SCHOOL CLIMATE AND STUDENT ACHIEVEMENT IN GREEK HIGHER SECONDARY SCHOOLS (*ENIAIA LYKEIA*): A HIERARCHICAL STATISTICAL ANALYSIS

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Abstract – *This paper examines the relation between the academic achievement of Greek 'eniaio lykeio' students and their teachers' views of school climate. It has been found that this relation, important as it may be, is being obscured by other factors found in the organisational and social domain. 'Eniaio lykeio' (EL) is the Greek comprehensive higher secondary school which was established in 1998 by the latest educational law. Initially the authors discuss the main characteristics of the Greek school system, emphasizing on special issues like the shadow educational system of 'parapaideia'. The issue of 'school climate' is then approached in its historical development both from an organizational and a psychological perspective. In terms of research design 223 teachers from 38 Athenian 'eniaia lykeia' participated and completed the Confidential Teacher Questionnaire. Exploratory Factor Analysis (GLS, oblimin) yielded the following five factors: (a) director's effectiveness, (b) self-regulation, (c) collegiality, (d) job satisfaction, and (e) keenness. These factors have had small impact on students' achievement (normalised mean grade in the EL leaving certificate) as the impact of parents' socioeconomic status is much larger. Finally the hierarchical linear analysis yielded a very small value for the intra-school correlation coefficient ($\rho = 0.025$).*

Introduction

The purpose of this study is firstly to identify aspects of school climate in Greek schools and secondly to measure the association of climate factors with students' academic achievement. By 'academic achievement' we refer to the final grade in the leaving certificate of *eniaio lykeio*, the comprehensive higher secondary school which was established in 1999. The main questions in the study are:

- Do teachers' opinions and beliefs constitute broader theoretical constructs of school climate?
- Are factors of school climate significantly correlated with students' academic achievement?

The idea of investigating the relation of school climate to student achievement was initiated by readings in the academic field of School Effectiveness Research (SER). Many researchers who have worked within the SER tradition have noted the contribution that teachers' opinions have made to the 'effectiveness' of the schools (see Scheerens, 1990; Levine & Lezotte, 1990; Sammons *et al*., 1995; Cotton, 1995, and Reynolds *et al*., 1996). A standard methodological practice in many similar studies is to use teachers as informants about the schools in which they participate. Researchers usually ask teachers a series of questions and teachers' responses to interrelated items are combined to yield a scale for each teacher on one or more dimensions or factors. Teachers' answers then form larger interpretative frameworks and that is how notions such as 'school climate', 'school ethos', and 'school organisational culture' have been constructed in the literature.

Historically the search for school climate reached its heyday in the 1950s. After the Second World War educators and economists all over the world had hoped that education could become the tool for economic prosperity and equity. For many decades 'school climate' was approached from a 'systemic' or an 'organisational' perspective. This was quite logical. After all, in the 1950s and at the beginning of the 1960s, schools were considered to be 'input-output' systems. Thus, in the first decades after the Second World War educational researchers produced school climate questionnaires (Boyan, 1988).

During the 1970s the interest in school climate came from social psychologists. At that time school climate was studied not as a means but as a goal in itself. Schools needed to be democratic and attractive. In practice school climate was being approached by various researchers either qualitatively, i.e. with 'thick description' or quantitatively, i.e. with the use of statistics. In both cases the researchers used to enter the 'field' – the school – by approaching the teaching personnel and seeking individual opinions. Different researchers constructed different research instruments. This resulted in serious fragmentation of the notion of school climate.

Nowadays, discrepancies in research findings on school climate are rather the rule than the exception. For Hallinger & Heck (1998) this may be explained by the fact that different researchers employ different conceptual and methodological tools. Anderson (1982) distinguished the four following aspects of school climate research in the literature:

(a) *ecology* (the physical and material environment of the school)
(b) *milieu* (the composition of the population of a school)
(c) *social system* (relationships between individuals) and
(d) *culture* (beliefs and values of the individuals in a school).

The theme of the current study falls in the third and fourth aspects in Anderson's list: the beliefs and values of teachers as well as the relations between them. Before proceeding with our own research findings we must present some key elements of the Greek educational system.

The background of the Greek high school system

The structure of the Greek school system is relatively simple and linear. Its compulsory part consists of six years of primary school (*demotiko scholeio*), followed by a three-year comprehensive lower secondary school (*gymnasio*) After *gymnasio*, most Greek students continue their studies to the higher secondary school, the *lykeio*. Until 1998 there were five types of *lykeia*. Since 1998, however, as a result of the Law 2525 of 1997, almost all types of *lykeia* have become *eniaia* i.e. comprehensive. One of the most important characteristics of an *eniaio lykeio* is that it comprises three programmes or 'directions' of studies (the *katefthinseis*): the 'humanities' direction, the 'scientific' direction, and the 'technical' direction. *Eniaio lykeio* students attend a number of common core subjects and a number of 'direction' subjects.

In the latest OECD report on Greek education (1997) a number of basic features of the system have been identified. Firstly, Greek education serves a traditional highly homogeneous society, sustained by its deep-rooted Hellenic and Byzantine traditions, by a cohesive, state-supported religion, and by strong family solidarity. Secondly, education in Greece operates within a context of great geographical contrasts and variety, with corresponding differences in the distribution of population between urban and rural areas, as well as great socio-economic differences between these two areas. School building space in cities is hard to find, and schools in rural areas are regarded as functioning at high cost. Thirdly, education in Greece has never been connected with the world of work. This is because by serving a traditionally agricultural country the Greek economy has shifted rapidly from the primary production sector to a secondary and tertiary level. Fourthly, education in Greece is extremely politicised. Politicisation is logically a characteristic of centralised education systems because teachers and administrators are directly accountable to the governments. Few other countries have experienced the extent of educational discontinuities that Greece has suffered as a result of political turmoil in the post War period.

Another important characteristic of the Greek education system is the existence of the parallel or 'shadow' education system. This can take either the form of a *frontisterion* or of an *idiaitero*. By *frontisterio* we refer to the lessons that take place in an organised way in specially equipped buildings. *Frontisteria* target groups of

students and offer extra help with everything that is being taught in schools during the day. Most *frontisteria* have been recognised by the Ministry of Education. On the other hand, *idiaitera* are the private lessons that take place in students' homes on a one-to-one basis. An *idiaitero* is usually a covert activity and no receipts are issued. For a normal teacher to offer private lessons to the students of his or her class is strictly prohibited. However, there is essentially no control on the part of the Ministry of Education with regard to this activity and no teacher has ever suffered any serious consequences as a result of offering *idiaitero* lessons (Verdis, 2002).

In terms of background and working conditions secondary school teachers in Greece are subject specialists with very little pedagogical training. Until recently they were appointed to schools through an official waiting list, known as *epetirida*, which was based on seniority. In 1998, however, objective and centrally steered selection examinations replaced *epetirida*. This policy met with strong resistance from those close to be appointed. After appointment Greek teachers become civil servants. Their posts are secured after two years' work in their 'organisational post'. Teachers are not allowed to have any other occupation apart from teaching. Their promotion and salary progression is essentially dependent on seniority as there is no evaluation of their work in the schools. Seniority has also been the most important criterion for the selection of education administrators and school consultants. This is supposed to have changed lately with the introduction of objective selection criteria. However, political considerations have always played a large role in the appointment of administrative personnel at the national, regional, and local level (including the school level). Usually, any change in government leads to a massive replacement of school directors, school consultants and other administrative personnel in education.

In terms of administration the Greek educational system has always been centralised and bureaucratically organised. All decisions pertaining to curricula, textbooks, school timetables, the appointment, salaries and promotion of teachers, the establishment, equipment and operation of the schools, are made by the Ministry of Education and are uniformly introduced into all the schools. The issues that are left undefined by the Ministry of Education are settled at regional and local level by teachers themselves in a democratic way. However, as Kassotakis (2000) and Kazamias (1995) point out, Greek teachers' have only limited discretion on what to teach and how to teach it. This is more evident in the third year of *lykeio*, when teachers and students together focus their attention to the final examinations.

Officially Greek schools are governed by their teachers' association. Decisions regarding the security of the students, the organisation of the classes, the rules, the educational visits, and the participation in extra-curricular activities are taken democratically by voting. The school council and the school committee, two bodies which include parents, deal with a number of issues not of essential

importance, the most important of these being the allocation of some of the resources at local and regional level. Through these two bodies parents have a minor role to play in the administration of the schools. In higher secondary schools there is a director and a deputy director, both of whom are appointed by the regional education councils with a number of objective criteria. The director and the deputy director are ordinary teachers with no special training in educational administration. Until recently their payment had not differed significantly from the payment of their colleagues who have no administrative tasks. Until today the directors' small administrative role has been restricted both by the higher levels (the powerful Ministry of Education) and the lower levels (the vote of the teachers' association within each school). It is thus evident that collegiality among teachers is a very important issue with regard the administration of the Greek schools.

In terms of educational evaluation and the assessment the Greek educational system has currently no monitoring mechanisms. School inspections are not being carried out and there are no agreed educational standards to be achieved. School inspectors were abolished in the early 1980s and the school consultants who replaced them have never had any evaluational authority over teachers and schools. Only recently a number of objective 'indicators' for the evaluation of teachers were introduced by the Greek Pedagogical Institute and voted in by Parliament. However, these indicators have not yet been implemented.

An additional but not valid source of information for the quality of the Greek education system are the 'bases' i.e. the necessary lower grades for university entrance. The bases are published every year in the pages of quality newspapers. In the final year of *lykeio* (around their 18th year), Greek students take the national examinations (*paneladikes exetasis*) which have a double function in Greece: both certification and selection. Regarding certification, students' mean grade is used as their final mark in the certificate of the *eniaio lykeio*. Regarding selection, students' grades in the common core and directional subjects are differentially weighted for different sets of academic fields and transformed into a final score (usually from 0 to 200). The formula for the calculation of the final score as well as the weights of the common and directional subjects usually change as a result of changes in educational policy. The issue of grading for university entrance, important as it may be, is beyond the scope of the current study.

School climate and student achievement in the literature

Teachers opinions have in many cases been associated with student achievement. In a relevant study, Heck & Marcoulides (1996) examined in the field of education the relevance of an organisational culture model that had been

developed and validated by the same authors three years before (Marcoulides & Heck, 1993). Heck & Marcoulides (1996) collected data from 156 teachers which had been previously selected at random from 26 secondary schools in Singapore. The authors designed a questionnaire through which they measured 42 strategic interactions between principals and teachers, focusing on how the school was structured and governed, how it was organised instructionally, and how teachers perceived elements of its culture and climate. The Confirmatory Factor Analysis (LISREL) resulted in a model which fitted well with the data. Personal and school level variables, like gender, teaching experience, academic background, and school size and type were not included. The authors (*op. cit.*) stated that 'how school staff and parents are able to organise and co-ordinate the work life of the school … shapes not only the learning experiences and achievement of the students, but also the environment in which this work is carried out' (p. 77). The school outcomes which were used as a measure of school performance in Heck's & Marcoulides' (1996) study were the national standardised tests for Reading and Mathematics. The other Factors in the model were arranged by the authors in three groups: (a) the *socio-cultural subsystem*, which includes the organisational structure and the managerial processes; (b) the *organisational value subsystem*, which included the organisational values and the organisational climate; and (c) the *individual belief system*, *i.e.* the teacher attitudes. Heck & Marcoulides (1996) interpreted their findings as supporting the notion that positive social and professional relations in the schools are related to learning.

Another study in which the social climate of the school has been connected to academic outcomes is that of Battistich *et al.* (1995). The authors used hierarchical linear modelling to examine relationships between students' sense of school community, poverty level, student attitudes, motives, beliefs, and behaviour. The authors (*op. cit.*) used a diverse sample of 24 elementary schools. Within schools, individuals' sense of school community was significantly associated with almost all of the student outcome measures. Between schools, school-level community and poverty were both significantly related to many of the student outcomes (the former positively, the latter negatively).

The most important study concerning the relation between school climate and educational outcomes is the Programme for International Student Achievement (PISA). In this study, which was carried out by (OECD, 2001), students, teachers and school principals from 35 countries were asked to evaluate the student- and teacher-related factors that affect school climate. From the answers of the principals OECD researchers constructed the following five indexes:

(a) teacher support and performance,
(b) student related factors affecting school climate,
(c) disciplinary climate,

(d)   teacher-related factors affecting school climate, and

(e)   principals' perceptions of teachers' morale and commitment.

These indexes were later associated with the academic achievement of 15-year-old students in literacy, mathematics and science. The results that will be presented in the following paragraph concern the achievement of 15-year-olds in Greek language.

In terms of 'teachers' support' (students' self-reports) Greece stands slightly above the OECD average. The effect of this factor on the combined reading literacy score of the Greek students is not statistically significant (OECD, 2001, p. 295). In terms of 'student related factors affecting school climate' (based on reports from school principals and reported proportionate to the number of 15-year-olds enrolled in the school) Greece has the lowest point of all the 35 OECD countries (-1.05). However, this factor does not appear to be significantly correlated with achievement (*op. cit.*, p.296). Greece has the lowest score in the index of disciplinary climate of all the OECD countries. The effect of this factor is also not statistically significant in 'explaining' student achievement in Greece (*op. cit.*, p.297). Another negative first place for Greece is in the index of 'teacher related factors affecting school climate (based on reports from school principals). The score for Greece in this index is –1.18 but still its effect is not statistically significant in explaining student achievement (*op. cit.*, p.298). Finally, concerning 'principals' perceptions of teachers' morale and commitment', Greece is around the OECD average. As in every other case, this index has no statistically significant effect on student achievement (*op. cit.*, p.299).

Research methodology and findings

Rather than translating a foreign research instrument for investigating school climate the researchers of the current study have used the 'Confidential Teacher Questionnaire' (CTQ). The basis for the construction of CTQ has been the literature on the climate and social environment of the school and the knowledge of the local conditions in the *eniaia lykeia* of Athens. In CTQ teachers are asked to show how much they agree or disagree with certain propositions using scales from –3 to +3. The scales are directional and the point '0' is not included. For the current study 223 teachers from 38 *eniaia lykeia* were selected to act as participants. The 38 *eniaia lykeia* were randomly selected from the population of *lykeia* in the greater area of Athens. The schools have been proportionally selected from the city centre and all the suburbs (apart from the eastern ones). Six to seven teachers from each *lykeio* have acted as informants. The informants have been

selected on the basis of being neither too closely colleagues or being 'peripheral' in the teachers' association. The participants are also neither new to the profession nor close to retirement. Finally, the researchers have access to the records of the students.

Teachers' responses in the confidential questionnaires have been analysed and a number of statistical entities (factors) have been constructed with the help of Exploratory Factor Analysis (EFA). In EFA the factors are linear combinations of individuals' responses to a number of directly posed questions. In our case we used *generalised least squares* method and the *direct oblimin* algorithm for the extraction of the factors and their rotation. The following five factors have been identified in the analysis: (a) 'directors' effectiveness', (b) 'self-regulation', (c)

TABLE 1: Pattern matrix of Factors derived from teacher questionnaire

Note: the Greek letter 'α' indicates Cronbach's *alpha* coefficient of reliability

'collegiality', (d) 'job satisfaction', and (e) 'keenness'. The factor analytic model has had a good fit. The value of the chi square test, which tests the hypothesis that the factor loadings can reproduce the original correlation matrix is 158. This value is not statistically significant for 131 d.f. ($\rho = 0.054$). The description of the factors and their loadings are presented in Table 1.

The complexity of the factor analytic solution in Table 1 is equal to 1 because each variable correlates strongly with only one Factor. It must however be noted that Table 1 presents the 'pattern' matrix *i.e.* the unique contribution of each variable to the rotated factor analytic solution. This means that the loadings in Table 1 do not take into account any possible correlation between the five Factors. The role of Table 2 is to present the correlation coefficients among the initially extracted Factors.

TABLE 2: Correlation matrix of the five Factors

	Director's Effectiveness	Self-Regulation	Collegiality	Satisfaction
Director's Effectiveness	1			
Self-Regulation	0.115	1		
Collegiality	0.216	0.078	1	
Satisfaction	0.123	0.089	0.105	1
Keenness	0.169	0.379	0.215	0.226

After Exploratory Factor Analysis, the authors tried to connect the climate factors of Table 1 with student achievement. For this purpose, a hierarchical regression model has been fitted to the data in which Y_{ij} is the achievement of the ith student in the jth school. It is important to state that the dependent variable Y refers to the normalised mean grade in the *lykeio* leaving examinations. The transformation of the scores was decided on the basis that the distribution of student outcomes deviated significantly from the normal distribution (skewness = -0.2, kurtosis -0.8). Thus, Y has mean 0 and standard deviation 1.

In the same model, the explanatory variables at student level have been denoted with an X, whereas the explanatory variables at school level have been denoted with a Z. There are 10 explanatory variables at student level and 5 explanatory variables at school level. The hierarchical model is of the following form:

$Y_{ij} =$

In the model the regression parameters of the explanatory variables (the γ terms) have the same interpretation as non-standardised regression coefficients in Ordinary Least Squares multiple regression models. The term γoo is the intercept. Note the random part of the model inside the parenthesis. The U_{oj} refers to school level error, and R_{ij} refers to the student level error. The population variance of U_{oj} is denoted by τ^2_0 and the population variance of R_{ij} is denoted by σ^2. As the two error terms in the parenthesis are uncorrelated the correlation coefficient between student i and student i` in the same school j is given by the formula:

In the above formula, the ρ parameter is called the *intra-school correlation coefficient*. The values of the multilevel multiple regression coefficients, the variances, the corresponding standard errors, and the intra-school correlation coefficient for the model are given in Table 3.

TABLE 3: Fixed and random part of Model 1

As we can see in Table 3, seven coefficients, all at student level, are statistically significant. The higher absolute value is for the coefficient $\gamma_{2,0}$ (having repeated a grade). This means that the students who for some reasons have been left behind in their normal school course, never recover. Those who are left behind achieve on average 0.881 standard deviations below the mean achievement of all the students in the sample. The factor 'programme of studies' also plays a very significant role in explaining student achievement. Specifically, the students who follow the scientific direction achieve higher grades than the control direction, the humanities. On the other hand, those who follow the technical direction achieve lower grades than those who follow the humanities direction. The socioeconomic status of the family is also a very important factor in explaining student achievement (see coefficients $\gamma_{6,0}$, $\gamma_{7,0}$, and $\gamma_{10,0}$). The *frontisterio*, a form of shadow education in Greece, is also a very important factor (coefficient $\gamma_{9,0}$). Specifically, those who attend frontisterio achieve on average 0.145 standard deviations above the mean achievement. On the other hand, idiaitero does not seem to play such a statistically important role in explaining student achievement. The school climate variables (coefficients $\gamma_{0,1}$ to $\gamma_{0,5}$) do not appear to be statistically important at 0.05 level.

Discussion

This study set off to answer two research question. In the question that examines if teachers' opinions and beliefs constitute broader theoretical constructs of school climate the answer must be affirmative. As it has been shown in Tables 1 and 2, teachers' answers can be combined to construct factors of school climate. Of course, the validity of this procedure must be considered in the 'reality' of a quantitative study in which factors are purely statistical constructs. The research instrument which has been used in the current study should be considered as a single example of a larger and undocumented universe of similar research instruments. The current study did not aim at the construction of a generic research tool for investigating school climate in different educational contexts. The meaning of the factors may also be different in the context of different educational systems.

In the question that examines whether the effect of school climate factor is significant in explaining educational achievement the answer must be negative. The current study has failed to connect school teachers' opinions with students' examination results. This finding is consistent with the findings of PISA 2000 that were presented in a previous section. A general discussion on the factors that affect student achievement in Greece is beyond the scope of the current study. The lack

of support for the significance of climate factors, however, does not mean that teachers' opinions are totally unconnected with student outcomes. Put simply, other variables, like students' socio-economic status and *frontisterio* attendance may be much more important. There are however some other reasons which may explain the small effect of school climate factors.

The first reason may be that the original examination scores of the students have been ranked as a first step for their normalisation. This was necessary in order to overcome the problem of skewed distributions in the examination results. However, the normalisation procedure may have affected the power of the statistical analysis. A second explanation for the small effect of the coefficients $\gamma_{0,1}$ to $\gamma_{0,5}$ in the hierarchical model may be the value of the between-school variance τ^2. In the hierarchical model, school level variance τ^2 appears to be very small in comparison to the within school variance σ^2 (a fact which also explains the limited value of the intra-school correlation coefficient ρ). When the differences between schools in the sample are not large, one can expect that the effect of the school-level coefficients in the model are not large either.

The lack of striking findings from a statistical point of view does not make our study less significant from a theoretical point of view. Teachers' opinions may seem uncorrelated with student achievement but in the final analysis this may mean that students' background variables like parents' socio-economic status, a computer at home or frontisterion attendance are much stronger. A possible conceptual map showing how school climate affects educational achievement could be presented as in Figure 1. In this map, effect of student background characteristics (line *a*) is much stronger than the effect of school climate characteristics (line *b*). A third line (*c*) presents the effect of student background characteristics to school climate factors. An example of this relationship would be

FIGURE 1: Explanatory variables at student and school (climate) level
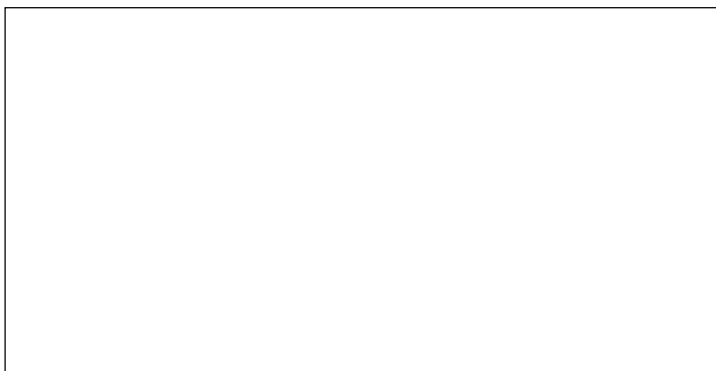
the difference in school climate when in a school there are many students with specific socio-economic background (either lower or upper). In that case school climate could have been affected by the compositional structure of the school. This interesting hypothesis could be the theme of further research.

In conclusion, we have investigated the relation between school climate factors and the educational achievement in a number of comprehensive higher secondary Greek schools (*lykeia*). The Factors presented in Table 1 deal with some very important issues in the Greek education system. The perceived effectiveness of the school director, the collegiality among teachers and their degree of satisfaction are especially important issues in the present context of Greek educational policy. The statistical analysis has failed to yield coefficients that are statistically significant at the 0.05 level. However, this does not mean that the school climate factors are insignificant from an educational perspective. Further research is needed on this interesting topic.

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