The Examination Of The Schools In Denizli According To University Entrance Exam By Multivariate Statistical Methods

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Abstract

The aim of the university entrance exam is two folds. First, it identifies the students that deserve the education after high school graduation. Second, the grades taken from this exam specify the quality of the high schools. These grades are important for the schools which are in competition with the others. In the present study, the schools in Denizli are examined according to the grades of the students who are graduates or senior class students. Multivariate statistical methods are used in the data analysis. The data of the study were gathered from 2012 Student Selection and Placement Exam statistics. The findings and the implications of the study is discussed accordingly.

Keywords: Multivariate statistical methods, education, student selection, university entrance

In order to determine students who could continue their education at the higher education schools, there is annual Student Selection and Placement Exam (SSPE) in Turkey. This exam is consisted of two stages: the Transition to Higher Education (YGS) and the Undergraduate Placement Exam. Students with YGS score equal to or greater than 180 are entitled to proceed with the LYS exam. The LYS exam is designated to measure knowledge and talents of candidate students to place them formal undergraduate education schools. Candidates could be placed in the higher education programs which they prefer according to their exam scores (SSPC, 2016).

The SSPE generally refers annual exams taken by senior high school students or individuals graduated from high schools, held in all cities of Turkey and in Nicosia Province of the Northern Cyprus Turkish Republic. Results of these exams provide an opinion to education administers about education and training activities at the high school level in addition to

determining succesful students in each province. Studies that have been conducted so far investigated factor effective on success of students who have taken these the SPEE exams based on survey data (Dursun & Dede, 2004; Sari, 2009). There are also studies investigating the success of provinces or the success of provinces in entire country (İşleri, 2012; Taşpınar Cengiz & İhtiyaroğlu, 2012; Turanlı, Taşpınar Cengiz, & Bozkır, 2012).

Denizli Province was ranked among the first five cities in terms of its general success in the 2015 YGS; and in the first five cities in terms of Math-Natural Science Major, in the first ten cities in terms of Turkish-Math Major. In addition, Denizli Province has been ranked among the first ten cities along the exams in recent years. This situation aroused curiosity about success levels of schools in Denizli among the successful frontier cities in Turkey. The present study aims to determine success levels in the SSPE and relevant similarities of high schools in Denizli Province. In this study, 99 high schools in Denizli Province were investigated according to their Math, Natural Sciences, Turkish, Social mean scores and rate of the students who gained score equal to or greater than 180; furthermore, 73 high schools, in addition to the aforesaid variables, were analyzed in terms of their mean LYS scores from each major and their individual undergraduate placement rates by means of clustering, factor and multi-dimensional scaling analysis methods. Students who applied to the programs at universities prepare a preference list at the end of the LYS according to their score types calculated in Math-Natural Science, Turkish-Math and Turkish-Social Majors. Therefore, high schools were investigated individually according to these score types through the aforesaid methods as well. Variables utilized in this analysis were determined based on the SSPC 2015 statistics; and they were analyzed by means of the SPSS 21.0 software.

Method

Collected data was analyzed by means of Clustering Analysis, Factor Analysis and Multi-Dimensional Scaling Analysis of the multivariate statistical methods. Clustering Analysis is utilized to group observations or variables in the row data matrix into homogenous sub-groups subject to their characteristics. Groups that would be obtained at the end of the Clustering Analysis are expected to be homogenous inside each group, but heterogenous among groups (Alpar, 2013). Clustering Analysis was repeated by means of the K-means method. In this method, observations are clustered in groups whose number of elements is determined by the researcher.

Factor analysis is a statistical method which gathers variables inter-related with each other together in a multi-dimensional case so as to find less new (common) unrelated variables (Tatlıdil, 2002). Before continuing with the analysis, it is necessary to evaluate appropriateness of the collected data

set to the Factor Analysis. In order to evaluate this, Bartlett's Spherity Test is conducted and the Kaiser-Meyer-Olkin (KMO) criterion is estimated. As a result of the Bartlett's Spherity Test, if hypothesis that correlation matrix is not equal to the unit matrix is accepted, then it could be concluded that data set is appropriate for factor analysis. In order to describe the factor analysis perfectly, it is desirable that the relevant KMO value is greater than 80% (Albayrak, 2005).

On the other side, the Multi-Dimensional Scaling Analysis (MDS) is the statistical method employed to determine the relationships among objects utilizing from distances among them in cases in which the relationships among objects are not known but the distances among them could be estimated. Stress values in the analysis are examined in order to decide that whether obtained results represent data set sufficiently, or not. According to the ranges of stress value, 0.025 - 0.05 and 0.05 - 0.10 are described as perfect and good conformity, respectively. Thus, it is possible to decide about the quality of the conformity between the original and estimated distances and that whether the analysis results are given as k-dimensional, or not (Kalaycı, 2006).

Greater the R^2 value indicator of conformity of the MDS model to collected data, the better conformity.

Findings

Evaluation of High Schools according to the YGS scores.

In order to organize clusters of high schools with similarities in terms of the relevant variables, clustering analysis method was employed. Hierarchal (gradual) clustering analysis based on standardized variables was conducted according to the Euclidian distance; and high schools were clustered into three sets by means of the tree-diagram. The first, second and the third sets were including 4 (Erbakır, Aydem, the Private Servergazi and the Private PEV Amiroğlu Natural Sciences High Schools (FL)), 35 and 60 high schools, respectively. Whereas the second set were including "Anatolian" high schools (AL) in general, of which, 6 were private institution; 2 were "Anatolian Religious High School" (AİHL) (Sarayköy and Denizli AİHL); and 1 was "Vocational and Technical Anatolian High School" (Pamukkale Vocational and Technical Anatolian High School), the third set was consisted of high schools which could be considered with the lowest success rate according to the YGS results. This set includes "multi-program Anatolian high schools", "vocational and technical anatolian high schools", "anatolian religious high schools" and "sport high schools". Again, there were Kılıçarslan, Menderes, Tavas and Mehmet Akif Ersoy Anatolian High Schools in this group. Unlike other private schools, the Private Denizli Doğa Anatolian High School was in the third list.

In order to support hierarchal clustering analysis results, K-mean method was also used in the clustering analysis. This analysis displayed minor differences with respect to the hierarchal clustering. According to the K-mean method, there were 8, 27 and 64 high schools in the first, second and the third sets, respectively. As a result of the ANOVA analysis, it was concluded that it was appropriate to cluster these 99 high schools in three groups (for each variable, p=0.000). In the first set there were Erbakır, Aydem, the Private Servergazi and the Private PEV and Amiroğlu FL as well as Lütfi Ege, the Private Servergazi, Denizli and the TEV Anatolian High Schools. Çal, Mustafa Şipar Anatolian High Schools which were included in the second set on the basis of the hierarchal clustering analysis results, were included in the third set by the K-mean method; that is, they were considered as among the schools with lowest success levels.

The factor analysis was conducted for ranking of these high schools. At first, it was investigated that whether analysis was appropriate for application; then, it was found it appropriate (Bartlett's Spherity Test Statistic = 917.682, p value = 0.000; KMO=0.769). In determination of the number of factors, the eigenvalue criterion was utilized. Accordingly, there were only 1 factor whose eigenvalue was greater than 1; and this factor was explaining 85.985% of the total variance. Total variance explanation strengths were exhibited in Table 1 below:

Table 1. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,299	85,985	85,985	4,299	85,985	85,985
2	,514	10,281	96,266			
3	,157	3,136	99,403			
4	,020	,407	99,810			
5	,010	,190	100,000			

Extraction Method: Principal Component Analysis.

As a result of the factor analysis conducted by means of the basic components method, all of the variables were gathered in a single factor. Factor weights of these variables were exhibited in Table 2 below:

Table 2. Component Matrix

	Component
	1
turkce_ort	,981
mat_ort	,942
Social_ort	,922
Fen_ort	,902
oran180	,888

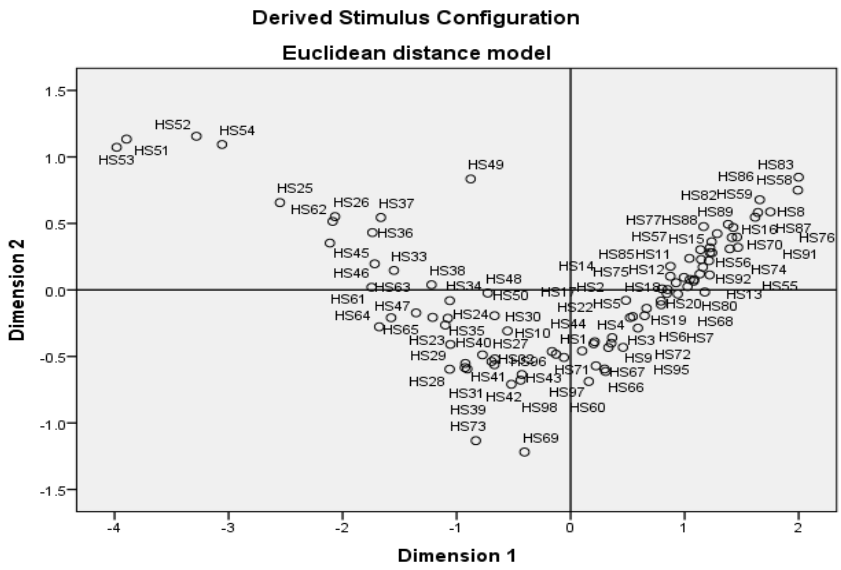
Extraction Method: Principal Component Analysis.

According to Table 2, the most effective variable in success ranking of high schools in terms of the YGS scores was Turkish mean score followed by Math, Social and Natural Sciences mean scores and the rate of the students who entered the YGS and scored equal to and/or greater than 180. According to the ranking based on the factor analysis, whereas the top-five schools were the Private Servergazi, Erbakır, Aydem, the Private PEV Amiroğlu FL and Denizli AL, respectively, 9th place of the Şevkiye Özel AL from Çivril County in this ranking was remarkable. At the end of rank list, abundance of vocational technical Anatolian high schools and multi-program Anatolian high schools were found interesting.

The MDS analysis was conducted to reveal relationships among 99 high schools according to their Math, Fen, Turkish, and Social Science mean scores and rate of the students who gained score equal to and/or greater than 180. For the 2-dimensional MDS analysis result, the stress value was 0.04008. Thus, it was possible to conclude that there was perfect conformity between original distances and estimated distances; and that analysis results would be given as 2-dimensional. R^2, as an indicator of conformity of the MDS model to the data, was estimated at 0.99674. Such proximity of R^2 to 1 indicates high level of conformity.

In Figure 1, schools were exhibited in 2-dimensional plotting. As it could be understood from the figure, Erbakır, Aydem, Private Servergazi and Private PEV and Amiroğlu FL indicated within the 1st set based on the result of the clustering analysis were compromising their own set and they were differentiated from other high schools.

Figure 1. Derived Stimulus Configuration



Evaluation of high schools according to the YGS and LYS Results

In order to cluster 73 high schools in terms of their similarities based on their variables, their YGS and LYS scores were calculated and the clustering analysis was employed. The hierarchal (gradual) clustering analysis was conducted according to the standardized variables with respect to the Euclidian distance; and high schools were clustered in three groups by means of the tree-diagram. The first, second and third groups were having 5 (Erbakır, Aydem, Private Servergazi, Private PEV Amiroğlu FL and Denizli AL), 32 and 36 high schools, respectively. The second group was consisted of public and private anatolian high schools as well as a religious high school. The third group was consisted of "vocational technical", "religious" and "multi-program" high schools.

In order to support hierarchal clustering analysis results, the clustering analysis was repeated with the K-mean method as well. This analysis exhibited minor differences with respect to the hierarchal clustering method. According to the K-mean method, there were the same five high schools in the first group. There were 26 and 42 schools in the second and the third groups. All of the 26 high schools in the second group were private and public "anatolian" high schools. Six high schools placed in the second group by the hierarchal clustering method were assigned to the third group by the K-mean method. Since one of these assigned schools was Denizli AİHL, no any other "AİHL" school left in the second group based on the K-mean method's clustering. As a result of the ANOVA analysis, it was found appropriate to assign 73 schools to the 3rd group (for each variable p=0.000). According to the both methods, although all high schools, except the Private Denizli Doğa Anatolian High School, were in the second group, this school was assigned to the third group.

Based on the factor analysis results, it was observed that factor analysis of the data set was appropriate for application (Bartlett's Spherity Test statistic = 2863.506, p value = 0.000). The KMO value was estimated at 0.935. The fact that the KMO value was above 80% addressed reliability of the factor analysis results remarkably. Eigenvalue criterion was used in determination of the number of factors. Thus, there were two factors whose eigenvalues were greater than 1. Of these factors, while the first one was able to explain total variance by 86.71%, the second one was explaining by 93.087%. Their variance explanation rates and eigenvalues were exhibited in Table 3:

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13,874	86,711	86,711	13,874	86,711	86,711	8,097	50,604	50,604
2	1,020	6,376	93,087	1,020	6,376	93,087	6,797	42,482	93,087
3	,266	1,660	94,747						
4	,244	1,525	96,272						
5	,191	1,195	97,467						
6	,115	,718	98,185						
7	,068	,423	98,608						
8	,061	,383	98,991						
9	,054	,337	99,328						
10	,041	,253	99,582						
11	,020	,127	99,708						
12	,016	,099	99,807						
13	,012	,073	99,880						
14	,010	,064	99,944						
15	,006	,035	99,980						
16	,003	,020	100,000						

Extraction Method: Principal Component Analysis.

As a result of factor analysis results, employing the principle components method and the Varimax rotation method, the variables were clustered into two factors. Weights of these factors were given in Table 4 below:

Table 4. Rotated Component Matrix

	Component	
	1	2
Fen_ort	,910	,385
LYS1geom_ort	,902	,414
LYS2fzk_ort	,891	,427
LYS2kmy_ort	,870	,458
LYS1mat_ort	,866	,486
mat_ort	,853	,506
LYS2biyo_ort	,824	,532
LYS4flsf_ort	,722	,630
oran180	,264	,920
LYS3tdedb_ort	,437	,830
lisans_oran	,485	,827
turkce_ort	,577	,792
LYS3cog1_ort	,537	,782
Social_ort	,547	,735
LYS4History_ort	,639	,707
LYS4cog2_ort	,632	,645

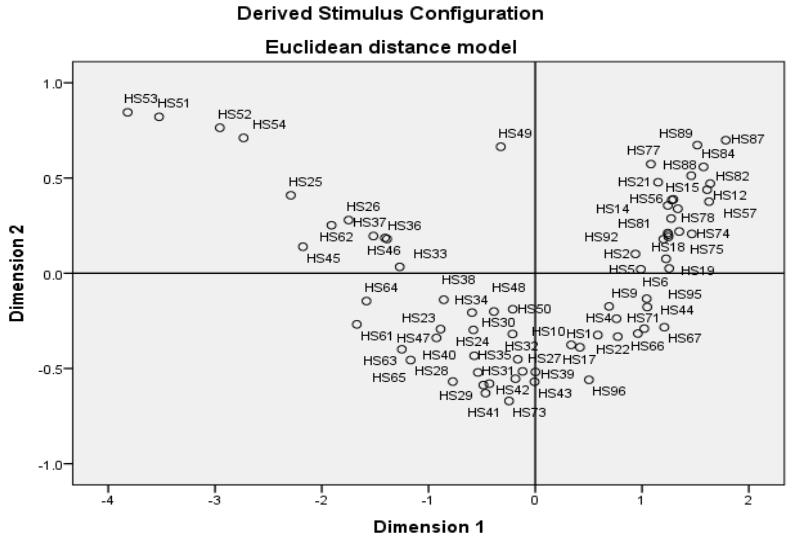
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Based on the comparison of weights of two factors in Table 4, variables of the first factor, displaying greater weight, were determined as YGS Natural Sciences mean, LYS Geometry mean, LYS Physics mean, LYS Chemistry mean, LYS Math mean, YGS Math mean, LYS Biology mean and LYS Philosophy Group & Religion and Ethics mean scores. Other variables displayed greater weight in the second factor. When it is considered that questions in the Philosophy Group were also including Logic questions, it is possible to assess that while the first factor was composed of quantitative courses and relevant success rates, the second factor was composed of verbal course and success rates. When high schools were ranked according to their success in the first factor, it was determined that the first five schools were the Private Servergazi, Erbakır, Aydem, the Private PEV Amiroğlu FL and Denizli AL. When high schools were ranked according to their success in the second factor containing verbal courses, it was determined that the first five schools were Acıpayam, Hilmi Özcan, Akın, Sarayköy and Özay Gönlüm AL. On the other hand, when high schools were ranked according to their success in both two factors, the first five schools were the same with the ones determined with the first factor again.

MDS analysis was conducted in order to reveal the relationship among 73 schools according to students' YGS and LYS mean scores, rate of students who gained score equal to and/or greater than 180 and their rate of placement in an undergraduate program. For the 2-dimensional MDS analysis result, estimated stress value was 0.07516. Accordingly, it could be concluded that there was good fit between original and estimated distances; and that analysis results could be given as 2-dimensional. On the other side, R^2, an indicator of conformity of the MDS model to the data, was estimated at 0.99113. Greater R^2 value suggests that there is better conformity in between.

Figure 2 illustrates high schools in 2-dimensional view. As it could be seen from the plotting, Erbakır, Aydem, Private Servergazi, Private PEV Amiroğlu FL and Denizli AL, ranked in the first group according to the clustering analysis, were constituting an individual group on their own; and they were differentiated from other high schools. Moreover, the closest schools to these 5 schools were determined as the TEV, Hasan Tekin Ada, Mustafa Kaynak, Nevzat Karaalp, the Private Servergazi, the Private Servergazi Günay and Acıpayam Cumhuriyet AL.

Figure 2. Derived Stimulus Configuration



Evaluation of high schools according to the Math-Natural Sciences Group (MF) Results

The clustering analysis was employed to group 75 high schools on the basis of their similarities according to the LYS MF Group (Math, Geometry, Physics, Chemistry, Biology) mean scores, YGS mean scores, rate of students who gained score equal to and/or greater than 180 and their placement rate in undergraduate programs. Hierarchal (gradual) clustering analysis based on standardized variables was conducted according to the Euclidian distance. The relevant tree-diagram revealed that high schools were clustered in three groups. There were 5 (Erbakır, Aydem, Private Servergazi, Private PEV Amiroğlu FL and Denizli AL), 32 and 38 high schools in first, the second and the third groups, respectively. Whereas the second group was consisted of public and private anatolian high schools, it contained one “religious” high school as well. The third group was consisted of “vocational technical”, “religious” and multi-program high schools.

In order to support hierarchal clustering analysis results, the clustering analysis was repeated with the K-mean method as well. This analysis exhibited minor differences in comparison with hierarchal clustering. According to the K-mean method, there were 5, 25 and 45 high schools in the first, second and third groups, respectively. All of the schools in the second group were private and public Anatolian high schools. The hierarchal clustering method assigned the 7 high schools once in the second group to the third group. Assignment of the Denizli AİHL, one of these seven schools, to the third group left no any “religious” high school in the second group. As a result of the ANOVA analysis, it was determined that clustering 75 high schools into three groups was meaningful (for each

variable p=0.000). According to the both methods, all private high schools, except the Private Denizli Doğa Anatolian High School, were in the second group.

When assumptions of the factor analysis were taken into consideration, it was concluded that the data set was appropriate for factor analysis (Bartlett's Spherity Test statistics = 2178.517, p value = 0.000; KMO value = 0.911). In determination of the number of factors, eigenvalue criterion was utilized. Thus, there was only one factor with eigenvalue greater than 1. This factor could explain solely 87.856% of the total variance. Table 5 exhibits total variance explanation rates and eigenvalues below:

Table 5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9,664	87,856	87,856	9,664	87,856	87,856
2	,884	8,040	95,897			
3	,214	1,946	97,843			
4	,098	,888	98,731			
5	,057	,516	99,246			
6	,026	,236	99,482			
7	,018	,163	99,646			
8	,015	,140	99,786			
9	,012	,109	99,895			
10	,008	,073	99,969			
11	,003	,031	100,000			

Extraction Method: Principal Component Analysis.

As a result of the factor analysis conducted through principle component analysis, variables were combined in a single factor. Factor weights of these variables were displayed by Table 6:

Table 6. Component Matrix

	Component
	1
mat_ort	,983
LYS1mat_ort	,980
LYS2biyo_ort	,978
LYS2kmy_ort	,970
LYS1geom_ort	,964
LYS2fzk_ort	,961
Fen_ort	,954
turkce_ort	,944
lisans_oran	,894
Social_ort	,880
oran180	,782

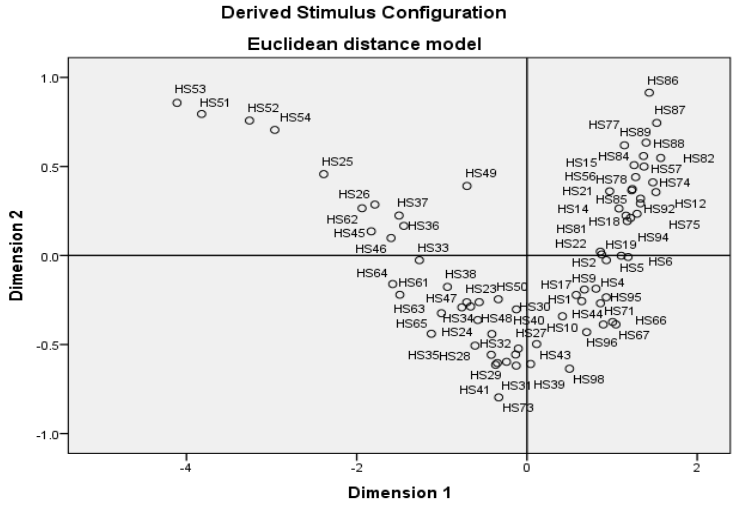
Extraction Method: Principal Component Analysis.

According to Table 6, the most effective variables on success of high school in ranking with respect to the MF Group score were determined as YGS and LYS Math mean scores. When schools were ranked according to scores of this factor, the best five high schools were the Private Servergazi, Erbakır, Aydem, the Private PEV Amiroğlu FL and Denizli AL. It was remarkable result that Acıpayam Cumhuriyet AL and Şevkiye Özel AL were at the 10th and the 12th place in the most successful high school ranking.

MDS analysis was conducted to reveal the relationship among the 75 high schools in terms of YGS, LYS Math and Natural Sciences Group mean scores, rate of students whose scores are equal to and/or greater than 180 and rate of students placed in undergraduate programs. The stress value for the 2-dimensional MDS analysis was estimated at 0.04432. Accordingly, it could be concluded that there was good fit between original and estimated distances; and that analysis results could be presented as 2-dimensional. R^2, an indicator of good fit of the MDS model to data set, was estimated at 0.99693. The greater R^2 value, the better conformity.

Figure 3 illustrates high schools in 2-dimensional view. As it could be seen from the figure, Erbakır, Aydem, the Private Servergazi, the Private PEV Amiroğlu FL and Denizli AL classified within the first group as a result of clustering analysis constituted their own group; and they exhibited difference with respect to other high schools. Furthermore, the closest high schools to these aforesaid five schools were the TEV, Hasan Tekin Ada, Mustafa Kaynak, Nevzat Karaalp, the Private Servergazi, the Private Servergazi Günay and Lütfi Ege AL. It is possible to conclude that the location at the bottom of the plotting supported the indecisiveness regarding assignment of the Denizli AİHL placed in two different groups by two different analysis methods.

Figure 3. Derived Stimulus Configuration



Evaluation of high schools according to the Turkish-Math (TM) Group Results

In order to groups 87 high schools according to their similarities in terms of the LYS TM (Math, Geometry, Turkish Literature and Geography) and YGS mean scores, rate of students at school who gained equal to and/or greater than 180, and rate of students who placed in undergraduate programs, the clustering analysis was utilized. On the basis of standardized variables, hierarchal (gradual) clustering analysis was conducted according to the Euclidian distance. It was observed that high schools were clustered in three groups according to the tree-diagram. Whereas there were 5 (Erbakır, Aydem, the Private Servergazi, the Private PEV Amiroğlu FL and Denizli AL) in the first group; there were 33 and 49 high schools in the second and third groups. The second group was consisted of public and private anatolian high schools. In the aforesaid group, there were also the Sarayköy AİHL and the Denizli AİHL. Third group was consisted of "vocational technical", "religious" and "multi-program" high schools.

In order to support results of the hierarchal clustering analysis, the clustering analysis was repeated through the K-mean method. This analysis exhibited minor differences in comparison with hierarchal clustering. According to the K-mean method, whereas there were the same 5 high schools in the first group, the second and the third groups were including 29 and 53 schools. All of 29 schools in the second cluster were private and public Anatolian high schools. According to the hierarchal clustering method, 4 high schools in the second were assigned to the third group. Since the Sarayköy and the Denizli AİHL high schools were in the third group, no any "religious" high school left in the second group. As a result of the ANOVA analysis, it was concluded that differentiation of 87 schools into 3 clusters were found appropriate (for each variable p=0.000).

When assumptions of the factor analysis are taken into consideration, it was seen that data set was appropriate for factor analysis (Bartlett's Spherity Test statistic = 1976.849, p value = 0.000; KMO value = 0.917). In determination of number of factor, eigenvalues criterion was employed. Accordingly, there was only single factor with eigenvalue greater than 1. This factor was able to explain 85.342% of the total variance solely. Total variance explanation strengths and eigenvalues were exhibited in Table 7 below:

Table 7. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8,534	85,342	85,342	8,534	85,342	85,342
2	,803	8,035	93,377			
3	,249	2,490	95,867			
4	,207	2,066	97,933			
5	,083	,831	98,764			
6	,074	,735	99,500			
7	,019	,186	99,686			
8	,017	,174	99,861			
9	,009	,085	99,946			
10	,005	,054	100,000			

Extraction Method: Principal Component Analysis.

As a result of the factor analysis conducted through the principal components method, variables were gathered in a single factor. Factor weights of these variables were exhibited in Table 8 below:

Table 8. Component Matrix

	Component
	1
turkce_ort	,972
mat_ort	,957
LYS1mat_ort	,950
lisans_oran	,935
LYS1geom_ort	,927
LYS3cog1_ort	,918
Fen_ort	,914
LYS3tdedb_ort	,903
Social_ort	,898
oran180	,859

Extraction Method: Principal Component Analysis.

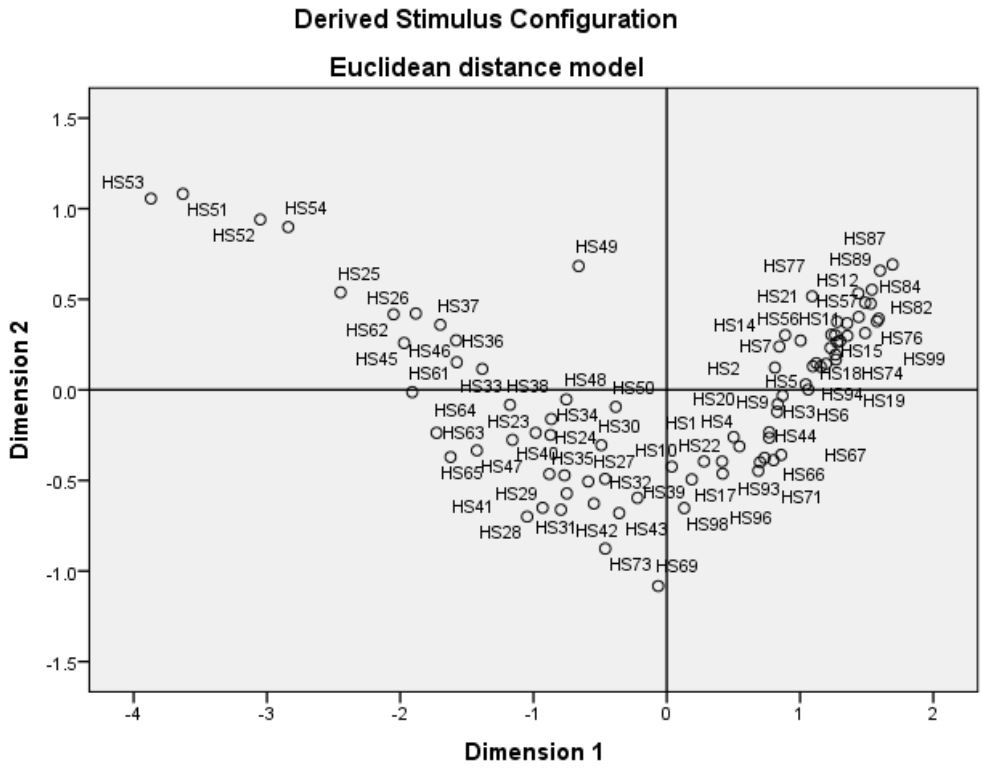
According to Table 8, the most effective variables on success rank of high schools were the YGS Turkish and Math mean scores. In the high school rank based on this factor, the top five schools were the Private Servergazi, Erbakır, Aydem, the Private PEV Amiroğlu FL and Denizli AL. It was remarkable finding with this ranking that the Şevkiye Özel AL and the Acıpayam Cumhuriyet AL were at the 8^{th} and 10^{th} positions, respectively.

Another MDS analysis was conducted to reveal the relationship among 87 high schools according to the YGS, the LYS Math, Geometry, Turkish Language and Literature and Geography Group mean scores, rate of students gained scores equal to and/or greater than 180 with respect to general population of the relevant school, and rate of students placed in an undergraduate program. The stress value was estimated at 0.07284 for the 2-

dimensional MDS analysis. Accordingly, it was concluded that there was good fit between the original and estimated distances; and that the analysis results could be presented in 2-dimensional. R^2, an indicator of good fit of the MDS model to the data, was estimated at 0.99120.

In Figure 4, high schools were plotted in 2-dimensional graphic. As it could be seen from the plotting, Erbakır, Aydem, the Private Servergazi, the Private PEV Amiroğlu FL and Denizli AL were assigned to the first group by the clustering analysis; and they were comprising of their unique group exhibiting difference with respect to other high schools. Furthermore, the closest schools to these five schools in the first group were the TEV, Mustafa Kaynak, Nevzat Karaalp, the Private Servergazi, the Private Servergazi Günay, Şevkiye Özel and Lütfi Ege AL. The facts that the Sarayköy and the Denizli AİHLs at the bottom of the plotting were assigned to the two different groups and their positions in the graph support the indecisiveness.

Figure 4. Derived Stimulus Configuration



Evaluation of high schools according to the Turkish-Social (TS) Group Results

The clustering analysis was utilized to group 92 high schools in terms of their similarities in terms of their mean scores from the LYS TS (Turkish

Language and Literature, History, Geography and Religion and Ethics, Philosophy) Group, the YGS, rate of students at school, who gained scores equal to or greater than 180, and rates of student at school, placed in an undergraduate program. Based on the standardized variables, hierarchal (gradual) clustering analysis was conducted with respect to the Euclidian distance. According to the tree diagram, it could be observed that high schools were clustered within three groups. Whereas the first group was consisted of 4 high schools (Erbakır, Aydem, the Private Servergazi and the Private PEV Amiroğlu FL), the second and third groups were consisted of 34 and 54 schools, respectively. The second group was consisted of public and private "anatolian" high schools; and this group included two "religious" high schools (the Sarayköy and Denizli AİHLs) as well. The third group was consisted of "vocational and technical", "religious" and "multi-program" high schools.

In order to support hierarchal clustering analysis results, clustering analysis was repeated by means of the K-mean method. Results of this analysis revealed minor differences in comparison with the hierarchal clustering. As result of the K-mean method, whereas there were 8 high schools (Erbakır, Aydem, the Private Servergazi, the Private PEV Amiroğlu FL, Denizli, the TEV, the Private Servergazi and Lütfi Ege AL) in the first group, the second and third groups were consisted of 29 and 55 high schools. All of the 29 schools in the second group were private and public "anatolian" high schools. Moreover, there was also the Denizli AİHL in this group. Four schools assigned to the second group by the hierarchal clustering method were assigned to the first group by the K-mean method. As a result of the ANOVA analysis, it was found appropriate to cluster 92 high schools into 3 groups (for each variable $p = 0.000$).

When assumptions of the factor analysis were investigated, data set was found appropriate for the factor analysis (Bartlett's Spherity Test statistic = 1873.749, p value = 0.000; KMO value = 0.922). The eigenvalue was utilized in determination of number of factors. Hence, there was only one factor with eigenvalue greater than 1. This factor was able to explain 84.895% of total variance. Total variance explanation strengths and relevant eigenvalues were exhibited in Table 9:

Table 9. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9,338	84,895	84,895	9,338	84,895	84,895
2	,557	5,060	89,955			
3	,292	2,657	92,612			
4	,269	2,442	95,055			
5	,185	1,679	96,734			
6	,125	1,138	97,873			
7	,080	,725	98,597			
8	,070	,639	99,237			
9	,060	,541	99,778			
10	,017	,157	99,935			
11	,007	,065	100,000			

Extraction Method: Principal Component Analysis.

As a result of the factor analysis conducted by the principle components method, variables were gathered in a single factor. Factor weights of these variables were given in Table 10:

Table 10. Component Matrix

	Component
	1
turkce_ort	,973
LYS4flsf_ort	,952
lisans_oran	,945
LYS4History_ort	,938
mat_ort	,932
LYS3cog1_ort	,919
Social_ort	,906
LYS3tdedb_ort	,905
LYS4cog2_ort	,901
Fen_ort	,882
oran180	,877

Extraction Method: Principal Component Analysis.

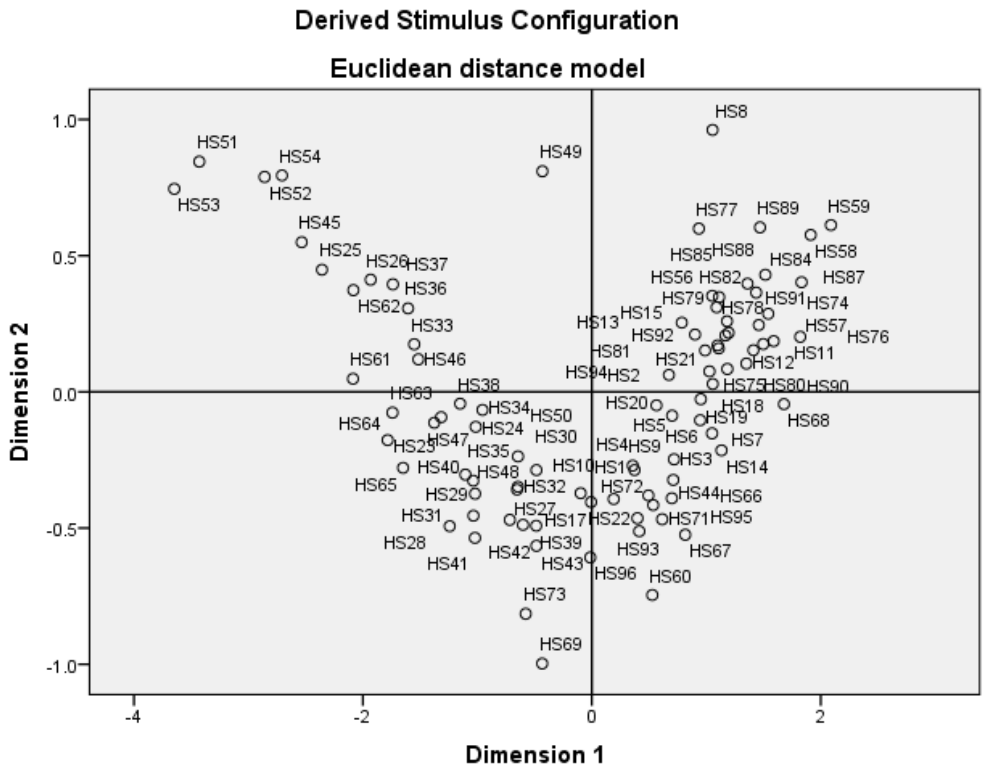
Table 10 addressed that the most effective variable on high school rank according to the TS Group mean scores were the YGS Turkish and the LYS Religion and Ethics and Philosophy mean scores. In the high school ranking based on mean scores of this factor, the top five high schools were determined as the Private Servergazi, Erbakır, Aydem, the Private PEV Amiroğlu FL and the Private Servergazi AL, respectively. It was also remarkable that there were the Şevkiye Özel AL and the Acıpayam Cumhuriyet AL on the 8^{th} and 10^{th} places in this rank, respectively.

MDS analysis was conducted to reveal relationship among 92 high schools in terms of the LYS TS Group and the YGS mean scores, rates of

students at school, who gained score equal to and/or greater than 180 and rate of students at school, who were placed in an undergraduate program. As a result of the 2-dimensional MDS analysis, the stress value was estimated at 0.09135. Thus, it could be concluded that there was good fit between the original and estimated distances; and that the analysis results could be given as 2-dimensional. R^2, an indicator of the good fit of the MDS model to data, was estimated at 0.98599.

In Figure 5, high schools were positioned in 2-dimensional plotting. As it could be seen from the graphic, the high schools of Erbakır, Aydem, the Private Servergazi, the Private PEV Amiroğlu FL, Denizli AL and the Private Servergazi AL were assigned to the first group by the clustering analysis; ant they were comprising of their unique group exhibiting difference with respect to the other high schools. Assignment of the Sarayköy AİHL and the Denizli AİHL, seen at the bottom of the plotting, to two different groups by two different methods supports this indecisiveness. The Sarayköy AİHL, assigned to the second and third groups by the hierarchal clustering the K-mean methods respectively, was positioned at the bottom of the plotting distinctively.

Figure 5. Derived Stimulus Configuration



Results

In the present study, high schools in Denizli Province were investigated on the basis of 2015 the SSPE results. In order to determine success status of high schools, hierarchal and K-mean clustering analyses, factor analysis and multi-dimensional scaling analysis were employed. Acquired results as result of these analyses were presented below:

The Private Servergazi, Erbakır, Aydem, the PEV Amiroğlu FL high schools were gained attention as the most successful school group at the university entrance exams. These schools were the ones who recruited the students ranked at the best percentage share of the exam once called as "the success level measurement exam". Therefore, students registered with the schools in this group were already successful students in general.

Right next to the most successful high school group mentioned above, in addition to Denizli, the TEV, Mustafa Kaynak, the Private Servergazi, Nevzat Karaalp and Lütfi Ege AL located in the province center, there were also Acıpayam Cumhuriyet and Çivril Şevkiye Özel AL high schools located in counties.

In general, "anatolian religious", "multi-program" and "vocational technical anatolian high schools" were considered as unsuccessful schools in the SSPE.

Among "religious high schools", Denizli AİHL and in some other score types Sarayköy AİHL were ranked at higher levels.

The present study was conducted according to high schools; but, effect of private tutoring institutions on students was ignored. Scores could be derived based on individual students and their socio-demographical characteristics and effect of private tutoring institutions could be included in the analyses. The new circumstance that arises as a result of transformation of aforesaid private tutoring institutions into basic high schools in the academic year of 2015-2016 should be studied in further researches.

Repetition of the study together with the socio-demographical variables that will be compiled according to the students would introduce different results.

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OKUL NO	OKUL ADI
HS1	ACIPAYAM LİSESİ
HS2	AKIN LİSESİ
HS3	ÇAL LİSESİ
HS4	KILIÇARSLAN AL
HS5	MENDERES AL
HS6	TAVAS AL
HS7	BEKİLLİ ATATÜRK ÇPAL
HS8	BEYAĞAÇ ÇPAL
HS9	ANAFARTALAR MTAL
HS10	MEHMET AKİF ERSOY AL
HS11	AKKÖY ÇPAL
HS12	KELEKÇİ ÇPAL
HS13	ÇİVRİL IRGILLI ÇPAL
HS14	KARAHİSAR ÇPAL
HS15	HONAZ ÇPAL
HS16	BAKLAN LİMAK HÜSAMETTİN TUYJİ ÇPAL
HS17	UZUNPINAR 70. YIL ÇPAL
HS18	ETHEM ÖZSOY ÇPAL
HS19	BOZKURT ÇPAL
HS20	BABADAĞ HACI MEHMET ZORLU ÇPAL
HS21	ÇAMELİ ÇPAL
HS22	IRLIGANLI ÇPAL
HS23	CUMHURİYET AL

OKUL NO	OKUL ADI
HS56	GÜNEY ÇPAL
HS57	ALİ TUNABOYLU METEM
HS58	SARAYKÖY METEM
HS59	ÇAL METEM
HS60	HAKKI DEREKÖYLÜ GSL
HS61	ŞEVKİYE PRİVATE AL
HS62	LÜTFİ EGE AL
HS63	ÖZAY GÖNLÜM AL
HS64	ACIPAYAM CUMHURİYET AL
HS65	AKIN AL
HS66	CEDİDE ABALIOĞLU AİHL
HS67	ACIPAYAM AİHL
HS68	ÇAL AİHL
HS69	SARAYKÖY AİHL
HS70	KALE AİHL
HS71	ÇİVRİL AİHL
HS72	TAVAS AİHL
HS73	DENİZLİ AİHL
HS74	ACIPAYAM ÇAMLIK MTAL
HS75	DENİZLİ MTAL
HS76	TAVAS MTAL
HS77	ÇARDAK ÇPAL
HS78	HONAZ KAKLIK OSMAN EVRAN ÇPAL

HS24	DENİZLİ LİSESİ
HS25	DENİZLİ AL
HS26	TÜRK EĞİTİM VAKFI AL
HS27	ÇİVRİL EMİNE ÖZCAN AL
HS28	ACIPAYAM AL
HS29	KAZIM KAYNAK AL
HS30	ALİ TUNABOYLU AL
HS31	SARAYKÖY AL
HS32	TAVAS ZEYBEKLER AL
HS33	HASAN TEKİN ADA AL
HS34	DURMUŞ ALİ ÇOBAN AL
HS35	NEVZAT ERTEN AL
HS36	MUSTAFA KAYNAK AL
HS37	NEVZAT KARALP AL
HS38	NALÂN KAYNAK AL
HS39	ÇAL AL
HS40	YAŞAR-SANİYE GEMİCİ AL
HS41	HİLMİ ÖZCAN AL
HS42	HİMMET-NİMET ÖZÇELİK AL
HS43	MUSTAFA ŞİPAR AL
HS44	PRIVATE DENİZLİ DOĞA AL
HS45	PRIVATE SERVERGAZİ AL
HS46	PRIVATE SERVERGAZİ GÜNAY AL
HS47	PRIVATE DENİZLİ BAHÇEŞEHİR AL
HS48	PRIVATE YÜKSEKÇITA AL
HS49	PRIVATE ELİT GRUP AL
HS50	PRIVATE MAVİ BİLGİ AL
HS51	ERBAKIR FL
HS52	AYDEM FL
HS53	PRIVATE SERVERGAZİ FL
HS54	PRIVATE P.E.V. AMİROĞLU FL
HS55	DENİZLİ BOZKURT SL

HS79	YUNUS EMRE MTAL
HS80	KAYHAN 75. YIL MTAL
HS81	KERİMAN KAMER MTAL
HS82	İL PRİVATE İDARESİ 75. YIL MTAL
HS83	YATAĞAN MÜFTÜ ARİF AKŞİT METEM
HS84	ACIPAYAM MTAL
HS85	ATATÜRK MTAL
HS86	BEYCESULTAN MTAL
HS87	KIZICABÖLÜK HANİFE VE AHMET PARALI MTAL
HS88	ORHAN ABALIOĞLU MTAL
HS89	GÜLAY KAYNAK SARIKAYA MTAL
HS90	KARAAĞAÇ MTAL
HS91	KADİR KAMEROĞLU MTAL
HS92	SERİNHİSAR HAKKI GÖKÇETİN ÇPAL
HS93	YEŞİLYUVA OSMAN ÇEMEN ÇPAL
HS94	İMKB MTAL
HS95	SERVERGAZİ İMKB MTAL
HS96	DR. BEKİR SIDDIK MÜFTÜLER MTAL
HS97	BEKİR GÜNGÖR MTAL
HS98	PAMUKKALE MTAL
HS99	SEMA-ABDURRAHMAN KARAMANLIOĞLU MTAL

AL	ANATOLIAN HIGH SCHOOL
AİHL	ANATOLIAN RELIGION HIGH SCHOOL
ÇPAL	MULTİPLE PROGRAM ANATOLIAN HIGH SCHOOL
FL	NATURAL SCIENCES HIGH SCHOOL
GSL	GÜZEL SANATLAR HIGH SCHOOL
METEM	VOCATIONAL AND TECHNICAL TRAINING CENTER
MTAL	VOCATIONAL AND TECHNICAL ANATOLIAN HIGH SCHOOL
SL	SPORT HIGH SCHOOL