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Evaluation of the discriminating ability of the Greek state foreign language exam (KPG) for English by means of the factorial analysis of correspondences.

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Abstract

The aim of this paper is to investigate the discrimination ability of the KPG English Language Examination Battery of May 2012 -A Level (A1 – A2). The present study proposes a new methodology for evaluating the discriminating ability of the test items.
More specifically, the paper proposes the assessment of the test to be carried out by means of the Factorial Analysis of Correspondences (Analyse Factorielle des Correspondences - AFC). This specific analysis can differentiate the sub-level A1 from that of A2. The more essential target of the study is the identification of the items that differentiate Greek speaking students' level of English Language Competence.
The survey sample consisted of 101 students of Greek state schools from different areas of Greece, who completed the KPG English Language Examination Battery of May 2012 -A Level (A1 – A2). The participants of the research were 6th grade primary school and 1st grade secondary school students. The results confirmed the suitability of the above mentioned methodology.

Keywords: Discriminating ability, item quality, Factorial Analysis of Correspondences, Vacor method.

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1. Introduction

The Greek state certificate for foreign language proficiency known as KPG offers exams in European languages of 'value' to Greek society. The specific exam battery is addressed to people who live, study or work in Greece. The only condition is that they understand the Greek language, as it is used to a limited extent in the exams. This is an instance of its local character, which is combined with its global aspect ('glocal' trait), as it refers to various sociocultural realities and is acknowledged nationally and internationally (Anastasiadou & Tiliakou, 2015).

As it is aligned with the Common European Framework of Reference for Languages it provides for the certification of three levels of language ability.

Level A: Basic User

A1 Beginner

A2 Elementary

Level B: Independent User

B1 Intermediate

B2 Upper Intermediate

Level C: Proficient User

C1 Advanced

C2 Full mastery

The format of the exam is almost identical with the other levels, namely: Module 1: Reading comprehension, Module 2: Writing, Module 3: Listening comprehension, Module 4: Speaking

Module 1 aims at evaluating the test takers' competence in understanding written and multimodal texts. Two Reading Comprehension activities from this module are examined in this research.

Nomenclature

Discriminating ability: to what extent the item captures the range of individual activities	
AFC	Analyse Factorielle des Correspondences
$COR_j(i)$	Correlation
CTR	Contribution

1.1. Theoretical framework

As with any language test, for reasons of fairness, the quality of the items must be investigated in order for poor items to be reviewed and possibly extracted from the test. Specifically, in this paper the discriminating ability of items is being checked. Discrimination is a fundamental property of language tests in their attempt to capture the range of individual abilities. On that basis, the more widely discriminating the test, the better it is (Davies, 1999). The quality of individual items is also imperative

for the validity of a test. Therefore, it is very important to determine to what extent each item contributed at discriminating against candidates based on their mastery of reading skills in this particular case, or the general linguistic knowledge which these activities assess (Tsopanoglou, 2010). If high achieving students correctly answer the more demanding items, as expected, then their linguistic aptitude is properly assessed. If they give the wrong answer to an item that low achieving test takers answer correctly, then this item performs poorly in assessing levels of linguistic competence. This is a problem, as each item that does not contribute effectively to the test purpose lowers its validity (Lado, 1961: 342,350).

1.2. Aims of the Research

The aim of this paper is to investigate the discrimination ability of the KPG English Language Examination Battery of May 2012 -A Level (A1 – A2 according to the Common European Frame of Reference). The overriding target is to differentiate level A1 from level A2. The underlying goal of the paper is to locate those items that differentiate the level of language ability of the students. The present study proposes a new methodology for evaluating the discriminating ability of the test items. More specifically, the paper proposes that the assessment of the test is carried out by means of the Factorial Analysis of Correspondences (Analyse Factorielle des Correspondences - AFC). This specific analysis can differentiate the sub-level A1 from A2.

1.3. Sample

The sample of this research consisted of 101 students, who completed the A level English Language Greek State Certificate (KPG) of May 2012. The candidates were 12-13 years old, 6th grade primary school and 1st grade secondary school students. The students were from northern as well as southern regions of Greece, and came from different backgrounds.

1.4. The A level KPG test of May 2012

This test included 20 activities in total. The oral exam was not examined as it touches on different issues compared to the rest of the exam battery, which is more explicit and measurable. Out of the 20 activities, 11 are reading comprehension tasks, 4 activities assess writing production and the last 5 are listening comprehension exercises. Specifically, the eighth and ninth task of the Reading Comprehension will be investigated in the present paper.

Activity 8: This is a closed type task, where the candidate must match the questions of the interview with the answers. The interviewee is a Robotics Professor talking about Asimo, a very special robot (Figure 1).

Concerning the coding of the items for the statistical process of data, item 33, which refers to what Asimo is, is coded as RC8.1. Item 34, which refers to how special Asimo is, corresponds to RC8.2. Item 35, which asks how easy the Asimo project was, corresponds to RC9.3, and item 36, which asks whether Asimo is cheap corresponds to RC8.4.

ACTIVITY 8

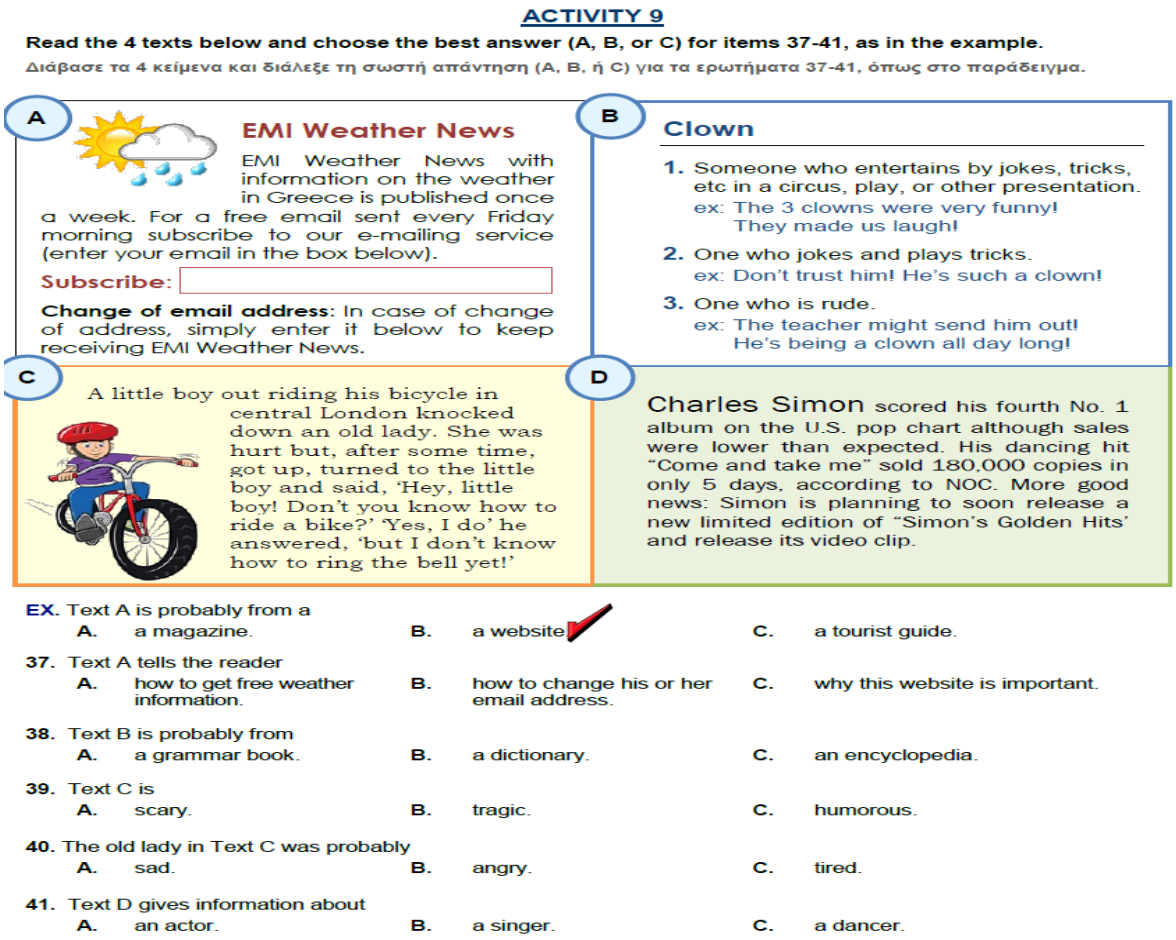
Read an interview on 'ASIMO', a very special robot. Match the interview questions (33-36) with the answers (A-E). There is one answer you do not need.

Διάβασε μια συνέντευξη σχετική με τον 'ASIMO', ένα πολύ ασυνήθιστο ρομπότ. Αντιστοίχισε τις ερωτήσεις της συνέντευξης (33-36) με τις απαντήσεις (A-E). Υπάρχει μια απάντηση την οποία δεν χρειάζεσαι.

Figure 1

Activity 9: This is a multiple choice task of converging production, with 3 options (Figure 2). The test takers are requested to choose the right option in relation to four small texts of informal and informative discourse. Text A is an advertisement about a weather update to be sent to people's e-mails. Text B is a dictionary entry for the word *clown*. Text C is a funny story about a boy on a bike and text D is from the news about a popular singer. Out of the 5 items one refers to text A, one to text B, two to text C and one to text D.

As regards the coding of the items for the statistical process of data, item 37, which refers to what Text A talks about is coded as RC9.1. Item 38, which refers to what type of book text B was extracted from corresponds to RC9.2. Item 39, which characterizes text C corresponds to RC9.3. Item 40, which asks how the old lady felt corresponds to RC9.4, and item 41, which asks who text D is about is coded as RC 9.5.



ACTIVITY 9

Read the 4 texts below and choose the best answer (A, B, or C) for items 37-41, as in the example.

Διάβασε τα 4 κείμενα και διάλεξε τη σωστή απάντηση (A, B, ή C) για τα ερωτήματα 37-41, όπως στο παράδειγμα.

A

EMI Weather News

EMI Weather News with information on the weather in Greece is published once a week. For a free email sent every Friday morning subscribe to our e-mailing service (enter your email in the box below).

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Change of email address: In case of change of address, simply enter it below to keep receiving EMI Weather News.

B

Clown

1. Someone who entertains by jokes, tricks, etc in a circus, play, or other presentation.
   ex: The 3 clowns were very funny! They made us laugh!
2. One who jokes and plays tricks.
   ex: Don't trust him! He's such a clown!
3. One who is rude.
   ex: The teacher might send him out! He's being a clown all day long!

C

A little boy out riding his bicycle in central London knocked down an old lady. She was hurt but, after some time, got up, turned to the little boy and said, 'Hey, little boy! Don't you know how to ride a bike?' 'Yes, I do' he answered, 'but I don't know how to ring the bell yet!'

D

Charles Simon scored his fourth No. 1 album on the U.S. pop chart although sales were lower than expected. His dancing hit "Come and take me" sold 180,000 copies in only 5 days, according to NOC. More good news: Simon is planning to soon release a new limited edition of "Simon's Golden Hits' and release its video clip.

EX. Text A is probably from a
A. a magazine. B. a website C. a tourist guide.

37. Text A tells the reader
A. how to get free weather information. B. how to change his or her email address. C. why this website is important.

38. Text B is probably from
A. a grammar book. B. a dictionary. C. an encyclopedia.

39. Text C is
A. scary. B. tragic. C. humorous.

40. The old lady in Text C was probably
A. sad. B. angry. C. tired.

41. Text D gives information about
A. an actor. B. a singer. C. a dancer.

Figure 2

2. Research Methodology

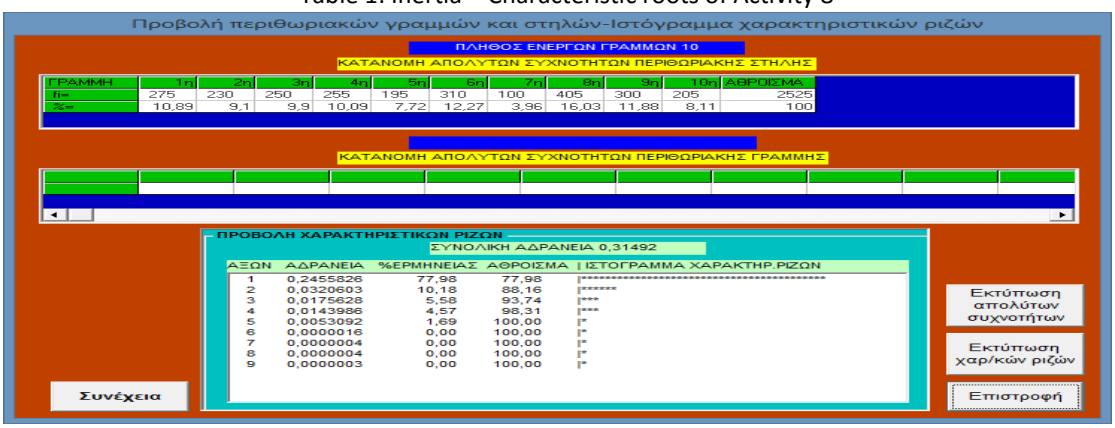
The research data were analysed via Classical Item Analysis and Factorial Analysis of Correspondences (Analyse Factorielle des Correspondences - AFC). By applying the Factorial Analysis of Correspondences, we achieve an almost global description of the situation aided by a lower number of new composite independent variables, the so-called factors. The factors, which take the

form of axes, vertical in two, are the factorial axes and are created from the composition of groups of initial variables, resulting in a more revealing search of relationships among variables-items in our case. The interpretation of the findings of the Factorial Analysis of Correspondences takes place in the first factorial planes, those namely, which are created by the factorial axes based on the rates of characteristic values λ_κ , where $k = 1,2,3,4,..$ for every axis, with values between 0 and 1. The results of Factorial Analysis of Correspondences, extracted with MAD software (Karapistolis, 2014), are interpreted via inertia, which every factorial axis (criterion 1) explains, and finally, via correlation (Cor) and contribution (Ctr). These indices allow us to immediately discern the most significant and determining variables or objects, contributing to the creation of factorial axes. Values $Cor \geq 200$ (criterion 2) and Ctr≥1000/numbers of variables (criterion 3) are considered satisfactory (Karapistolis, 2014).

3. Results of the Factorial Analysis of Correspondences (Analyse Factorielle des Correspondences – AFC).

Activity 8: The analysis of the table of data via AFC gives initially table 1, which shows the characteristic values of Burt table, as well as the inertia percentages of each factorial axis. Table 2 allows us to distinguish the amount of the principal factorial axes, which are the most suitable in interpreting the results. The inertia percentage of each factorial axis offers the ability to know the percentage of importance each axis conveys (criterion 1). According to the rates accompanied by the histogram (Table 2) the percentage of importance of the first factorial axis is 77.98%; of the second it is 10.18%; of the third it is 5.58%; and of the fourth it is 4.57%, and 1.69% is the percentage of the fifth factorial axis. The totality of information provided by the first five factorial axes, amounts to 100%. In the following table, we can see the sum of information offered by the first five factorial axes.

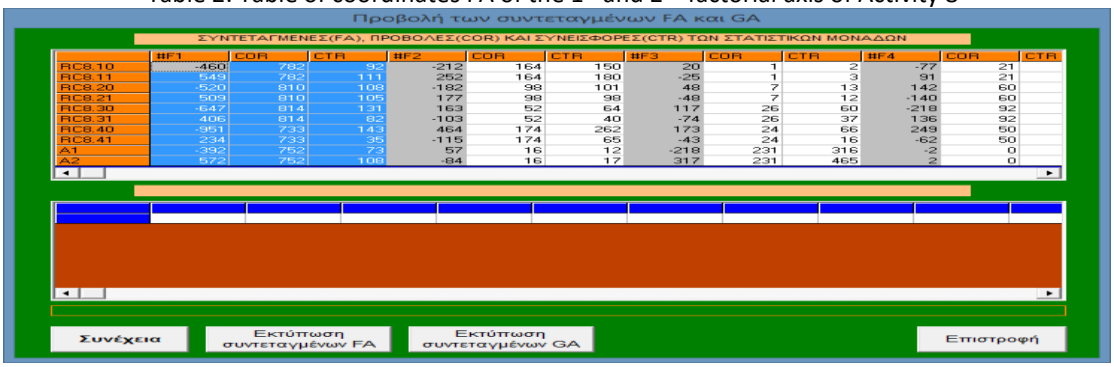
Table 1: Inertia – Characteristic roots of Activity 8



Based on the cumulative frequency, the first two factorial axes interpret 86.98% of the total variance of data (Table 1). This percentage is considered satisfactory for data interpretation. Then, from the table of results of the factorial correspondence analysis, and according to the above mentioned selected criteria (inertia, correlation and contribution), we detect the variables contributing to the formation of the first two factorial axes.

The variables, which were deemed most significant for the extracted factorial axes according to the two criteria: correlation ($Cor \geq 200$, criterion 2) and contribution (Ctr≥1000/numbers of variables, criterion 3) are presented in detail as follows (Table 2).

Table 2: Table of coordinates FA of the 1st and 2nd factorial axis of Activity 8



	#F1	COR	CTR	#F2	COR	CTR	#F3	COR	CTR	#F4	COR	CTR
RC8.10	-460	782	92	-212	164	150	20	1	2	-77	21	
RC8.11	549	782	111	252	164	180	-25	1	3	91	21	
RC8.20	-520	810	108	-182	98	101	48	7	13	142	60	
RC8.21	509	810	105	177	98	98	-48	7	12	-140	60	
RC8.30	-647	814	131	163	52	64	117	26	60	-218	92	
RC8.31	406	814	82	-103	52	40	-74	26	37	136	92	
RC8.40	-951	733	143	464	174	262	173	24	66	-249	50	
RC8.41	234	733	35	-115	174	65	-43	24	16	-62	50	
A1	-392	752	73	57	16	12	-218	231	316	-2	0	
A2	572	752	108	-84	16	17	317	231	465	2	0	

Interpretation of the first factorial axis e_1: More specifically, based on the answers of the test takers, and as it derived from the factorial analysis, the first axis – factor e1, with eigenvalue 0.2455826 explaining 77.98% of total variance, is constructed from classes RC8.10, RC8.11, RC8.20, RC8.21, RC8.30, RC8.31, RC8.40 and RC8.42. In fact, the first factorial axis e_1 is formed by those variable classes projecting the ability of the examinees as they appear in Activity 8 (Figure 3).

Moving further on the axis from left to right we note the gradation of the respondents' performance. At the beginning we observe low ability of the testees, that is students whose ability is of A1 level (Cor=752, Ctr=73), regarding their wrong answer to whether Asimo is cheap (RC8.40) (Cor=733, Ctr=143), how easy the Asimo project was (RC8.30) (Cor=814, Ctr=131), how special Asimo was (RC8.20) (Cor=810, Ctr=108), and finally what exactly is Asimo (RC8.10) (Cor=782, Ctr=92). In the opposite extreme of the axis we detect high language ability of the examinees, that is students who were categorized as A2 level (Cor=752, Ctr=108), regarding their right answer to is Asimo cheap (RC8.41) (Cor=733, Ctr=35), how easy was the Asimo project (RC8.31) (Cor=814, Ctr=82), how special Asimo was (RC8.21) (Cor=810, Ctr=105), and what exactly is Asimo (RC8.11) (Cor=782, Ctr=111) (Table).

In greater detail, on the left of the first factorial axis we perceive the classes establishing the quite unsuccessful response of the test takers concerning the matching of questions with their respective answers. On the other hand, on the right of the first factorial axis are the classes determining the quite successful response of the examinees in Activity 8, and especially items RC8.1, RC8.2, RC8.3 and RC8.4.

Thus, we can assume that the first axis expresses a new composite variable, which defines the ability (high- low) of the testees in Activity 8. Accordingly, we can conclude that the first axis expresses a new composite variable, which determines the differentiation of students of level A1 and A2 regarding Activity 8 and items RC8.1, RC8.2, RC8.3 and RC8.4.

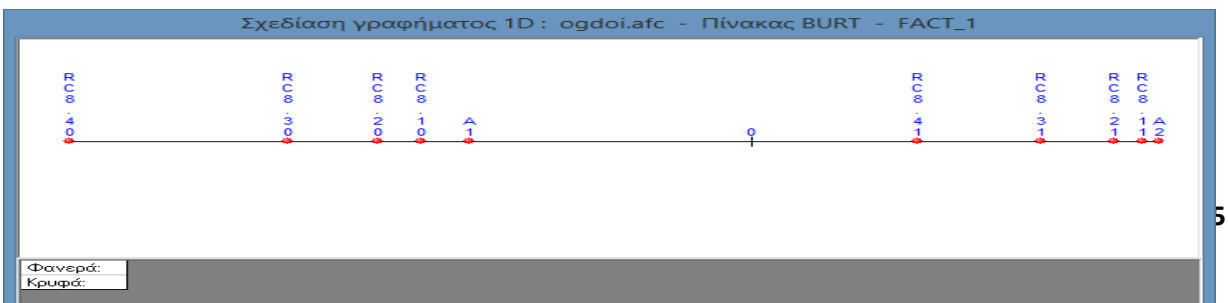


Figure 3: Factorial axis e_1 of Activity 8

Interpretation of the second factorial axis e_2*:* The variables, which are more important for the second factorial axis as regards Activity 8 according to the two criteria: inertia and contribution, are thoroughly exhibited on the following Figure (Figure 4). In fact, based on the examinees' responses, and as it stems from the factorial analysis, the second axis-factor e_2 with eigenvalue 0.0320603 explaining 10.18% of total variance is composed from classes RC8.10, RC8.20, RC8.30, RC8.40, RC8.11, RC8.21, RC8.31, RC8.41, A1 and A2.

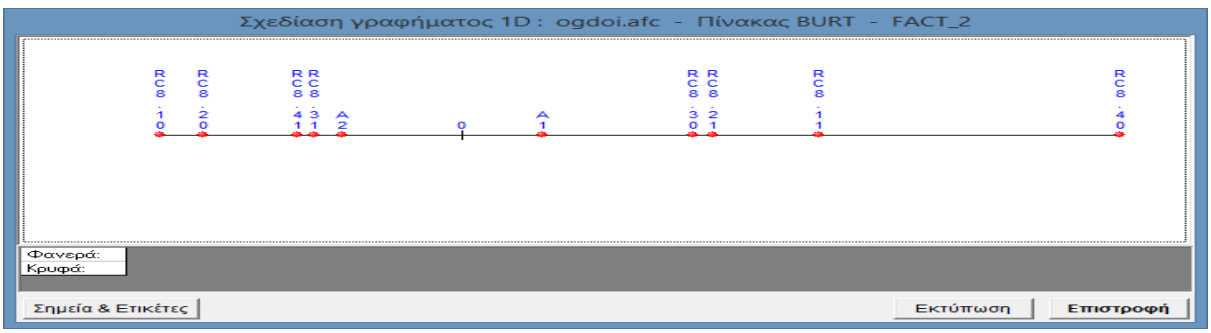


Figure 4: Factorial axis e_2 of Activity 8

Moving further on the axis from left to right we observe the gradation of the testees' performance. First we notice their wrong answer about what exactly is Asimo (RC8.10) (Cor=164, Ctr=150), how special Asimo was (RC8.20) (Cor=98, Ctr=101), and their correct answer to how easy the Asimo project was (RC8.31) (Cor=52, Ctr=40), or whether Asimo is cheap (RC8.41) (Cor=174, Ctr=65). On the right of the second factorial axis the examinees who answered incorrectly how easy Asimo project was, are positioned (RC8.30) (Cor=52, Ctr=64), while we find the testees, who answered correctly how special Asimo was (RC8.21) (Cor=98, Ctr=98), what exactly is Asimo (RC8.11), and incorrectly whether Asimo is cheap (RC8.40) (Cor=174, Ctr=65). These are level A2 students.

First factorial plane $e_1 \times e_2$. The variables, which are more important for the first factorial level $e_1 \times e_2$ as regards Activity 8, according to the criteria inertia and contribution, are thoroughly presented in the next Figure (Figure 3).

The first factorial plane $e_1 \times e_2$ interprets (Figure 5) 88.16% of total inertia – information, a particularly satisfactory percentage. The first factorial axis contrasts the extreme cases, while the second the middle ones.

In the first factorial plane on the left, and between the second (e_1-, e_2+) and third quadrant (e_1-, e_2-) we notice the unsuccessful response of test takers to items RC8.4, RC8.3, RC8.2 and RC8.1. Classes RC8.40, RC8.30, RC8.20 and RC8.10, which define the lowest classification level in the KPG exam, level A1, are therefore ranked in that level.

On the first factorial plane, on the right and between the first (e_1+, e_2+) and fourth quadrant (e_1+, e_2-) we meet the higher language skills of the examinees, of level A2 that is, and the classes of items RC8.11, RC8.21, RC8.31 **και I DO NOT UNDERSTAND THIS** RC8.4. This means that the students, who were finally ranked in level A2 answered items RC8.1, RC8.2, RC8.3 and RC8.4 correctly.

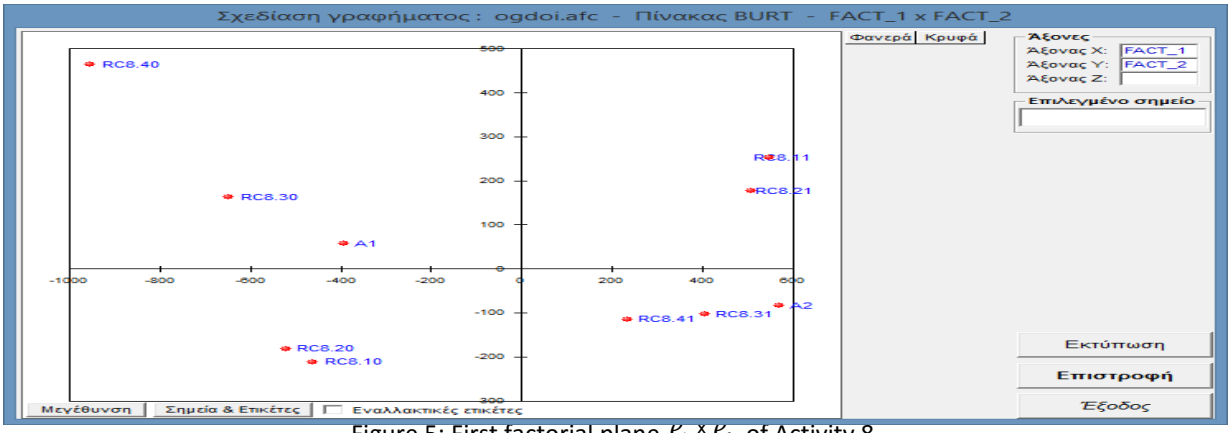
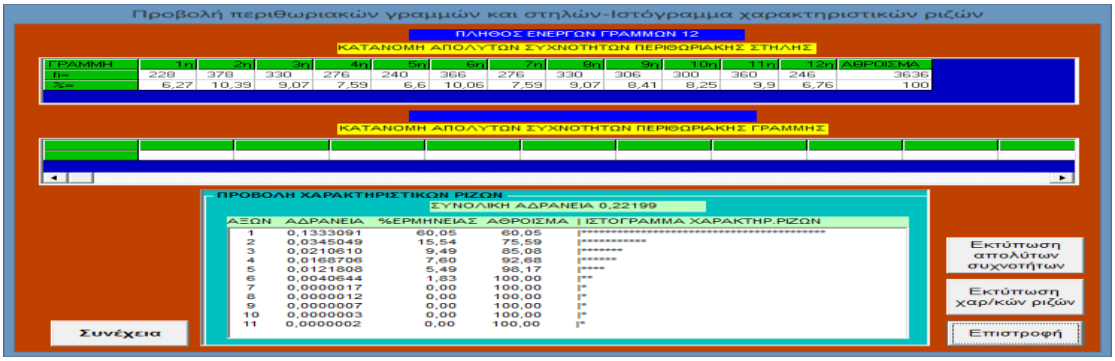


Figure 5: First factorial plane $e_1 \times e_2$ of Activity 8

Activity 9: The analysis of the table of data with AFC yields initially table 3, which presents the characteristic values of Burt table as well as the inertia percentages of each factorial axis. Table 3 allows us to discern the number of the principal factorial axes, which are the most suitable for the interpretation of the results. The inertia percentage of the factorial axis permits us to know the percentage of importance each axis conveys (criterion 1).

According to the values, which are accompanied by the histogram (Table 4), the percentage of importance of the first factorial axis is 60.05%, of the second it is 15.54%, of the third it is 9.49%, of the fourth it is 7.60%, 5.49% is the percentage of the fifth and 1.83% of the sixth factorial axis. The totality of information, provided by the first 6 factorial axes, amounts to 100%. This information appears in the following table.

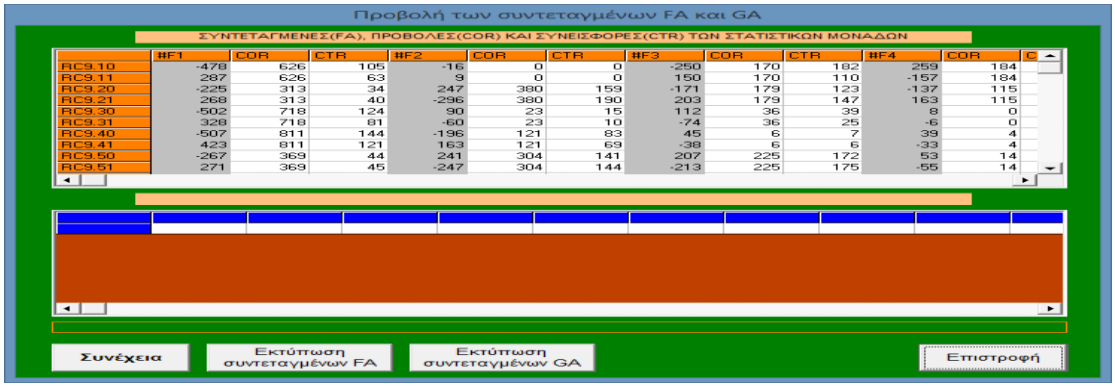
Table 3**:** Inertia – Characteristic roots of Activity 9



Based on accumulative frequency the two first factorial axes read 86.98% of total variance of the data (Table 3). This percentage is considered adequate to interpret the data. Afterwards, from table 4 of the results of the factorial analysis of correspondences, and according to the above mentioned selected criteria (inertia, correlation and contribution), we detect the variables contributing to the formation of the first two factorial axes.

The variables of highest importance for the extracted factorial axes according to the criteria correlation ($Cor \geq 200$, criterion 2) and contribution ($Ctr \geq \frac{1000}{12} \approx 83{,}3 \approx 84$, criterion 3) are displayed in detail below (Table 4).

Table 4: Table of FA coordinates of the 1st and 2nd factorial axis of Activity 9



Interpretation of the first factorial axis e_1: More specifically, based on the responses of the examinees, and as it occurred in the factorial analysis, the first axis-factor e_1, with eigenvalue 0.1333091, which explains 60.05% of total variance, is composed by classes RC9.40, RC9.30, RC9.20, RC9.50, RC9.20, A1, RC9.21, RC9.51, RC9.31, and RC8.41, A2 (Figure 6).

More specifically, the first factorial axis e_1 is constructed by those classes of variables that project the language ability of examined students, and which refer to Activity 9. At the beginning we observe the failure of the test takers who were classified in level A1. In particular, on the left side of the first factorial axis we note the candidates classified as A1 (Cor=789, Ctr=69), and answer wrongly regarding the feelings of the old lady in text C (RC9.40) (Cor=811, Ctr=144), or what kind of text is text C (RC9.30) (Cor=718, Ctr=81), and what text A talks about (RC9.10) (Cor=626, Ctr=105).

On the right of the first factorial axis, the item classes of the first factorial axis are gathered, which denote candidates' success in the items of Activity 9. In fact, on the right side of the first factorial axis we note the high linguistic ability of candidates since they are categorized as level A2 (Cor=789, Ctr=152), regarding their correct answers, not only in the question on what text A says (RC9.11) (Cor=626, Ctr=63), but also what kind of text is C (RC9.31) (Cor=718, Ctr=81), and finally what feelings was the old lady experiencing in text C (RC9.41) (Cor=811, Ctr=121).

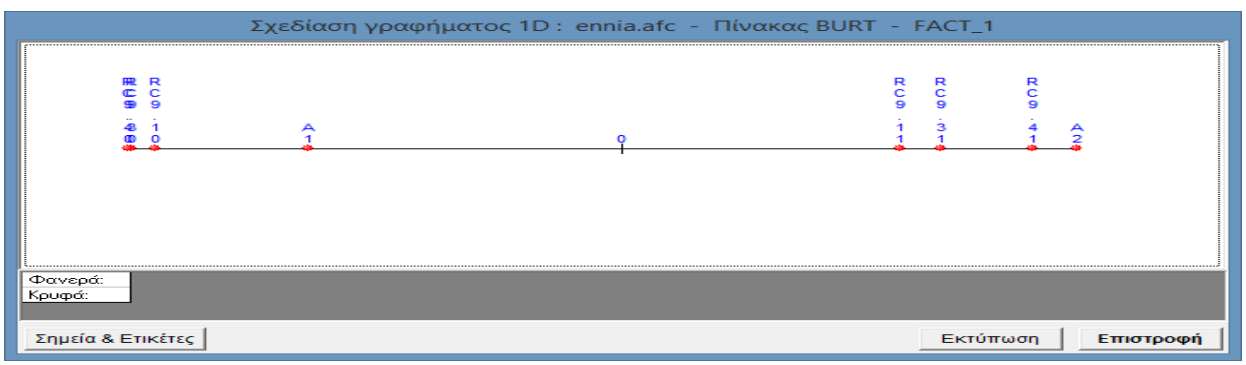


Figure 6: Factorial axis e_1 of Activity 9

More explicitly, on the left of the first factorial axis are the classes defining the totally unsuccessful response of the candidates as regards text comprehension. Conversely, on the right of the first factorial axis we observe the classes defining the completely successful response of the examinees to the specific reading comprehension activity and items RC9.1, RC9.2, RC9.3, RC9.4 and RC9.5 (Figure 4).

Interpretation of the second factorial axis e_2: The variables, which are most important for the second factorial axis referring to Activity 9, according to the criteria inertia and contribution, are thoroughly presented in the following table (Table 4). In greater detail, the examinees' responses together with the factorial analysis yielded the second axis-factor e_2, with eigenvalue 0.0469329,

which explains 21.11% of total variance and is composed of classes RC3.20, RC3.21, RC3.30 and RC3.31 (Figure 7).

Observing the axis from left to right we understand the gradation of the candidates' responses. Initially, we see the examinees who correctly answered where text B came from (RC9.21) (Cor=380, Ctr=190) and what information text D offers (RC9.51) (Cor=304, Ctr=144). On the right we see the candidates who incorrectly answered what information text D offers (RC9.50) (Cor=304, Ctr=141) and where text B was from (RC9.20) (Cor=380, Ctr=159).

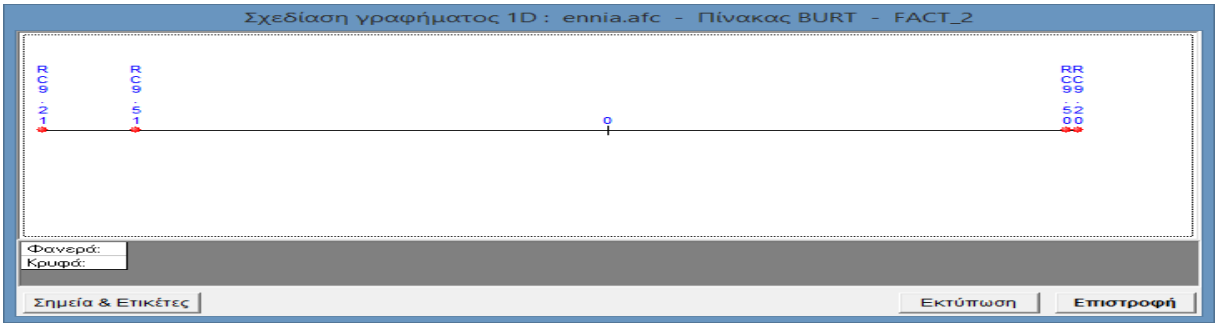


Figure 7: Factorial axis e_2 of Activity 9

More specifically, on the left side of the first factorial axis we find the classes defining the failed answer of the test takers regarding reading comprehension. In contrast, on the right of the first factorial axis are the classes designating the successful responses of candidates to the particular reading comprehension activity and items RC9.1, RC9.2, RC9.3, RC9.4 and RC9.5.

First factorial level $e_1 \times e_2$**.** The above mentioned level interprets (Figure 8) 77.33% of total inertia – information, a quite satisfactory percentage.

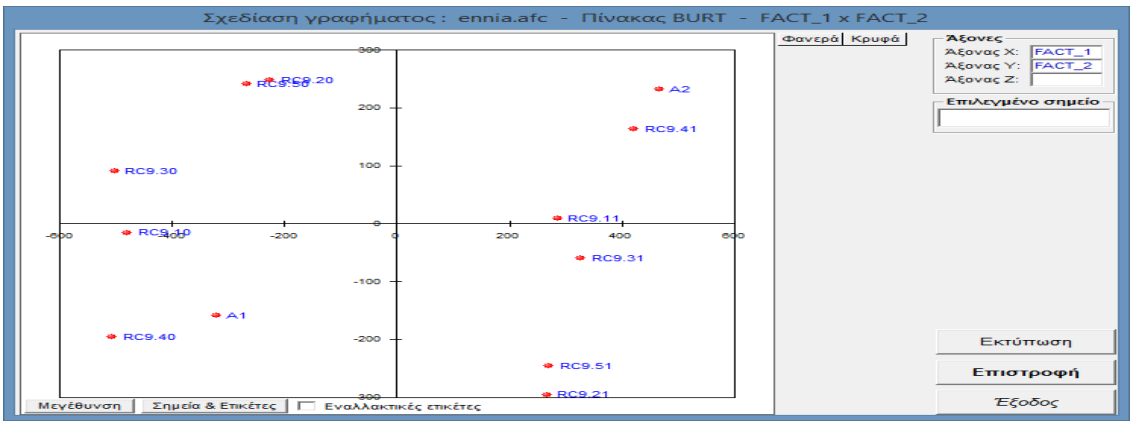


Figure 8: First factorial plane $e_1 \times e_2$ of Activity 9

The above mentioned level interprets (Figure 6) 77.33% of total inertia – information, a quite satisfactory percentage. The first factorial axis presents the extreme cases, while the second the middle ones. On the first factorial axis on the left, and between the second (e_1+, e_2-) and third quadrant (e_1-, e_2-) we find the low linguistic level (A1) item classes RC9.40, RC9.10, RC9.30, RC9.50 and RC9.20. Consequently, the students who were finally classified as A1 level did not correctly answer items RC9.4, RC9.1, RC9.3, RC3.5 and RC9.2.

On the first factorial axis, on the right, and between the first (e_1+, e_2+) and fourth quadrant (e_1+, e_2-) we find the high linguistic skills of candidates of level A2 and the items classes RC9.41,

RC9.31, RC9.11, RC9.51 and RC9.21. This means that the examinees finally classified in level A2 successfully answered items RC9.4, RC9.3, RC9.1, RC5.1 and RC9.

4. Conclusions

The validity and control of discriminating ability of the Greek State Foreign Language Certificate, was instituted in 1999 and is known by the acronym KPG. This aims to ensure that this qualification is a suitably objective tool that can measure the level of language awareness, and that the difficulty of the exam does not differ from one administration to the next. Factorial Correspondence Analysis is a very important method of evaluating the validity, fairness and discriminating ability of the language certificates.

The present research investigated the above mentioned properties of the May 2012 KPG in English at levels A1/2, with particular reference to Reading Comprehension by means of the Factorial Analysis of Correspondences. In total, 101 students of a 6th grade primary school and a 1st grade secondary school took part in the research. In the present paper, two activities (activities 8 and 9) were thoroughly studied out of the eleven activities of the Reading Comprehension section.

In particular, the results of the research showed that items RC8.1, RC8.2, RC8.3 and RC8.4 of Activity 8 could differentiate between 'high' and 'low' achieving candidates and consequently they do not need revision.

Activity 9, however, is relatively problematic concerning the discrimination ability of all its items. Items RC9.5 and RC9.2 could not differentiate 'good' from 'bad' test takers and needs to be reviewed.

In conclusion, there are items that need to be reviewed so that difficulty and discriminating ability are ensured. It is very important to undertake further research into new and larger samples and other minority populations, and to study the impact of demographics on student achievement.

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