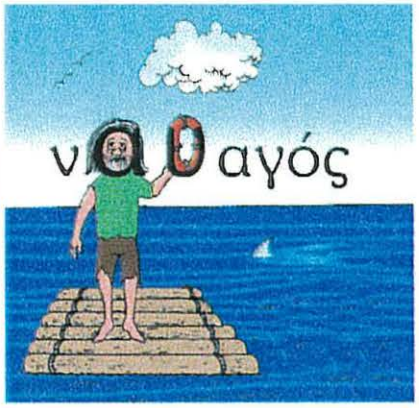



κρύβω (hide)

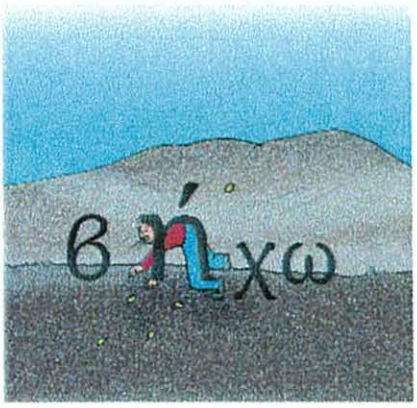
κυμμένος (hidden)




ωραία (beutiful)



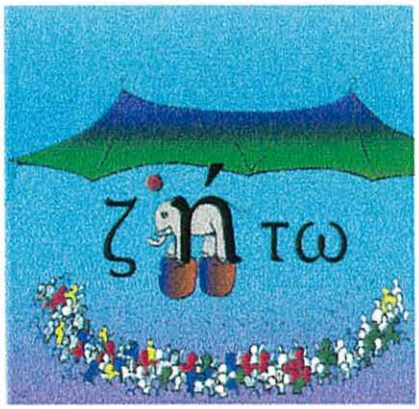

ναυαγός (castaway)




βήχω (cough)

μηχανικός (mechanic)

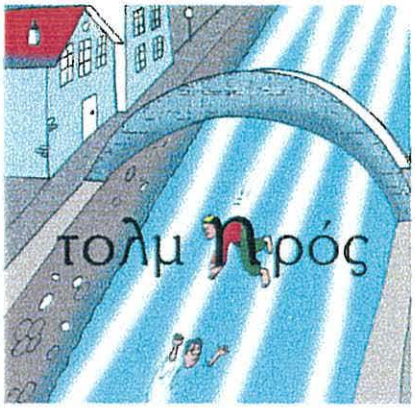
πυροσβέστης (fireman)




ζήτω (cheer)

σφαίρα (bullet)

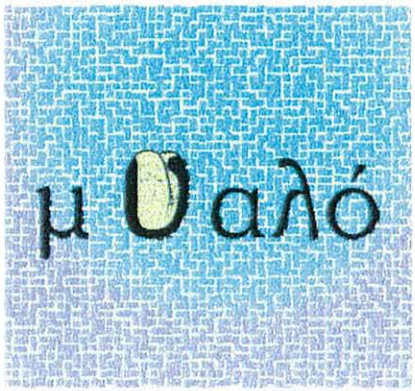
πονηρός (sly)



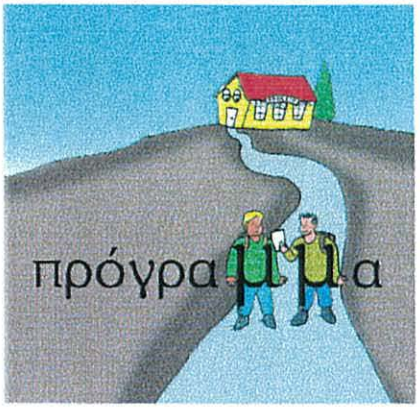

τολμηρός (daring)

λαιμός (throat)

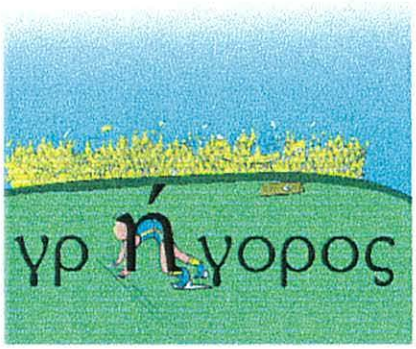
λαιμαργία (gluttony)



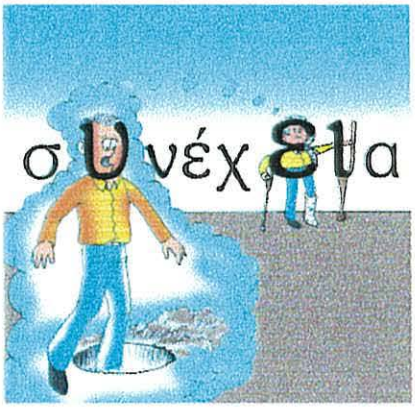

μυαλό (brain)




πρόγραμμα (schedule)

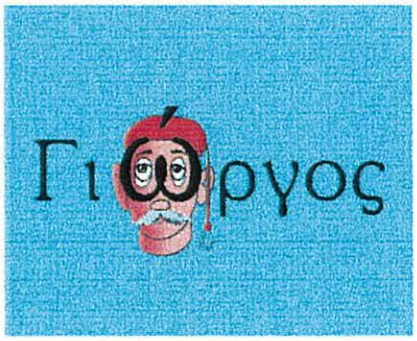



γρήγορος (quick)

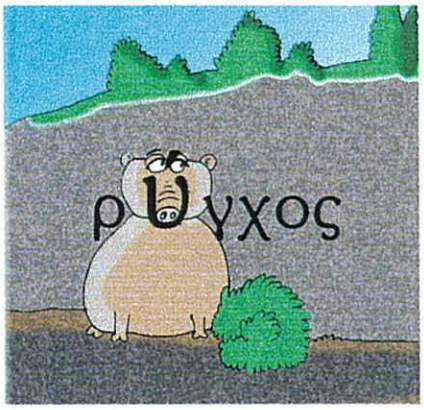



συνέχεια (sequence)

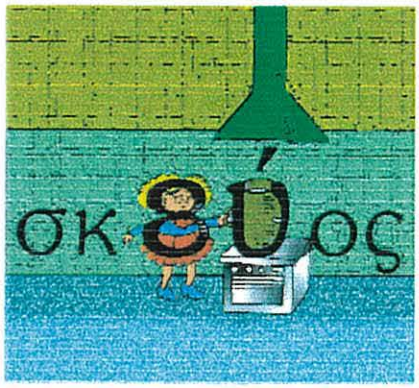
Κώστας (Kostas)




Γιώργος (George)

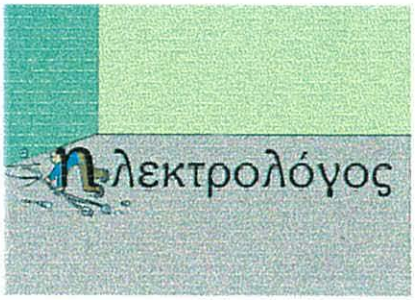



ρύγχος (muzzle)




σκεύος (pot)

κυλώ (roll)

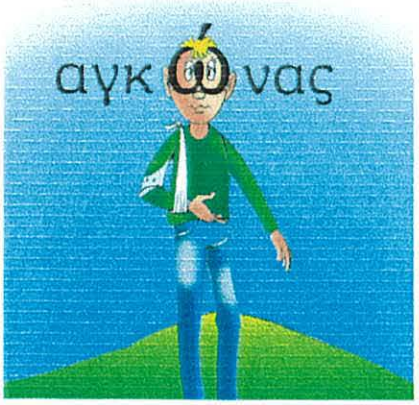



ηλεκτρολόγος (electrician)

καλύπτω (cover)

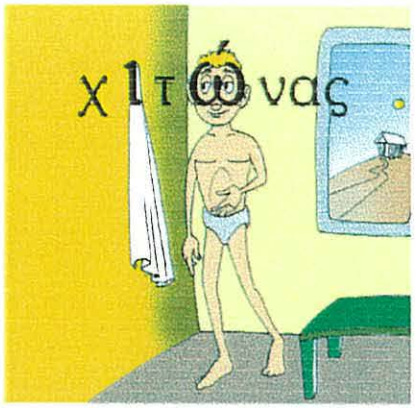
αποκαλύπτω (uncover)

κάλυμμα (covering)



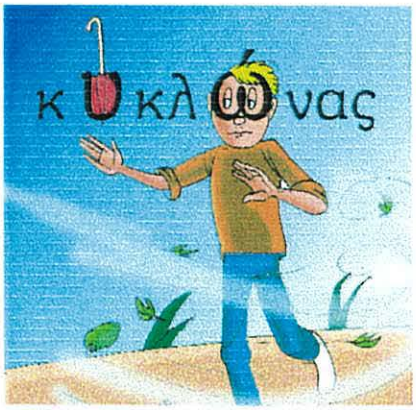

αγκώνας (elbow)

αρραβώνας (engagement)

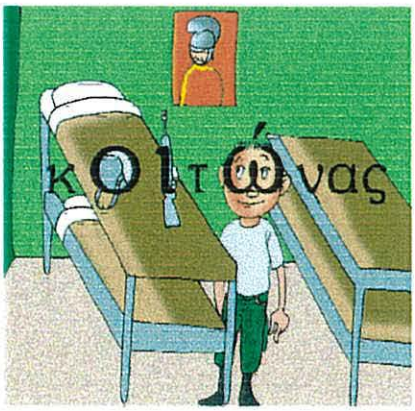



χιτώνας (robe)

θαμώνας (habitue)




κυκλώνας (cyclone)

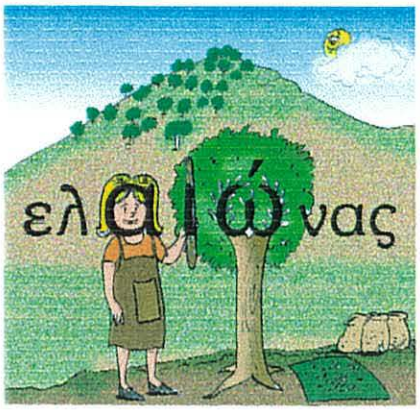



κοιτώνας (dormitory)

ορνιθώνας (hen house)

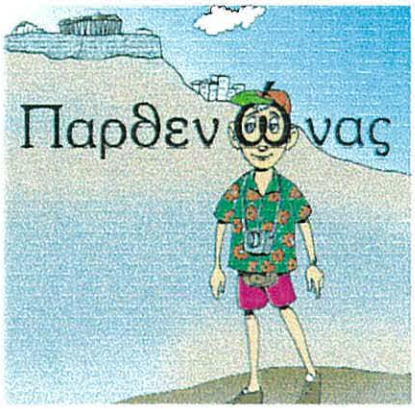
περιστεριώνας (pigeon loft)

πευκώνας (pine-clad)



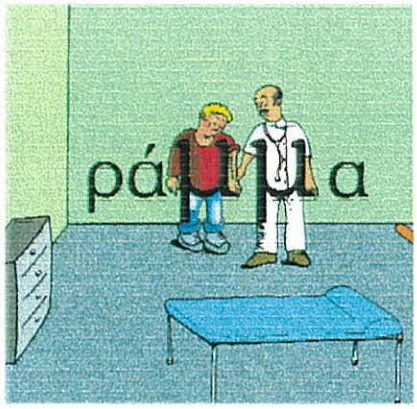

ελαιώνας (olive grove)

καλαμιώνας (reed-bed)

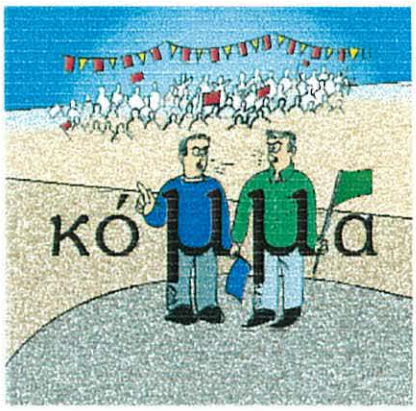



Παρθενώνας (Parthenon)

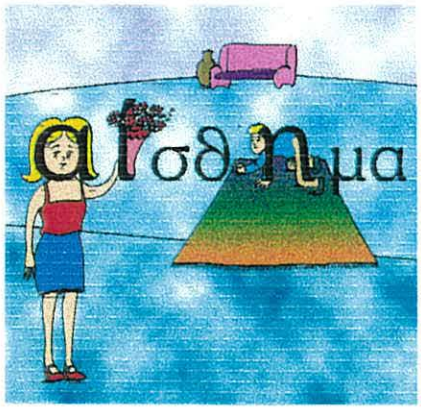
Ποσειδώνας (Posidonas)



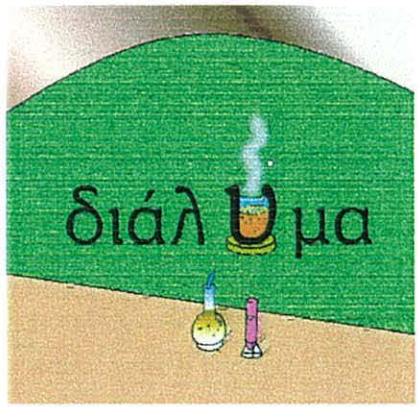

ράμμα (stiches)




κόμμα (political part, party)




αίσθημα (feeling)

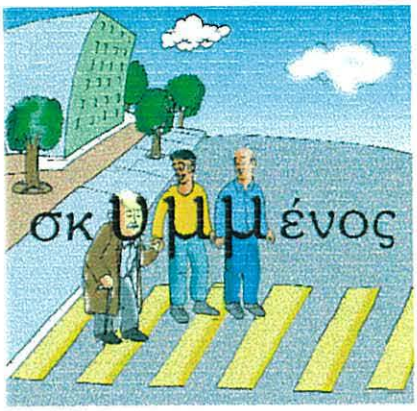



διάλυμα (solution)

διάλειμμα (break)

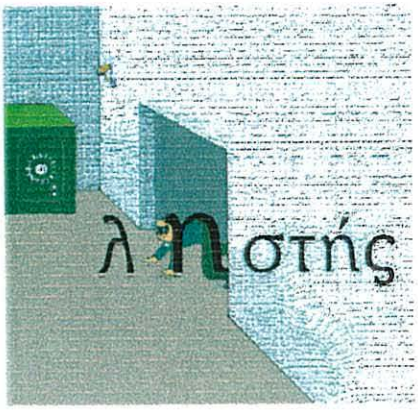
κείμενο (text)

δεσποινίς (miss)



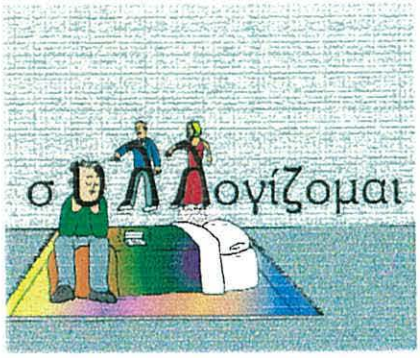
σκυμμένος (bowed)

Έλληνες (Greeks)



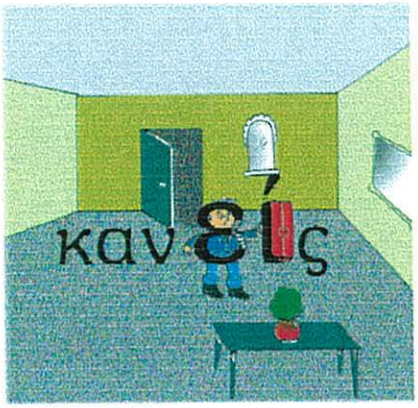
ληστής (rob)

λημέρι (hideout)

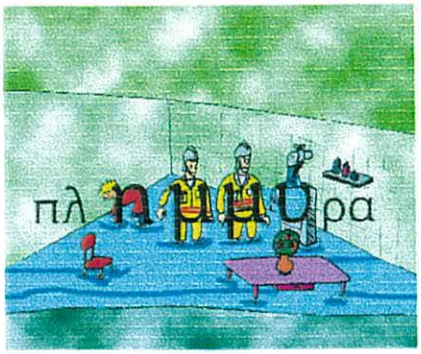


συλλογίζομαι (think)

φήμη (fame)

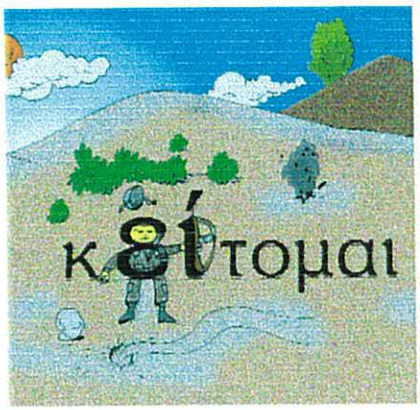


κανείς (nobody)

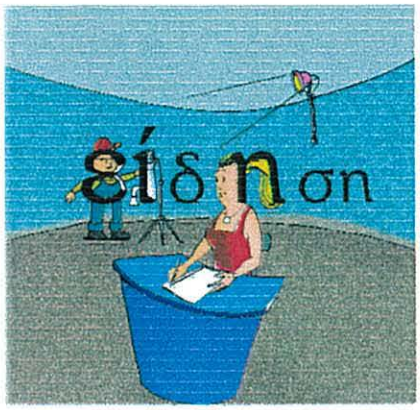


πλημμύρα (flood)

μεταξύ (in between)

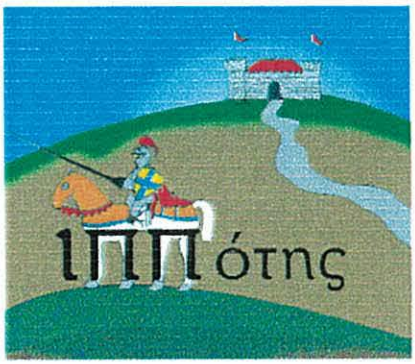


κείτομαι (lay)

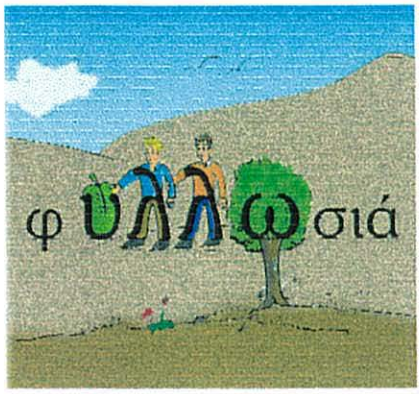


είδηση (news)

ποδήλατο



ιππότης (knight)



φυλλωσιά (leafage)

νύφη (bride)

στοιχειό (ghost)

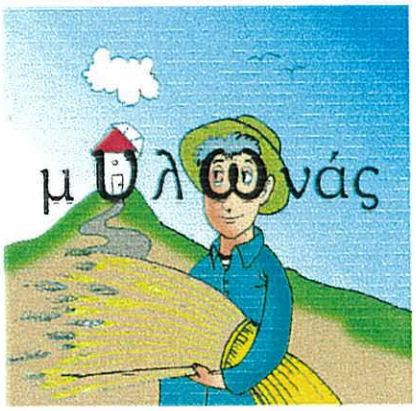
σιωπηλός (quiet)

ήπια (I drank)

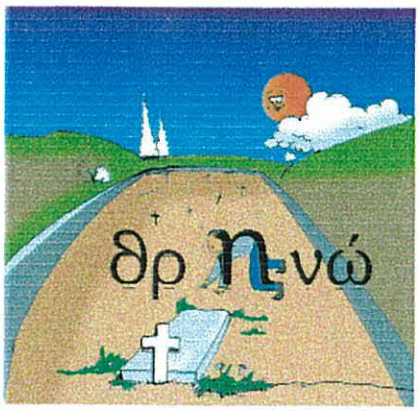
διώχνω (turn away)

ποικιλία (variety)

Μύλος (flour-mill)

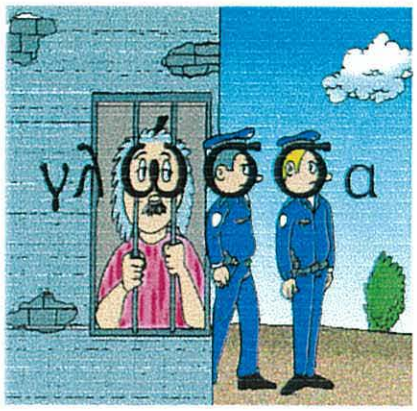


μυλωνάς (flour miller)



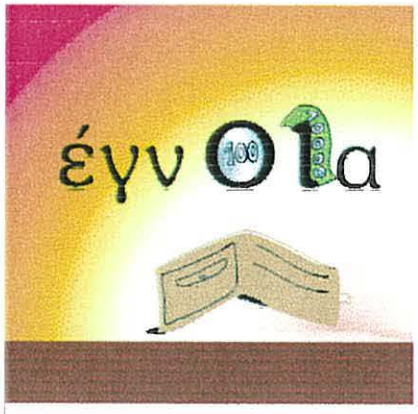
θρηνώ (mourn)

δείπνο (dinner)



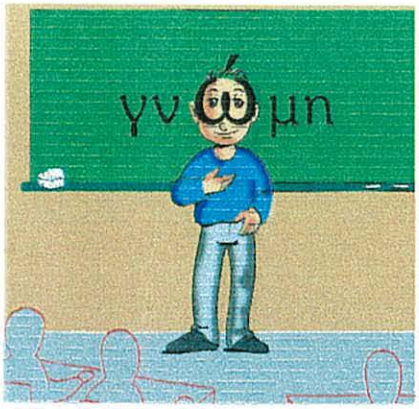
γλώσσα (tongue-be impertinent to)

βογγάω (groan)



έγνοια (worry)

φθινόπωρο (Automn)

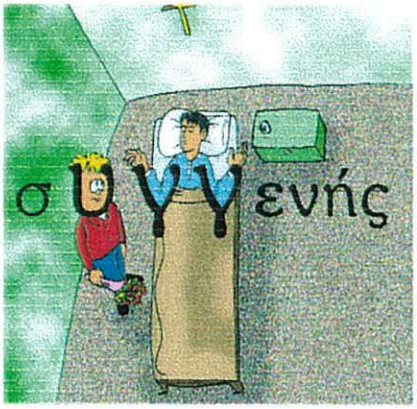


γνώμη (opinion)

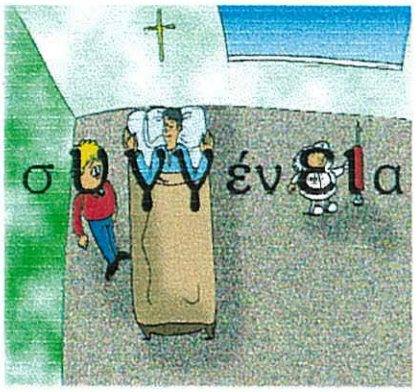
δίκαιος (fair)

δικαιοσύνη (justice)

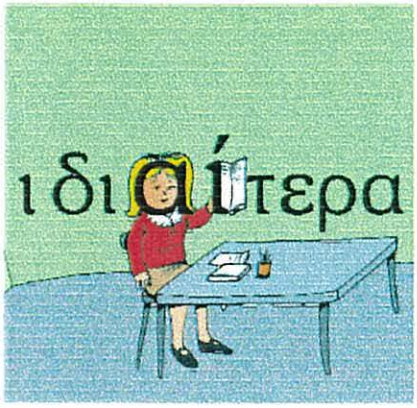
σύνθημα (sign)



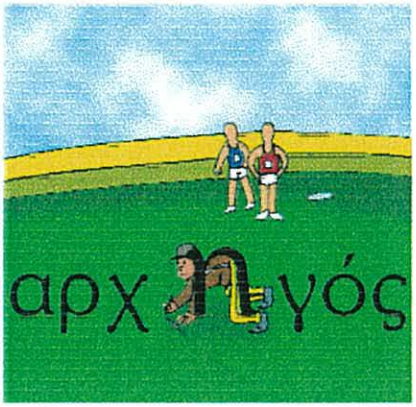
συγγενής (relative)



συγγένεια (relationship)



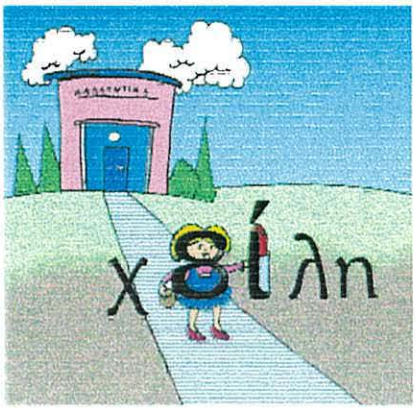
ιδιαίτερα (private)



αρχηγός (leader)

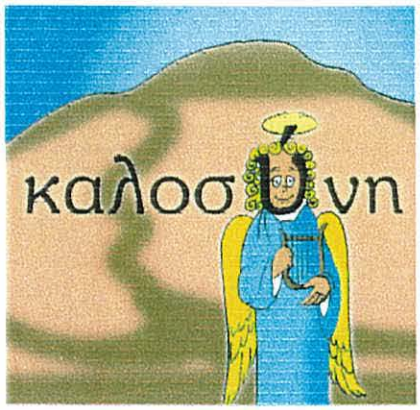
πείσμα (stubborn)

στήλη (column)

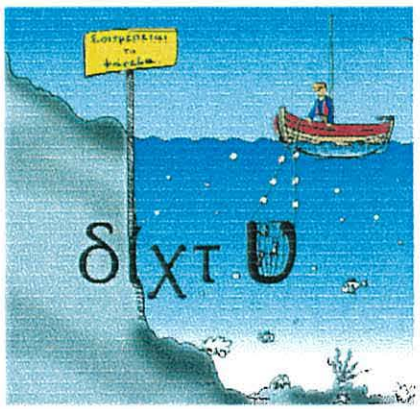


χείλη (lips)

θηλιά (noose)

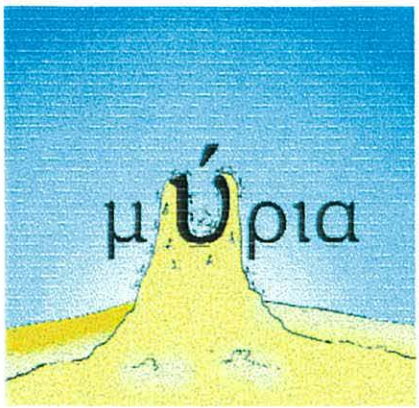


καλοσύνη (goodness)



δίχτυ (fisher's net)

διχτυωτό (net)



μύρια (thousands)

τριμμένο (smash)

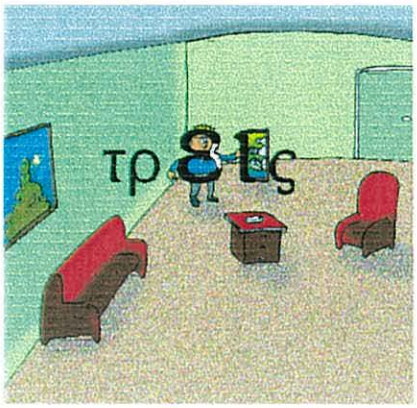
μήνυμα (message)

θωρώ (look)

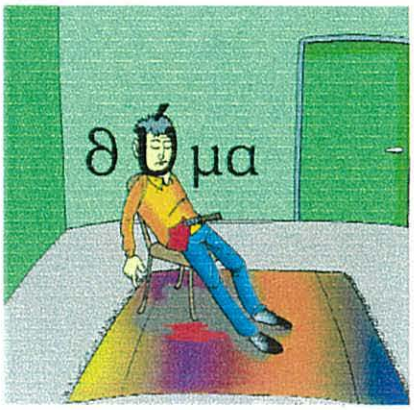
φαράγγι (gap)

ανήμπορος (disable)

χειρότερος (the worst)

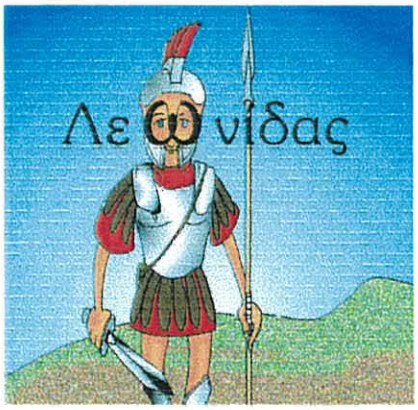


τρείς (three)



θύμα (victim)

σύσκεψη (meeting)

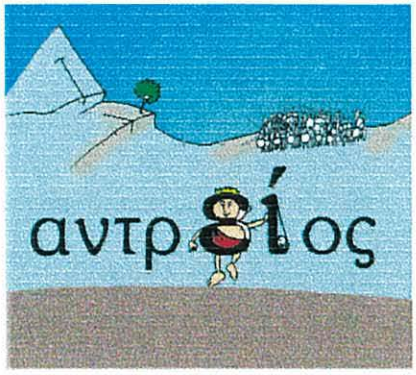


Λεωνίδας (Leonidas)

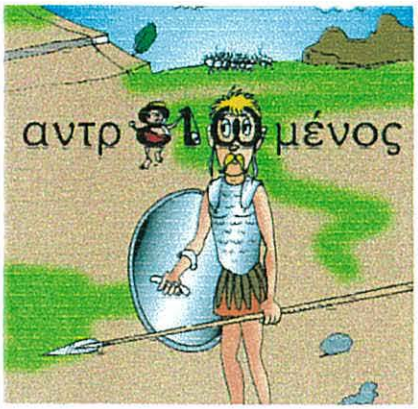
προϋπαντώ (go out and meet)

πλατύ (wide)

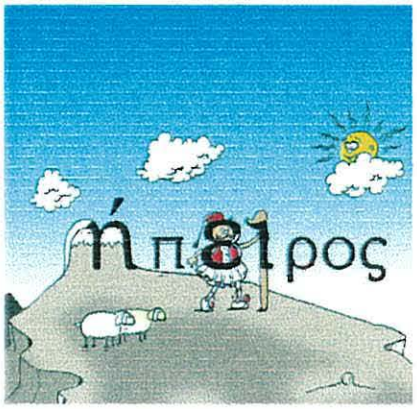
σημείο (point)



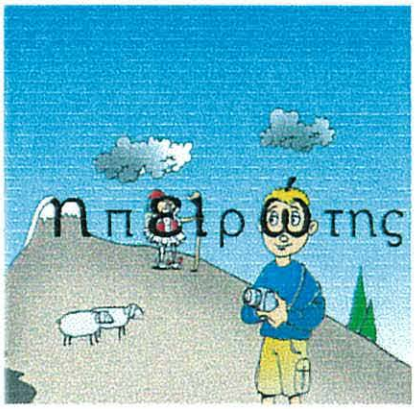
αντρείος (brave)



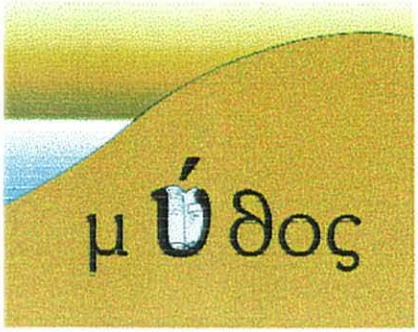
αντρειωμένος (brave)



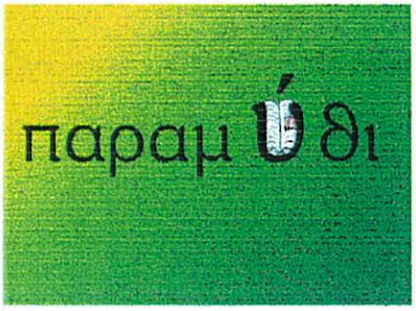
ήπειρος (Ipiros)



ηπειρώτης (man from Ipiros)

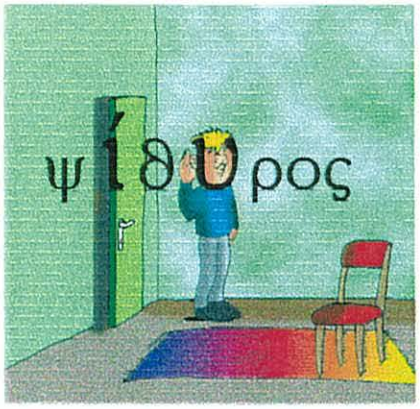


μύθος (legent)

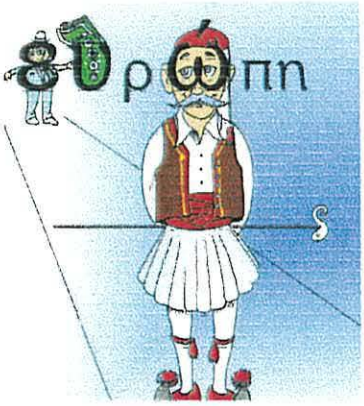


παραμύθι (fairy tail)

τύμπανο (drum)



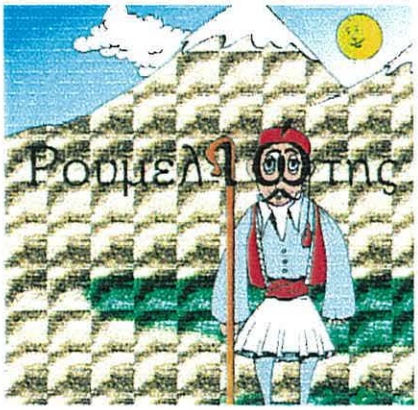
ψίθυρος (whisper)



Ευρώπη (Europe)

Ευρωπαίος (European)

ταξιδιώτης (traveller)



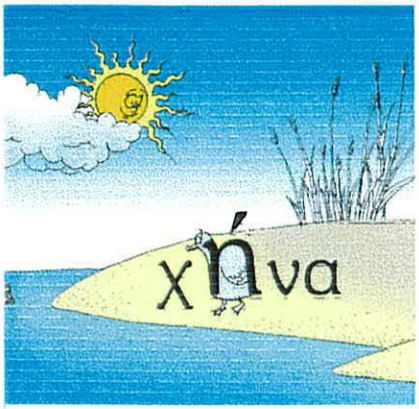
Ρουμελιώτης (man from Roumeli)

νησιώτης (islander)

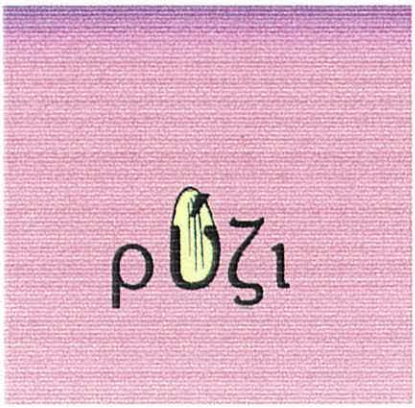
Σαμιώτης (Samian)

πατριώτης (patriot)

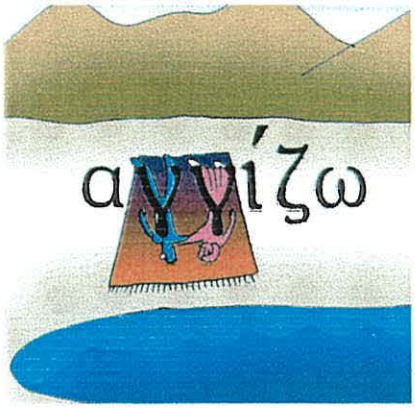
ξεπροβάλλω (appear)



χήνα (goose)



ρύζι (rice)



αγγίζω (touch)

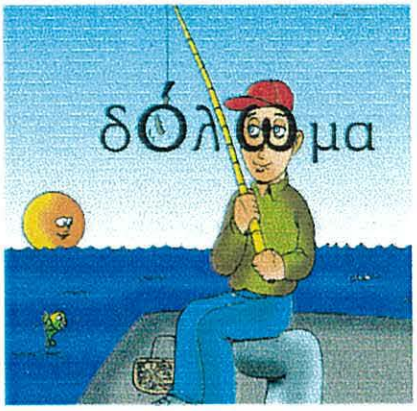
στρατώνας (arm)

στρατιώτης (soldier)

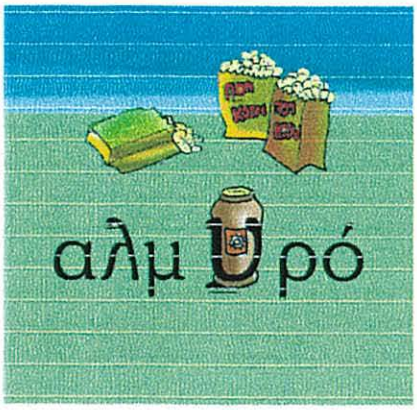
απειλώ (threaten)

παράλυτος (paralysis)

καπνοπωλείο (tabaconist's)



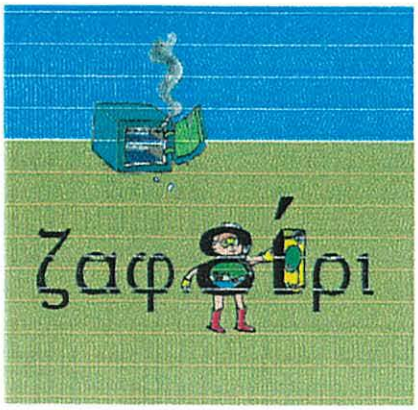
δόλωμα (bait)




αλμυρό (salty)

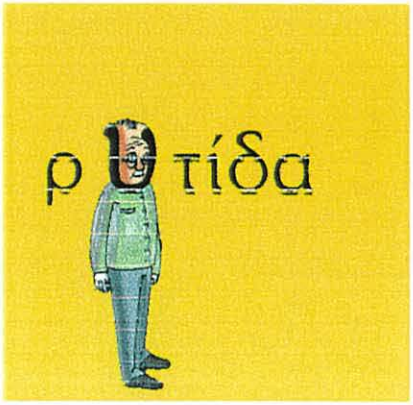
κελαρύζω (babble)

σύννεφο (cloud)




ζαφείρι (sapphire)

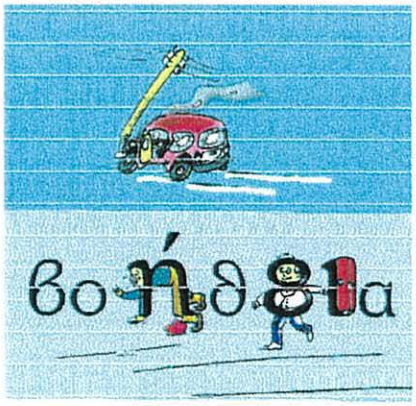
ατελείωτο (unfinished)




ρυτίδα (wrinkle)

Θαύμα (mirakle)

φυσώ (blow)

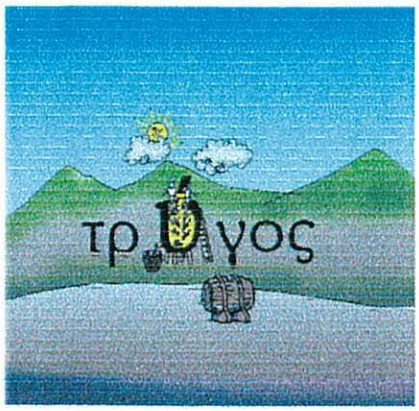



βοήθεια (help)

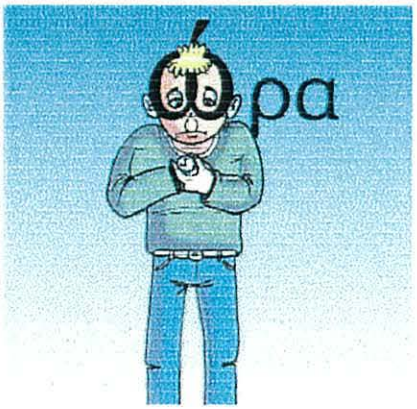
κυπαρίσσι (cypress tree)

φταίω (my fault)

κοιτάζω (look)

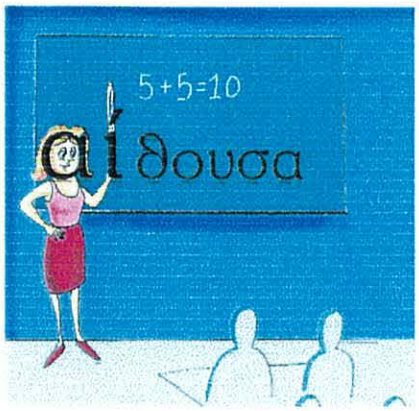



τρύγος (grape harvest time)



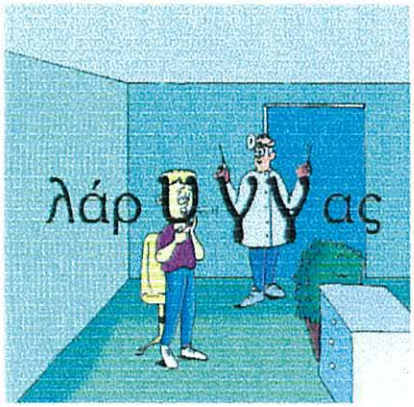

ώρα (time)

δύση (sunset)




αίθουσα (school room)

επειδή (because)



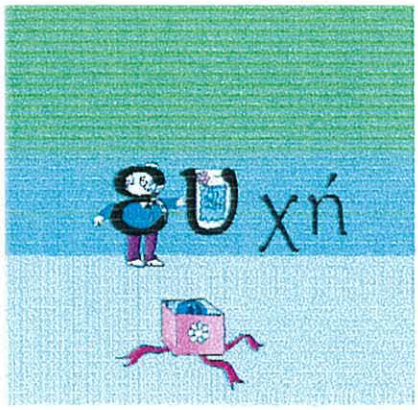

λάρυγγας (larynx)

εκεί (there)

εκείνο (that)

καημένος (poor)

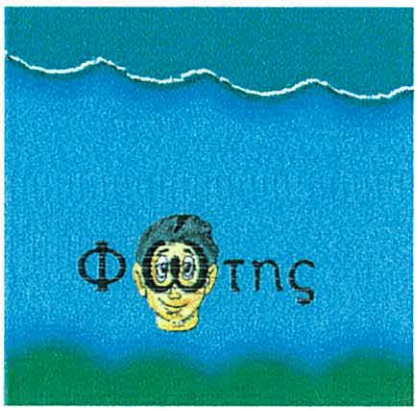
είδα




ευχή

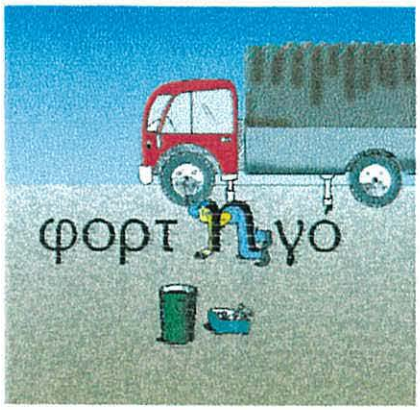
αυλή (yard)

κόλλα (glue)

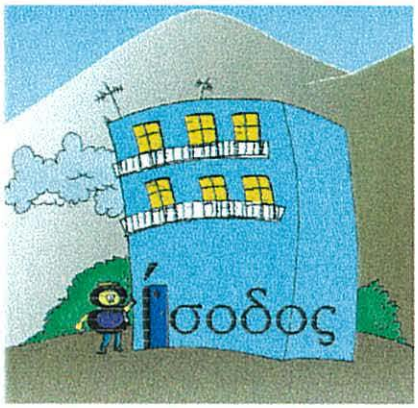



Φώτης (Fotis)

σκύβω (bow)

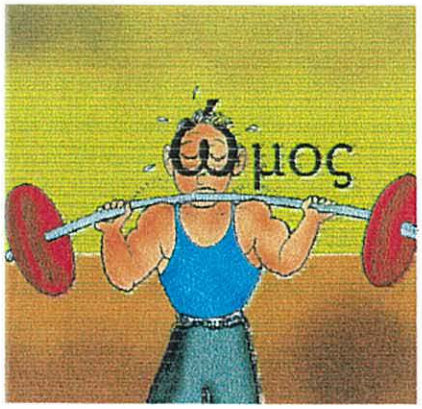



φορτηγό (van)




είσοδος (entrance)

ταλαιπωρία (suffering)




ώμος (shoulder)

στρυφνός (crotchery)

πληρωμή (payment)

ανακάλυψα (I discovered)

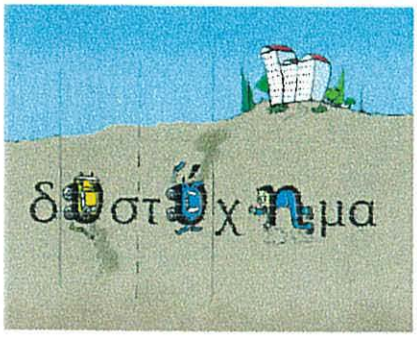
δύσκολο (difficult)

πέτυχα (I succeed)

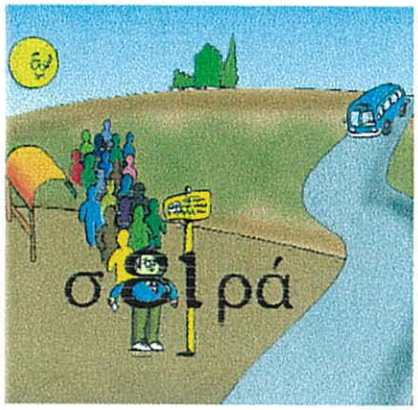
χρήματα (money)

βαμμένος (painted)

αφαίρεση (subtraction)




δυστύχημα (accident)

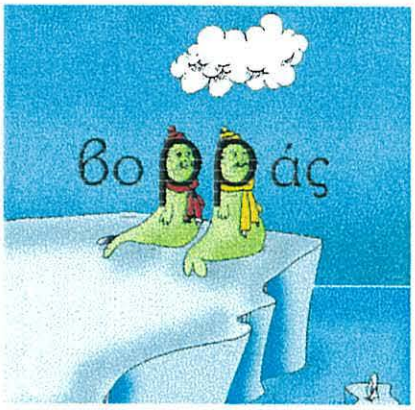



σειρά (queue)

παππούς (grandfather)

πρόσφυγας (emigrant)

βόρεια (nothern)



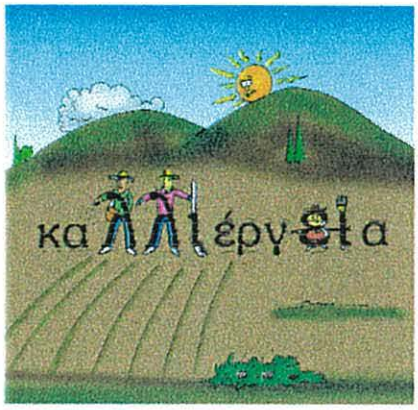

βορράς (North)

ύστερα (later on)

κυρά (Mrs)

επώνυμο (surname)

καλλιεργώ (cultivate)



καλλιέργεια (cultivation)

μέταλλο (metal)

μεταλείο (mine)

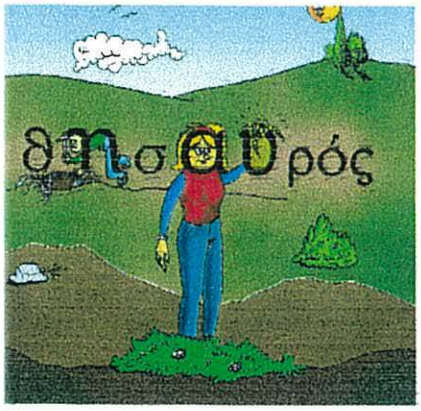
δοχείο (pot, bin)

ερημιά (dessert)

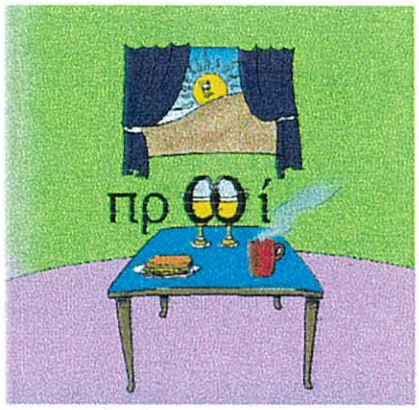
σοδειά (crop)

χαιρετώ (say goodby)

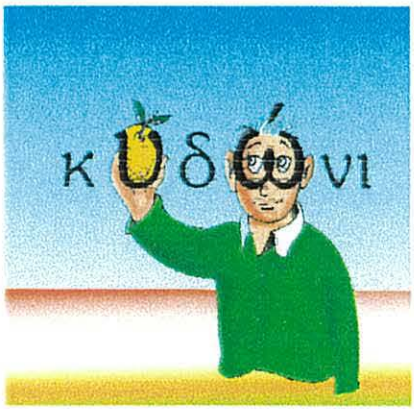
χαίρομαι (feel happy)



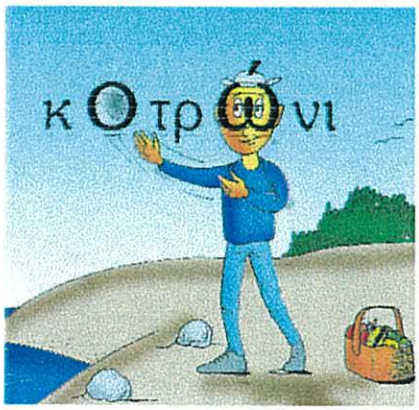
θησαυρός (treasure)



πρωί (morning)



κυδώνι (guince)




κοτρώνι (stone)

παγώνι (peacock)

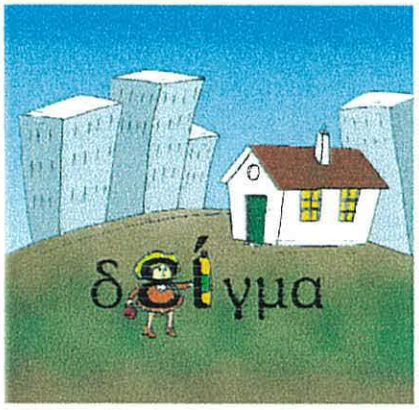
σιφώνι (siphon)

μαύρο (black)

συμμαθητής (schoolmate)

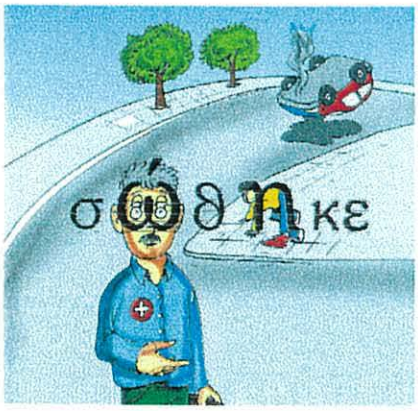
συμφωνία (agreement)

συλλογή (collection)

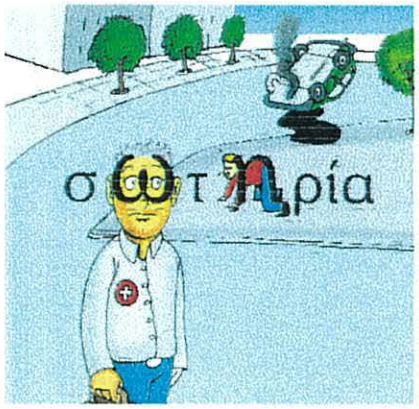



δείγμα (sample)

πέτρωμα (rock)

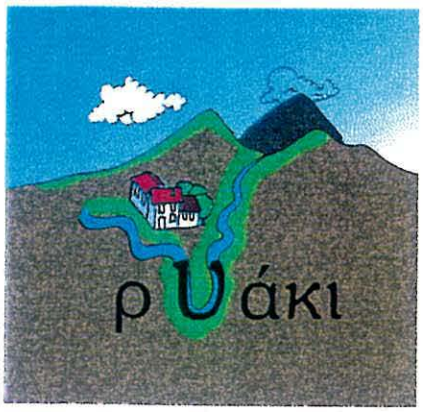



σώθηκε ( he saved)

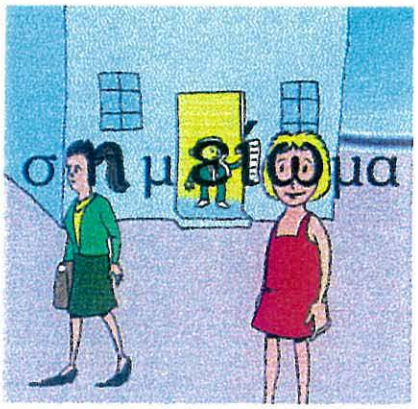



σωτηρία (salvation)

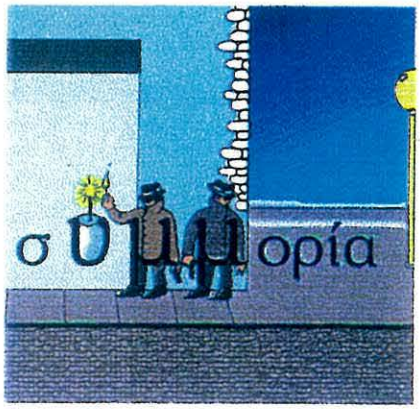
ήντα (prefix: inta)



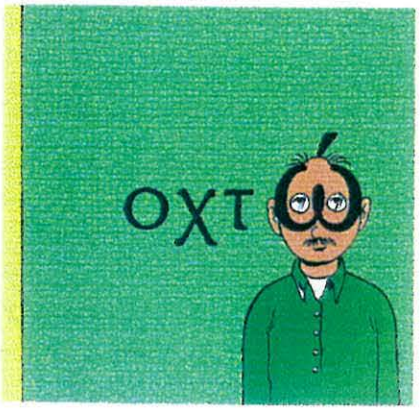
ρυάκι (stream)



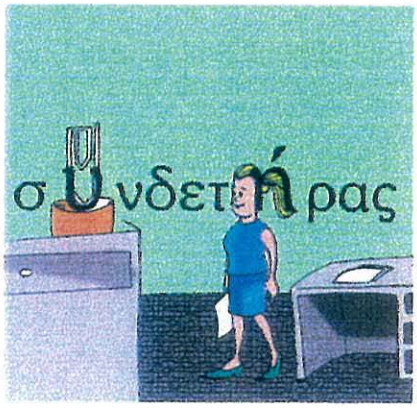
σημείωμα (note)



συμμορία (gang)



οχτώ (eight)

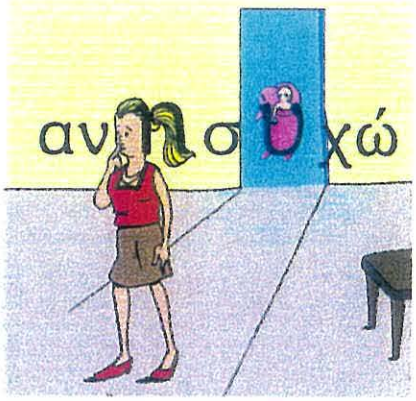


συνδετήρας (clip)

συνδυασμός (combination)

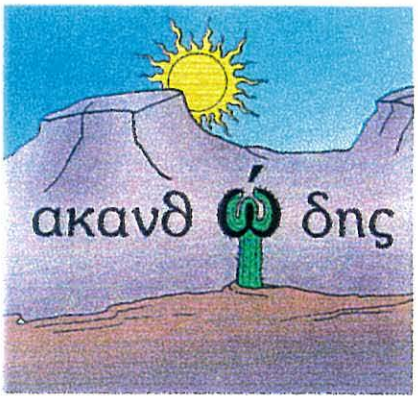
ωκεανός (ocean)

ανελκυστήρας (elevator)



ανησυχώ (to worry)

αποτύπωμα (figger print)

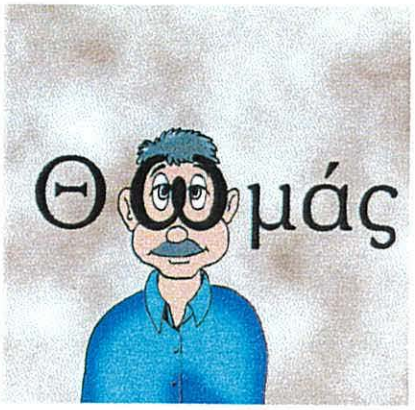


ακανθώδης (thorny)

πύραυλος (rocket)

ηλικία (age)

ηλικιωμένος (old man)



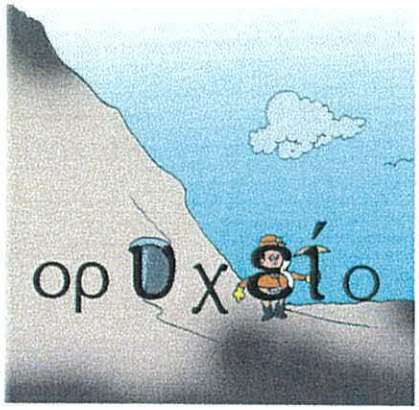

Θωμάς (Tom)

καμήλα (camel)

ζητάω (ask)

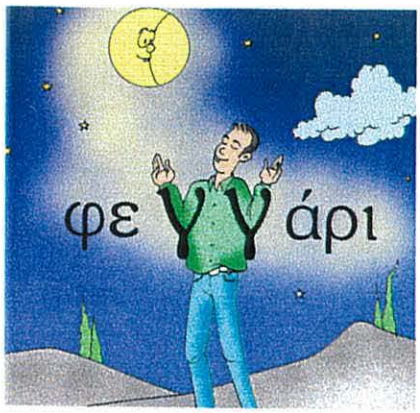
ζητιάνος (burglar)

χορωδία (choir)

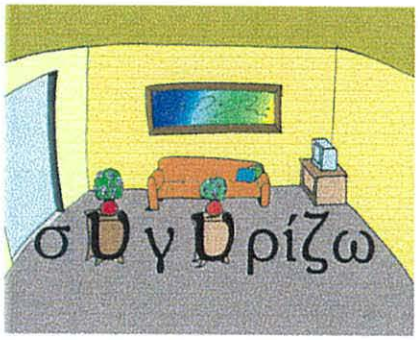



ορυχείο (mine)

εισπράκτορας (ticket's collector)



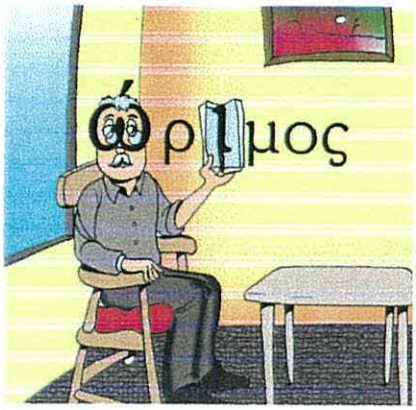

φεγγάρι (moon)




συγυρίζω (to tidy up)

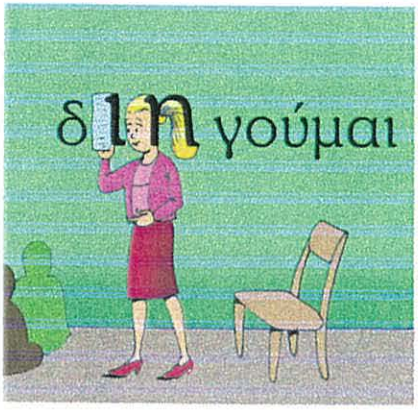
επείγον (urgent)

κατοικία (house)

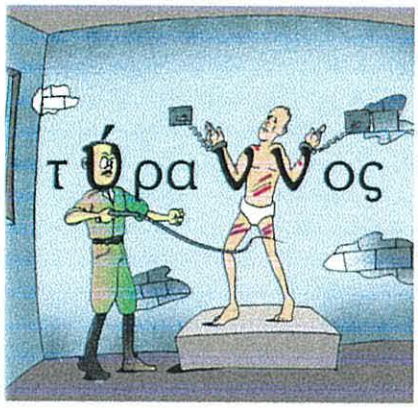



ώριμος (mature)

καταρράκτης (water fall)

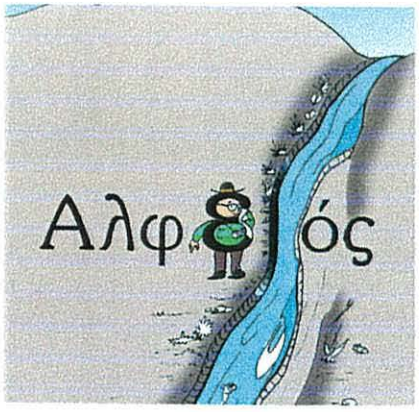



διηγούμαι (narrate)

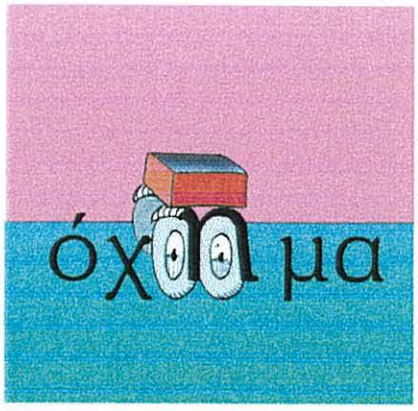



τύραννος (tyrant)

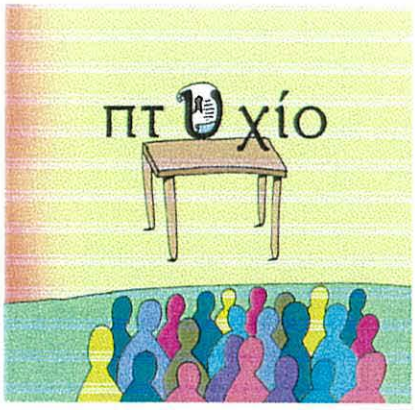
δάκρυ (tear)




Αλφειός (Alphaeus)

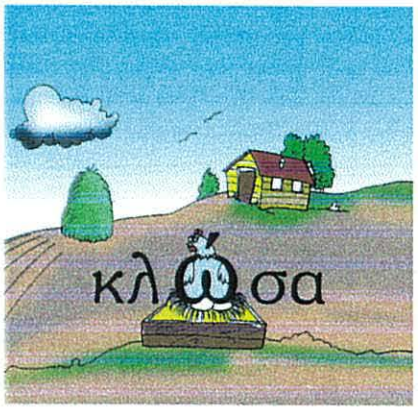



όχημα (coach)




πτυχίο (degree)

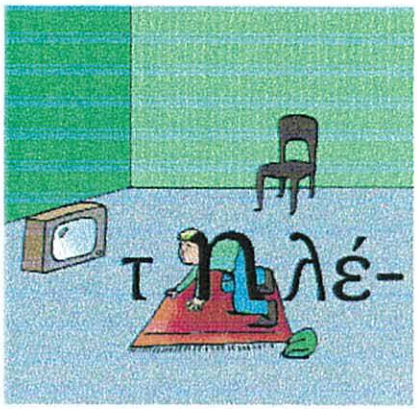
συντριβάνι (fountain)



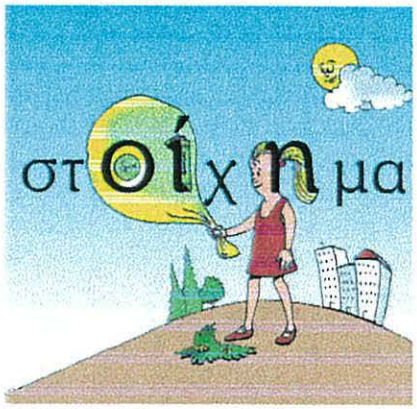

κλώσα (broody hen)

θώρακας (chest)

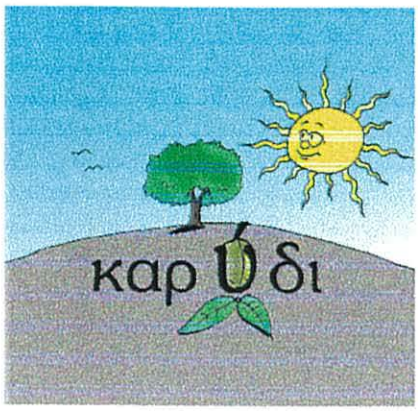
παροιμία (proverb)




τηλέ-(prefix- "tele")

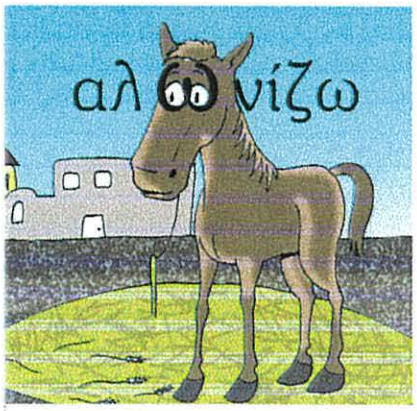



στοίχημα (bet)

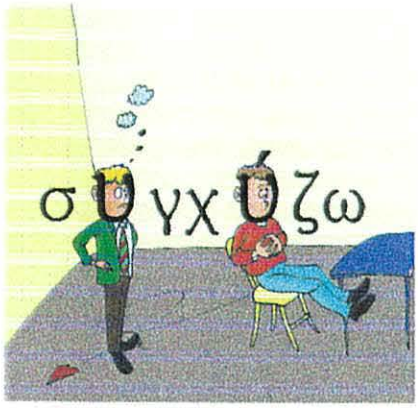



καρύδι (nut)

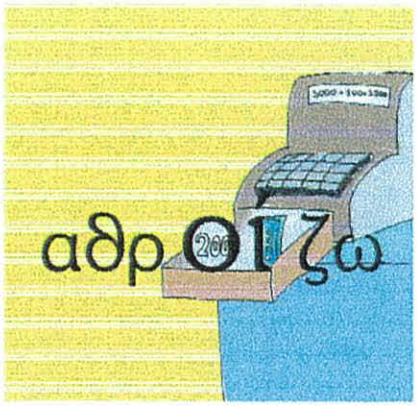
βράδυ (evening)



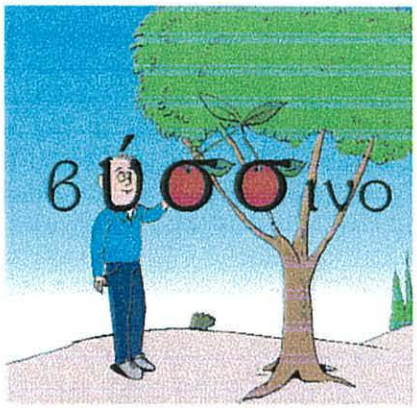

αλωνίζω (thresh)



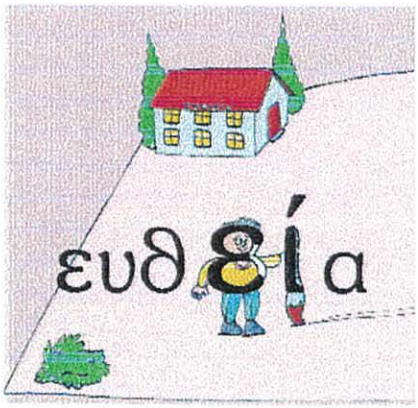

σύγχυση (comfusion)



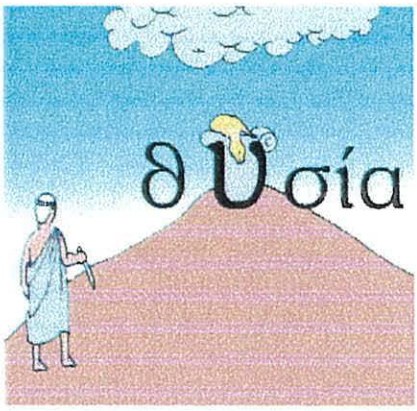

αθροίζω (add)




βύσσινο (sour cherry)

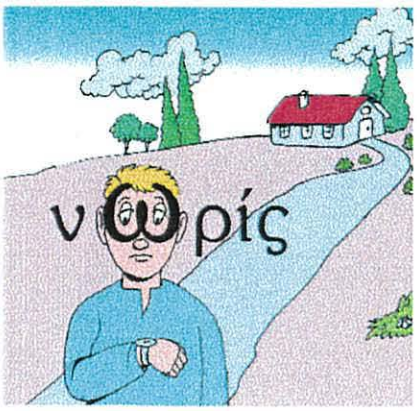



ευθεία (straight line)

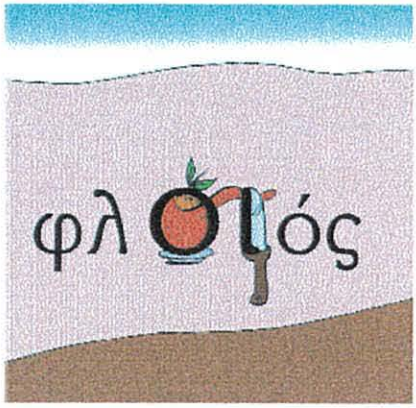



θυσία (sacrifice)

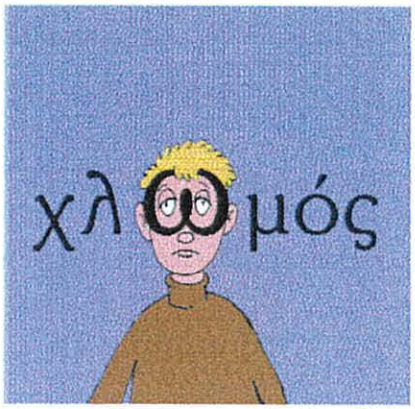
κήρυγμα (sermon)




νωρίς (early)




φλοιός (bark)

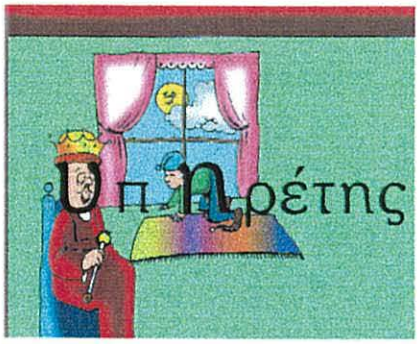



χλωμός (pale)

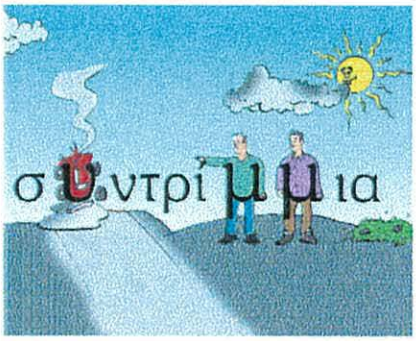
προσευχή (pray)

ταχυδρόμος (post man)

υπήκοος (obedient)



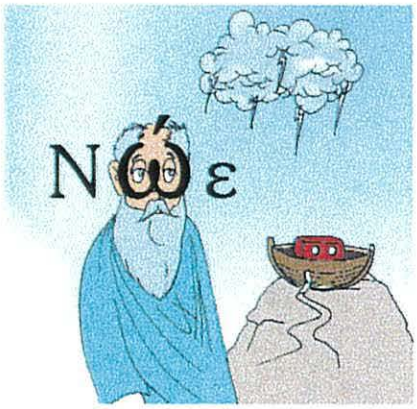

υπηρέτης (server)




συντρίμμια (remains)

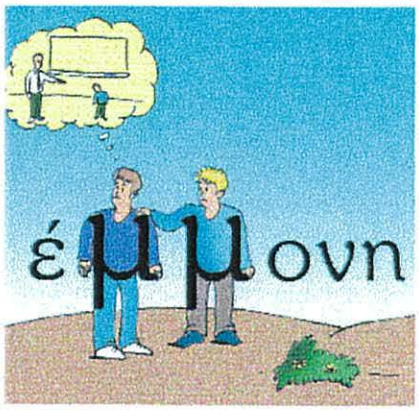
βιασύνη (hurry)

ξηρασία (a dry spell)



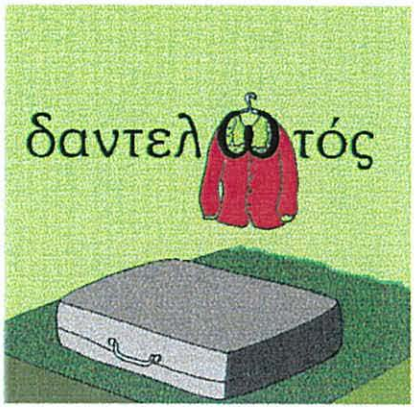

Νώε (Noe)

περιβάλλον (environment)




έμμονη (persistence)

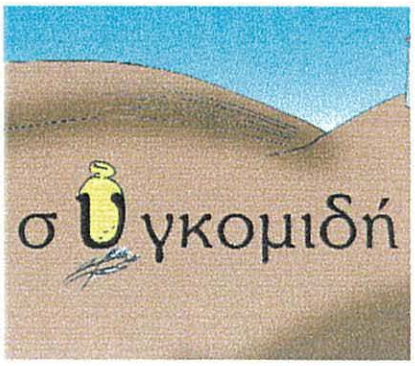
ματαιώνω (cancel)




δαντελωτός (made from lace)

ειδικός (specialist)

βυθός (the bottom of the sea or a lake)

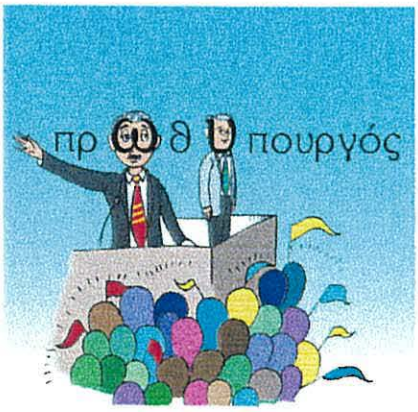



συγκομιδή (gathering)

Σκωτσέζος (Scotish)

σωλήνας (tube)

υπουργός (minister)

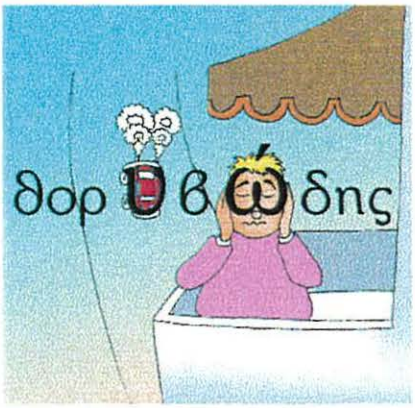



πρωθυπουργός (prime minister)

πολυθρόνα (armchair)

μειονεκτώ (disable)

εμπρησμός (fire-raising)



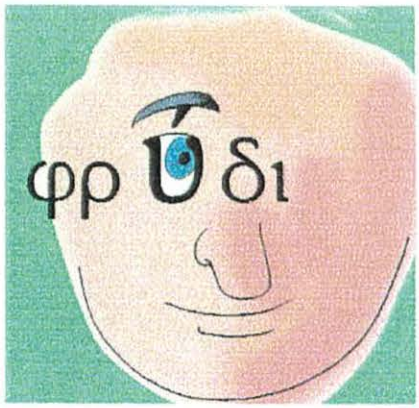

θορυβώδης (noisy)

θύελλα (storm)

καλλυντικά (cosmetics)

καμπύλη (curve)

νηστικός (hungry)




φρύδι (eyebrow)

κλώθω (spin)

μεγαλοπρέπεια (majesty)

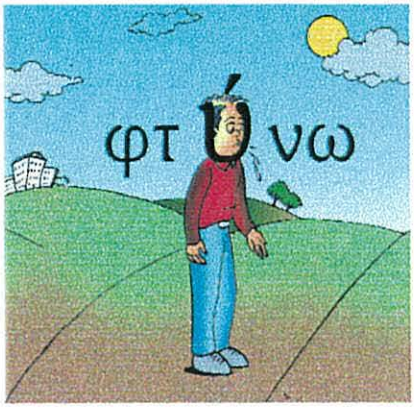
λείψανο (dead person's body)

λεωφορείο (bus)

ψάλλω (chant)

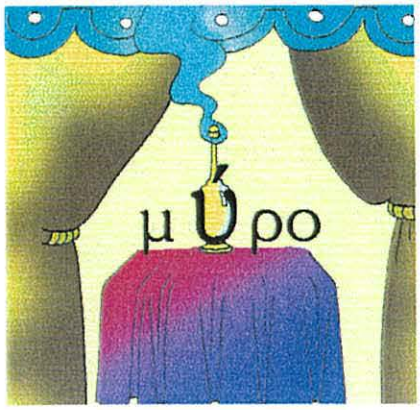
διαφημίζω (advertise)

αναβλύζω (gush)

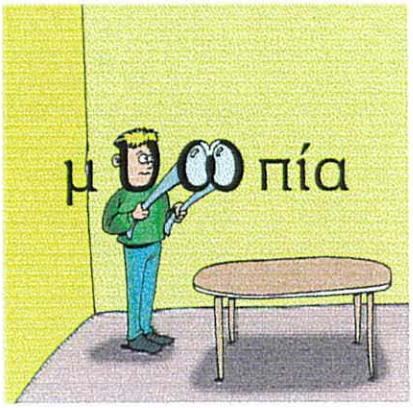



φτύνω (spit)

μαιευτήριο (maternity clinic)

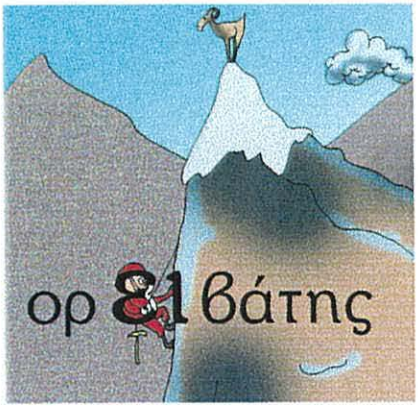



μύρο (aroma)

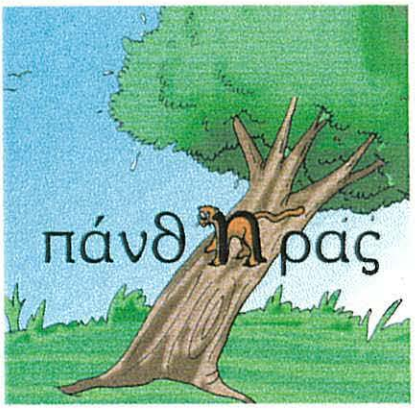



μυωπία (short sight)

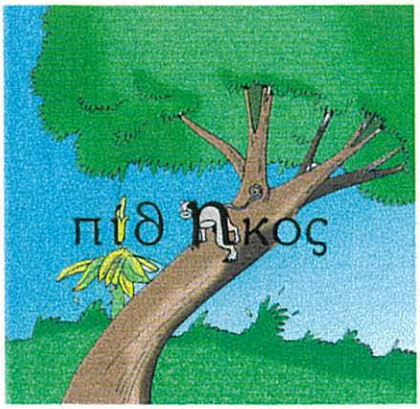
ξυπόλυτος (barefooted)



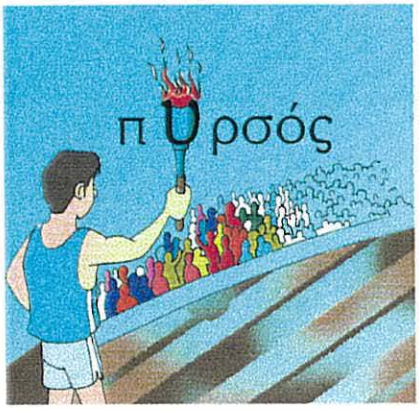

ορειβάτης (mountain climber)



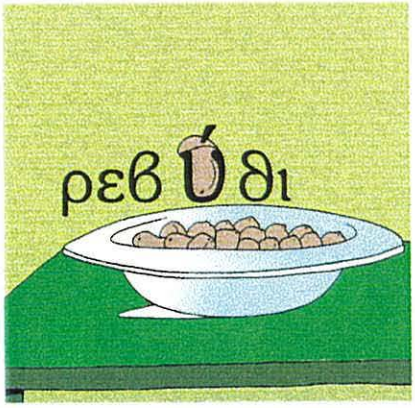

πάνθηρας (panther)




πίθηκος (monkey)



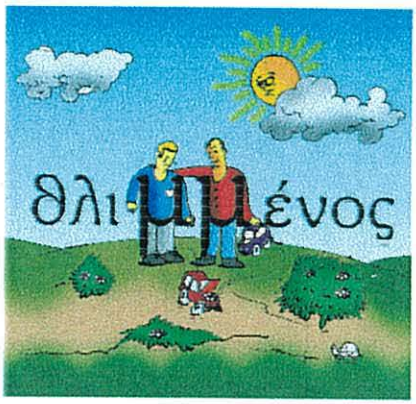

πυρσός (firebrand)



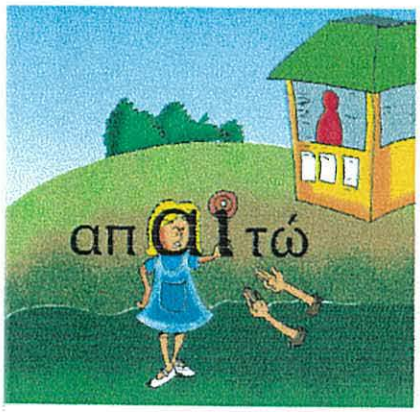

ρεβύθι (chickpea)

αλεξίπτωτο

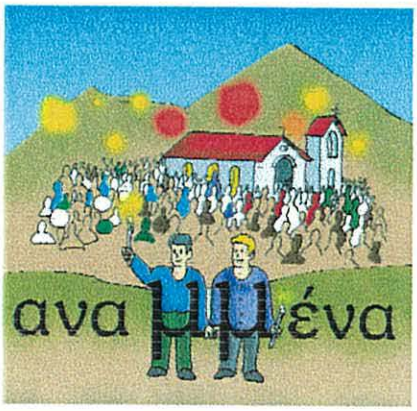
σκαμμένο (digged)




θλιμμένος (sad)




απαιτώ (demand)




αναμμένα (on)

ειρωνία (ivony, sarcasm)

καλλιτέχνης (artist)

μπρούμυτα (face down)