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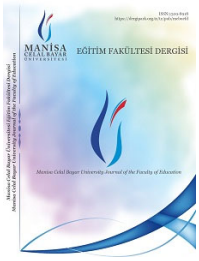

A Scale Development Study: The Evaluative Scale of Data-Based Management in Education

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Abstract

The purpose of this study is to develop a scale to assess the data-based management applications in education through the perceptions of school administrators. We live in the age of information and data serves as the main source of information. Therefore, data-based management is regarded as an important component of educational management practices today as it can add also to the effectiveness and efficiency of the management practices in education. In this regard, the scale developed through this study can play an important role for the evaluation as well as the improvement of the ongoing data-based management processes in education. The draft scale was formed of 55 items which were set through a detailed literature review. The data was collected in two phases, the first for exploratory factor analysis with participants of 227 school administrators and the second for the confirmatory factor analysis with 313 administrators. It was found out that the scale was formed of 21 items and two factors which were named as "data literacy and management" and "data-based management".

Keywords

Data-based management
Data-based decision making
Demographic data
Instructional data
Perception data

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INTRODUCTION

Some studies (Memduhoğlu & Karataş, 2017; Toprak, 2011; Duranay, 2005) about school effective in Turkey demonstrate that the perceived level of effectiveness of schools is "average". In the study by Mehduhoğlu and Karataş (2017) teachers assessed the effectiveness level of their school directors as "average". Uğurlu and Demir (2016, s. 68) assert that the achievement level that Turkey attains in international exams also proves that there are problems about school effectiveness in Turkey. Many factors can play role in determining the effectiveness of schools however "the managerial skills of the administrators" can be regarded as one of the most important. In the research carried out by Ertürk & Memişoğlu (2018) "the fact that school administrators have a good management skill" has been determined as an important component for defining "effective school". The same results found out by Gökçe and Kahraman (2010), in which the leadership of the school director is one of the most significant elements of school effectiveness. Çubukçu and Girmen (2006) reached the result that school administrator is the most important constituent of an effective school. All these demonstrate that two of the most important elements underlying effective schools can be alleged to be the administrators and administrative processes.

The problems encountered during administrative processes can hinder school effectiveness. In this regard, solving administrative problems with effective tools can add to the school effectiveness level. The problem-solving skills of administrators can play an important role in this process. Arslanargun and Bozkurt (2012) regard problem solving skill as a decision-making process. Çelikten (200) alleges that effectiveness of school administrators in decision processes is a necessity beyond a desirable situation. Contrary to its importance, school administrators in Turkey do not have the desired capabilities. In the study carried out by Tabak, Şahin and Tabak (2020) it was found out that school administrators stick to the laws and regulations. In the similar way, it was found out by Sezer (2016) that laws and regulations are the most important components of school administrators' decision processes. These can be regarded as the fact that school administrators do not pick up a solution-based approach in decision processes as taking the situational factors into consideration can play an important role in this process. In this phase, the concept of "data" tread the stage as data can enable school administrators obtain a healthier understanding the underlying factors leading to problems and ensure them to take healthier decisions. However, as an initial precursor for data to shed light on administrative decisions, school administrators should develop a healthy understanding the for the concept and its functions in educational management processes.

"Data" and "information" concepts are generally used interchangeably however, although they interact, they are completely different terms (Sanders, 2016). Rowley (2007) defines the term "data" as "the symbols which represent properties of objects, events and their environment". Data can be defined as facts which are observed and recorded in real life environments, and they have no independent meaning or value (Allen, 2017). Data serves as the raw material for information (Zins, 2007). Information is obtained through collecting, processing and interpreting data for the purpose of relating the data with a context or situation (Allen, 2017). Contrary to data, information has a meaning, and it is functional and thus it plays an important role for an output, a decision or behavior (Dorji & Kirikova, 2016). As the decision making is in the center of administrative processes (Stewart, 2005; as cited in Robbins & Coulter, 2012), data could play a functional role in the managerial processes in all kinds of organizations.

As data can serve as a reference for managerial tasks, data-based management approaches have begun to influence the management realm as well as information technologies. Data can play a central role in all phases of management especially in the decision-making processes. As Dixon (2003) states effective decisions are based on functional information and thus data-based approach in decision making can keep organizations away from risks and surprises and assist them to take more effective decisions in the management processes. Data-based approach in decision making is also functional in basing decisions on objective grounds and getting support from the employees for the decisions made in the organizations (Curuksu, 2018). Data can be regarded as an instrument also to justify the decisions taken by the management in any kind of organizations as well as the educational institutions.

Data based management applications should not be restricted only to the decision-making processes as data can serve as a reference for all phases of management. Data based approach can also play a central role in the planning stage of management processes in the organizations (Anderson, 2015). It can also pave the way to a flexible approach in the structuring of the organization and enable the administrators to realize organizational activities and practices in a more effective way (Morrison, 2015). Data can also be a tool to strengthen the interaction and communication processes in an organization (Paine, 2007). And finally, data constitutes a significant part of evaluation and control mechanisms of any kind of institutions.

Control in management can be defined as comparing standards and actual performance and taking preventive measures when necessary to keep the performance compatible with standards (Gomez-Mejia & Balkin, 2012). Data can play an important not only for assessing the final output or the performance of the organization but also for establishing healthy standards for the organizational performance. According to self-efficacy theory, previous performance is an important indication for the feeling of self- sufficiency and self-confidence (Lunenburg & Orstein, 2013). In this regard, it can be asserted that previous performance data can be functional for establishing effective and attainable standards for the employees and organization as a whole. Data is the cornerstone of evaluation processes as healthy assessment can be realized through basing assessment on healthy information derived from objective data (Hitt, Black & Porter, 2012).

When its significance in administrative processes in organizations is taken into consideration, it can be put forward that data can also play a functional role in the realm of educational administration. The complex nature of the problems encountered in educational administration makes it imperative to develop a deep understanding for those problems (Knapp, Copland & Swinnerton, 2007). Data can serve as a landmark to establish a new perspective and understanding for the problems encountered in educational administration. Today many schools are becoming more and more data rich, and they have information systems where many types of data such as student test scores, grades, attendance and discipline are saved (Dougherty, 2015). These kinds of data stored at schools can be utilized by school administrators to make teaching and learning processes more effective. School administrators can make use of various types of data during administrative applications. The data which the school administrators can utilize in administrative processes could be categorized as follows (Datnow & Park, 2014);

- Demographic data: The data such as student attendance and discipline.
- Student achievement data: The data obtained from standard tests, formative assessment, evaluation tests developed and applied by teachers, portfolios and reports.
- Instructional data: Data such as teacher performance data, time spent by teachers for instructional activities and the quality of the curriculum.
- Perception data: The data obtained by means of such tools as questionnaires and focus groups for the purpose of determining values, attitudes and perceptions of teachers and employees towards applications at school (Bernhardt, 1998; as cited in Datnow & Park, 2014).

Data can be a useful instrument to solve administrative problems at school. For example, some problems about the instructional processes at school can occur and the administrators and teachers may have different opinions and resolution alternatives for those problems. In such a case, data can play a functional role in establishing a qualified discussion environment for such problems (Datnow & Park, 2015). Data can realize some other functions in educational management. Knapp et al. (2007) list these functions as follows;

- Data can be a tool to diagnose organizational problems and develop a deeper understanding for them
- Data can be functional in determining the advantages and limitations of various decision alternatives.
- Data can also be utilized to justify the decisions made by the school administrators. Decisions justified by data are always regarded to be superior to the other decisions.
- Data can enable administrators to evaluate effectiveness of curriculums and to compare and contrast them.

- Data is an effective tool to evaluate the actual performance of schools.
- School administrators can make use of data to direct the routine activities and applications at school.
- Data can reveal the perceptions of teachers and employees towards administrative applications at school.
- Data is an important tool to determine professional learning needs of the teachers.
- Data-based performance evaluation can serve as a crucial component of motivational activities at school.

Data-based management constitutes some components. The first component is data management. Data management is the process of extracting value from raw data and making that value functional for organizations (Ladley, 2012). Data literacy is another element, and it refers to the basic level capacity of the administrators about the "data" concept and its extent. Data culture refers to an organization-level understanding for collecting, analyzing, interpreting, sharing the results and reflecting the results on the organizational processes and procedures (Leary, 2015). And the last component of data-based management is data-based leadership. Data-based leadership refers to the leadership actions and applications basing the data-driven applications in the center of leadership activities; however, it does not mean that leaders strictly adhere to data in leadership processes (Knapp et al., 2007).

Anderson (2015) alleges that a data-based approach in educational management is important in terms of establishing a data-based culture in schools and this in turn may also contribute to the developing leadership skills of school administrators (Anderson, 2015). For example, situational leadership requires administrator to make decisions by taking the situational factors into consideration (Cemaloğlu, 2007) being acquainted with the parameters of the organization and its environment. In this context, data can be regarded to be the most valuable asset for school administrators to know the school and its environment from different perspectives.

Data based management can also pave the way for accountability in different levels of the educational systems. In the qualitative study by Selwyn (2016), carried on the digital data use in two different schools, it was found out that data can play an important role in terms of accountability in system, school and class levels of education. It was also found that data is used frequently by principals to guide instruction and organizational operations (Luo, 2008). Data-based management applications can also be a means of monitoring schools on the local, regional and national levels (Hartong & Förschler, (2019). Data based management applications can also pave the way for teachers to have data-based decisions in their practices (Marsh & Farrell, 2015).

Data based approach is also essential to create an atmosphere of progress at school (Finn, 2015). When its functions are taken into account, it can be alleged that data can be an important remedy for the complicated problems in educational administration (Knapp et al., 2007). Thus, a data-based approach may function as an important instrument to improve administrative processes in education (Datnow & Park, 2015). In this regard, as we live in the age of information, it can be important to set up a data-based management in educational institutions and such an application can add to the effectiveness and efficiency of schools by enabling school administrators to carry out administrative processes in a healthier understanding. In the case of Turkey, data-based management was also attached importance in the 2023 Vision Document published by the Ministry of Education (MEB, 2018). In this context, the goal of this study is to develop a scale to assess data-based management applications in education through the eyes of school administrators.

METHOD

Draft Scale

A scientific and systematic procedure was followed in the formation of the draft data collection tool. First of all, the literature was reviewed in a detailed way and a draft item pool was created. The first item pool contained 55 different items each aiming at revealing administrators' opinions on different aspects of data-based management in education. Then, the researchers in collaboration had a final revision of the items. In the second phase, the draft was

sent to specialists who have studied data-based management before and have expertise on the subject. The names of the specialists who contributed to the development of the draft scale have been mentioned in the footnote.

The draft was revised after their opinions have been gathered. In this phase, some items have been omitted, some have been combined and some have been changed in terms of expressions. The items "I know the data sources at school", "I know which sources of data will be functional at school", "I know from which sources I can get data at school" items were very close to each other in terms of meaning and scope. Therefore, they were all taken under the item of "I know which sources of data are important for administration". "I can explain the concept of 'information pyramid'" and "I can explain the concept of 'metadata", "items were regarded to be too technical and omitted. One specialist asserted that some items are about situations, and some are actions. He offered to change all of them into actions. So, the item "I am capable of making use of databases" was changed into "I can make use of educational databases in management" The final draft of the data collection tool comprised 28 items. The draft was revised again by the researchers before the pilot application. The pilot application was carried out with two assistant administrators.

First Application

To be able to implement exploratory factor analysis, first application was carried out for development of the scale. The details about the first application and the findings of the exploratory factor analysis were given under this part.

Research Samples

The school administrators in Kastamonu constitute the population of the first application in the study. To be able to reach the target number of participants, the online form was shared with some WhatsApp groups especially with the ones which contain Bachelor of Science, master and PhD degree school administrators. Hair et al. (2014) denote that the sample size for factor analysis should be at least 100 or more or the observations should be at least five times as many observations as the number of variables to be analyzed. As the draft scale contains 28 items, it can be put forward that the sample size should be at least 140. In this context, it was supposed that 227 school administrators could be an ideal sample. As for the sampling, a multi-phase sampling system (Cohen et al., 2018) was used for the research.

In the first phase, stratified random sampling was used. In stratified sampling, the population is divided into subpopulations or groups and respondents are selected from each subgroup (Kothari, 2004). In this research, the education levels and the duties of the school administrators were regarded to be different subgroups. In the second phase, quota sampling was applied. Quota sampling requires the researcher to determine the number of participants from different groups by taking the number of respondents which each group includes in its population. Thus, it ensures that each subgroup is represented in the sample in proportion to its population (Cohen et al., 2018). Therefore, the appropriate number of respondents from each subgroup has been represented in the sample. In the last stage, the different types of schools (primary, secondary, high school) were regarded to be different subgroups and stratified sampling was applied to represent these subgroups in the population.

In the second application, the school administrators who work in 20 different districts of Kastamonu province constituted the population. Stratified sampling method was utilized in this research to be able to represent different subgroups or locations which could propose different points of view about the data-based applications in education. Stratified sampling requires dividing the sample into different subgroups and then selecting a random sample from each of the groups (Christensen et al., 2015). In this research, each district of Kastamonu was regarded as a different subgroup and schools were selected randomly from these districts. The scale was sent to 146 different schools in 20 different districts and 313 school administrators participated in the study.

Data Collection

The data collection was carried out via Google survey instrument. The draft data collection tool was turned into a digital form first. Before the main application, the digital tool was sent to 10 school administrators so as to determine any possible words or expressions to be misunderstood and revised before the main data collection process. After that, the draft scale was sent to the school administrators determined in the sampling phase. After the draft data collection tool was sent, some time (about two weeks) was allocated to the respondents, and they were requested to respond before the deadline. The demographic data about the participants of the data collection process is presented in Table 1.

Table 1. The Demographic Data About the Participants of the First Application

Gender	Male	151	66.2%
	Female	77	33.8%
Seniority	1-10 Years	72	31.6%
	11-20 Years	90	39.5%
	21-30 Years	52	22.8%
	31 years and over	14	6.1%
Institution	Primary	114	%50
	Secondary	66	28.9%
	High	48	21.1%
Duty	Director	69	30.26%
	Assistant director	157	68.85%
Education level	Bachelor of science	176	77.2%
	Master	44	19.3%
	Ph. D.	8	3.5%

Data Analysis

In this study, SPSS and LISREL were utilized for the development of the scale. Both exploratory and confirmatory factor analyses were applied in the process. Before the main analyses were applied, data preparation analyses were fulfilled. As the first stage, missing data analysis was carried out. First of all, it was found out that the missing data is not more than 5% of the data sets and this proved that the percentage is below the threshold (Tabachnick & Fidell, 2013). The percentages of the missing data change between the values of .00 and .09 and missing data was found out in 10 data sets in total. As a result of the missing data analysis, it was calculated that $p=.967$ and $p>.05$. This verifies that missing data shows a random distribution and averaging can be utilized as a method to replace missing data with series means. According to Çokluk and Kayrı (2011) averaging (series means) is an effective method to replace missing values. As a result, in this research, averaging method was used to replace the missing values.

In the second phase, outlier analysis was carried out. Z-scores is one way of determining outliers in a data set and the z scores in data set should be between the values of +3 and -3 (Çokluk et al., 2018). In the Z-score analysis, the highest Z-score was calculated to be 1.88 and the lowest value was calculated to be-1.94. Z-score analysis verified that there are no outliers in the data set. For outlier analysis, Mahalonobis distance values were also checked. Mahalonobis distance is one of the ways of determining outliers in the data sets. Tabachnik and Fidel (2016) put forward that for a case to be regarded as an outlier with Mahalonobis distance, p value should be less than .001 for $\chi 2$ value. In the analysis, it was found out that $p<.001$ for only seven cases. Tabachnik and Fidel (2013) allege that Mahalonobis distance can hide a real outlier or "swamp" a normal case and it should not be utilized as the only way of determining outliers in a data set. In the light of these findings, it was regarded that there are no outliers in the data set.

After missing value and outlier analyses, normality tests were fulfilled. First of all, skewness and kurtosis values were calculated. Çokluk et al. (2018) assert that skewness and kurtosis values between the values of -1 and +1 are proof of normal distribution. Only the kurtosis value of the PhD degree group of respondents (only eight respondents) were calculated to have a meaningful discrepancy (-2.432) with the threshold value. For normality,

Kolmogorov-Smirnov goodness-of-fit test was also carried out and the result was found to be p=.200 and p>.05, which shows that the dataset has a normal distribution (Martin & Bridgmon, 2012). Histogram of the distribution was also examined, and the normal distribution was verified by the histogram. Normality was also tested with Levene test, and it was calculated to be p=.632 and p>.05 which proves the homogeneity of the variances (Stockemer, 2019). Finally, to be able to decide on the rotation method, Pearson correlation coefficients were calculated among the variables and the possible factors were calculated.

Field (2009) denotes that orthogonal rotation is used when the underlying factors are independent. In the correlation analysis, the lowest coefficient was calculated to be r=.46. Heiman (2011) put forward that a correlation coefficient around .40 should be regarded as strong. To test the correlation among the possible factors, an initial exploratory factor analysis was carried out with varimax, an orthogonal rotation method, and it was found out that the correlation coefficients among three possible factors were calculated to be as high as .608. As the result of these initial factor analysis results, it was decided to apply to oblique rotation strategy which regards the factors as correlated. In this research, as it was regarded that zero correlation is improbable direct oblimin as oblique rotation method was utilized.

Ethical Pledge of the Paper

It is pledged by the authors that scientific, ethical and citation rules are obeyed; any falsification related to data is done; chief editor of the Manisa Celal Bayar University Journal of the Faculty of Education has no responsibility regarding any ethical issues related to paper, all the responsibility is on the authors and this paper wasn't sent any other journal under consideration of publication.

Ethical committee : Gazi University Ethics Commission

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FINDINGS

Exploratory Factor Analysis

In this research, principal component analysis (PCA) which is one of the alternatives in exploratory factor analysis was applied. Principal component analysis is a kind of factor analysis which is applied in dimension-reduction process (Greenacre, 2013). Before the actual analysis of principal component analysis, Bartlett's test of sphericity was calculated. Bartlett's test of sphericity examines the correlations among all dependent variables and evaluates if significant intercorrelation exists among the variables. A calculation of p<.05 shows that sufficient correlations exist among the variables to proceed the analysis (Hair et al., 2014). In the Bartlett' test of sphericity analysis fulfilled, it was found out that p=.000 and p<.05 and this displays the sufficient correlation between the variables in the draft scale.

To be able to test the sampling adequacy, Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was made use of. Field (2009) note that the value of KMO test varies between the measurements of 0 an1 and a value close to 1 displays that the data set is suitable for factor analysis, yielding distinct and reliable factors. Can (2013) asserts that a value between .5 and .7 can be regarded to be adequacy of sampling. In the analysis Kaiser-Meyer-Olkin value was calculated to be p=.97 and this value reveals that sampling of the research is adequate for factor analysis.

In the first application of the factor analysis, the lowest communality was calculated to be p=.535 and Hair et al., (2014) put forward that communality over .50 display the eligibility of any item. In the total variance explained table, three factors with eigenvalues greater than 1 were revealed. These three factors have the cumulative total variance of 59.35%. The first factor itself has the total variance of 51.55% itself. This value and the scree plot displays a pattern of one factor scale at this stage. When the pattern matrix was scrutinized, it was found out that four items have close factor loadings under at least two different factors: Item 10, .412 under factor 1 and .431 under factor 2,

item 11, .314 under factor 1 and -.389 under factor 3, item 20, .363 under factor 2 and -.377 under factor 3, and item 24, .403 under factor 1 and .360 under factor 2. In the light of the findings, these four items were regarded to be overlapping items and they were omitted from the data set. After omitting the items, the principal component analysis was repeated.

In the second analysis KMO was calculated as p=.961 and Bartlett's test of sphericity was calculated to be p=.000 and these findings display that the data set is suitable for factor analysis. The lowest communality is .442. There are two factors which have an eigenvalue greater than 1 and the percentage of the total variance of the two factors are 56.25%. The first factor itself has the total variance of 51.6 %itself and the scree plot displays a structure of one factor pattern. In the pattern matrix table, it was revealed that items 8 and 19 have close factor loadings under different factors; Item 8, .358 under factor 1 and .416 under factor 2, item 19, .347 under factor 1 and .383 under factor 2. As the findings guided, these two items were regarded to be overlapping items and the analysis was repeated omitting these two items.

In the third repetition of the PCA analysis, Item 9 has factor loading values of .363 under factor 1 and .463 under factor 2. Çokluk et al. (2018) put forward that for an item to be regarded as overlapping, the difference between the factor loading values should be higher than .10. Therefore, item 9 has close factor loadings under different factors, it was regarded as an overlapping item, and it was deleted from the draft scale.

In the fourth phase of exploratory factor analysis, KMO was calculated p=.960 and Bartlett's test of sphericity as p=.000. Field (2009) suggests that if KMO result is close to the value 1, it proves that the data set is appropriate for the factor analysis. Bartlett's test of sphericity is an effective tool to determine the equality of variances (Singh, 2007) and a value of p<.05 displays that factors can be derived from the data set (Çokluk et al., 2018). Çokluk et al. (2018) assert that the total variance explained by the factors which have an eigenvalue of greater than 1 should be 2/3 but they denote that it is difficult to reach this value in social sciences, so the percentage of total variance explained could be reduced to 30% especially in one-factor structures. In this study, the total variance explained by the first factor is 51.60%. The total variance percentage of the second factor is 5.54%. Hair et al., (2014) suggest that the percentage of variance explained by a factor should not be less than 5% of the total variance explained and this verifies that second factor could be regarded as an independent factor. The scree plot was also examined. The lowest communality is .444. In the total variance explained table, there are two factors with an eigenvalue greater than 1. These findings reveal a pattern of two-factor scale.

When the component correlation matrix was scrutinized, the correlation was calculated to be r=.714. Büyüköztürk (2013) alleges that a correlation coefficient between the values of .70 and 1.00 could be regarded as a high correlation. The value might seem to cause a multicollinearity problem but Çokluk et al. (2018) put forward that for the multicollinearity problem to occur correlation coefficient should be .90 or higher. The correlation might have resulted from the rotation method applied in the study as direct oblimin which allows correlation between factors (Field, 2009) has been utilized. In the light of the findings of principal component analysis, the scale was formed of two factors; "Data-based management applications" and "Data literacy and management" The values factor loadings are presented in Table 2.

Table 2. The Factorial Structure of the Evaluative Scale of Data Based Management Applications in Education

Factor 1	Item No	Item	Factor Loadings
Data-based management applications	7	I can interpret visual data like graphics	.477
	13	I can benefit from educational databases in administration	.567
	14	I can benefit from technology to make use of data	.621
	15	I can ensure data privacy when necessary	.621
	16	I utilize data to improve instructional processes	.511
	17	I take data into account for decisions of distribution of sources	.551
	18	I benefit from data in communication processes effectively	.855
	21	I make use of data in planning processes	.694
	22	I utilize data about teachers for setting up teams	.694
	23	I benefit from data in supervision and evaluation processes	.661

	25	I make use of data effectively to solve administrative problems	.864
	26	I benefit from data for the justification of administrative decisions	.810
	27	I can ensure data sharing at school	.668
	28	I can utilize data from the environment of the school in administration	.762
Factor 2	Item No	Item	Factor Loadings
Data literacy and management	1	I can explain the term "data" and its scope	.732
	2	I have enough knowledge about the types of data	.740
	3	I have information about the tools to collect data	.876
	4	I know the instruments to analyze data	.735
	5	I can interpret the analyzed data	.698
	6	I know which sources of data are important for administration	.616
	12	I know the significance of performance data for administration	.605
	KMO=.960 Bartlett's Test of Sphericity=.000 Chi-Square=2855.68		

As the findings in Table 2 are scrutinized, it is observed that factor loadings are higher than is .30 as is regarded to be the threshold value in most researches (Field, 2009). Hair et al. (2014) allege that the values of .40 and even .30 can be regarded to be the minimum values for factor loadings. In the analysis, the lowest factor loading value was calculated to be .447. In the second phase, confirmatory factor analysis was applied with a new data set.

Second Application

To test the validity and reliability of the factorial structure established by the exploratory factor analysis, confirmatory factor analysis was carried out with a new data set. The analysis was carried out after the second application of the scale. The scale was re-organized before the second application in the light of the alterations determined by the exploratory factor analysis. The details about the second application and the findings of the confirmatory factor analysis are given below.

Data Collection

Data was collected mainly by Google survey form due to the difficulty of visiting schools owing to the pandemic. Google form was sent to the administrators through e-mail and WhatsApp. The demographic information about the participants is as in Table 3.

Table 3. The Demographic Data About the Participants of the Second Application

Gender	Male	225	71.9%
	Female	88	28.1%
Seniority	1-10 Years	27	8.6%
	11-20 Years	122	39%
	21-30 Years	149	47.6%
	31 yeras and over	15	%4.8
Institution	Primary	132	42.2%
	Secondary	114	36.4%
	High	67	21.4%
Duty	Director	63	20.1%
	Assistant director	250	79.9%
Education level	Bachelor of science	289	92.3%
	Master	21	6.7%
	Ph. D.	3	1%

Data Analysis

In this study, confirmatory factor analysis was carried out by means of LISREL. The path diagram was applied in setting up the model. Before the application of the confirmatory factor analysis, data preparation analyses were carried out. First of all, missing value analysis was fulfilled. The result of the expected maximization (EM) analysis was p=.587 and p>.05. This displayed that the missing data showed a random nature. In the analysis, it was also

found out that in none of the cases no more than 5% of missing data was found out and this showed that the percentage of the missing data is below the threshold (Tabachnick & Fidell, 2013). The highest percentage of missing value in the data was found out to be 1%. To replace the missing values in the data set, mean substitution was applied. Hair et al. (2014) put forward that mean substitution is one of the most widely applied methods to replace missing values in data sets. So, the missing values in the data set were replaced with series means method. After the missing value analysis, outlier analysis was carried out. First of all, scatterplot of the distribution was examined. Hair et al. (2014) assert that scatterplots are a bivariate method of determining outliers. There are a few other ways of detecting outliers in a data set and transforming the data into z-scores is one of those methods (Field, 2009). To detect the outliers, z scores were calculated. In the analysis, the highest z score was calculated to be 2.926. Field (2009) asserts that a z-score between the values of -.3.29 and +3.29 can be regarded to be the verification of a normal distribution. The z-score analysis displayed that there no outliers exceeding the threshold values in the data set. The residuals were assessed with Cook's distance. Cook's distance is one of the ways of evaluating the effect of a case on a model and the value should not be higher than 1 (Field, 2009). In the analysis, the highest Cook's distance was calculated to be =.004 verifying that there are no residuals or outliers in the data set. According to Cook's distance, values greater than 1 should be taken as the indicators of outliers (Field, 2009).

After missing value and outlier analyses, normality tests were carried out. In the first phase, histogram of the distribution was scrutinized. Then skewness and kurtosis values were calculated. Hair et al. (2014) allege that skewness values outside the range of -1 and +1 are the indicators of a substantially skewed distribution. For kurtosis, the range can be between the values of +3 and -3 (Singh, 2007). The highest skewness value was calculated to be .779 in the master degree sub-group. The highest kurtosis value was calculated as 2.678 again in the master degree sub-group. The skewness and kurtosis values are between the acceptable ranges. The Kolmogorov-Smirnov test was calculated to be $p=.033$ and $p <.05$ which can be regarded as the indication of the non-existence of a normal distribution (Martin & Bridgmon, 2012). In this stage, the data was tried to be normalized by some methods such as deleting the cases with higher z scores. However, it was not possible to get a normalized distribution in terms of the Kolmogorov-Smirnov test. Muthen and Muthen (2002) put forward that with a normal distribution, with no missing data, a sample size of 150 could be ideal for confirmatory factor analysis, however in a non-normal distribution without a missing data, a sample size of 265 is needed. In the research, as the sample size is 313, the data set could be regarded as appropriate for confirmatory factor analysis. The homogeneity of the variances was tested by Levene test in gender group and the score was calculated to be $p=.832$, $p >.05$, which can be regarded as the indication of the homogeneity of the variances (Stockemer, 2019). As the result of these analyses, the data set was regarded to be ready for the confirmatory factor analysis.

FINDINGS

Confirmatory Factor Analysis

Whereas exploratory factor analysis aims at identifying common factors and explaining their relationship to the observed data, confirmatory factor analysis aims at confirming a model as the analysis begin with a strong prior notion which is sufficient to identify the model (Singh, 2007). Exploratory factor analysis is applied for setting up a theory while confirmatory factor analysis is applied to test a theory (Tabachnik & Fidel, 2013). Before the confirmatory factor analysis, Critical N (CN) value was calculated. Critical N (CN) allows the researcher to decide on the goodness of fit for the sample size (Marsh, Balla & McDonald, 1988). The obtained value is compared with the sample size and the sample is expected to be equal or higher. In the analysis, it was calculated as Critical N (CN)=241.07, which verifies that our sample of 313 is enough to carry out a confirmatory factor analysis. Path diagram was utilized to test the model. As the estimation method, maximum likelihood method was applied as it is an estimation method fairly robust to violations of normality assumption (Hair et al., 2014). Asymptotic covariance matrix was applied in the analysis. The results of the analysis were presented in the Table 4.

Table 4. The CFA Results the Evaluative Scale of Data-Based Management Applications in Education Scale

Factor 2: Data literacy and management			
Item	t-scores	Standardized Loadings	R^2
1	8.93	.50	.26
2	12.76	.85	.46
3	13.26	.81	.49
4	12.42	.78	.44
5	10.80	.56	.36
6	12.71	.66	.46
12	11.13	.58	.37
Factor 1: Data-based management applications			
7	8.08	.44	.21
13	8.75	.51	.24
14	11.75	.71	.39
15	10.32	.54	.32
16	8.29	.41	.22
17	11.15	.70	.36
18	11.32	.71	.37
21	12.00	.74	.41
22	11.96	.73	.40
23	11.06	.65	.36
25	13.46	.75	.48
26	11.39	.71	.37
27	11.12	.59	.36
28	11.33	.60	.37

When Table 4 is examined, it can be observed that t scores which are about the degree to which the manifest variables predict latent variables are meaningful (t>2.56, p<.05). Çokluk et al. (2018) assert that t values over 1.96 are significant at the level of p=.01 significance level and t values over 2.56 are significant at the significance level of .05. When standardized factor loadings are analyzed, the lowest loading was calculated to be .68. Hair et al. (2014) assert that factor loadings should not be lower than .30. The goodness of fit statistics for the first order confirmatory factor analysis about the model are presented in Table 5.

Table 5. Goodness of Fit Statistics for the First Order CFA Analysis of the Evaluative Scale of Data-Based Management Applications in Education

Model	X^2	(X^2 /df)*	RMSEA	SRMR	NNFI	CFI	GFI	AGFI
First Order	351.65	1.66	0.046	0.048	0.98	0.98	0.91	0.89

**df=188, p<0.01*

Çokluk et al. (2018) put forward that a value below 3 for (X2 /df) verifies that the model is robust. Browne and Cudeck (1993; as cited in Kline, 2016) a value below .05 for RMSEA should be taken into account as the indicator of a good fit. The RMSEA score of the model was calculated .046. Kline (2016) denotes that a value close to 0 for standardized root mean square residual (SRMR) is the indication of a good fit. In this regard, the model can be regarded as displaying a good fit in terms of SRMR index. Tabachnick and Fidel (2013) allege that a NNFI score over .95 is the sign of good fit and the NNFI score of the model is over .95 (.98). Kline (2016) denotes that any CFI score close to 1 could be regarded as the indication of good fit, and the CFI score of the model is .98. Hair et al. (2014) put forward that a score over .90 for GFI addresses to the goodness of fit and the value in this model was calculated to be .91. Joreskog and Sorbom (1993; as cited in Çokluk et al., 2018) denote that AGFI score should be over .90 for a good fit but a score over .80 could be regarded as acceptable (Anderson & Gerbing, 1984; as cited in Çokluk et al., 2018). In the light of the findings in Table 3, the model could be regarded to display a good fit. The first order path diagram of the model is presented in Figure 1.

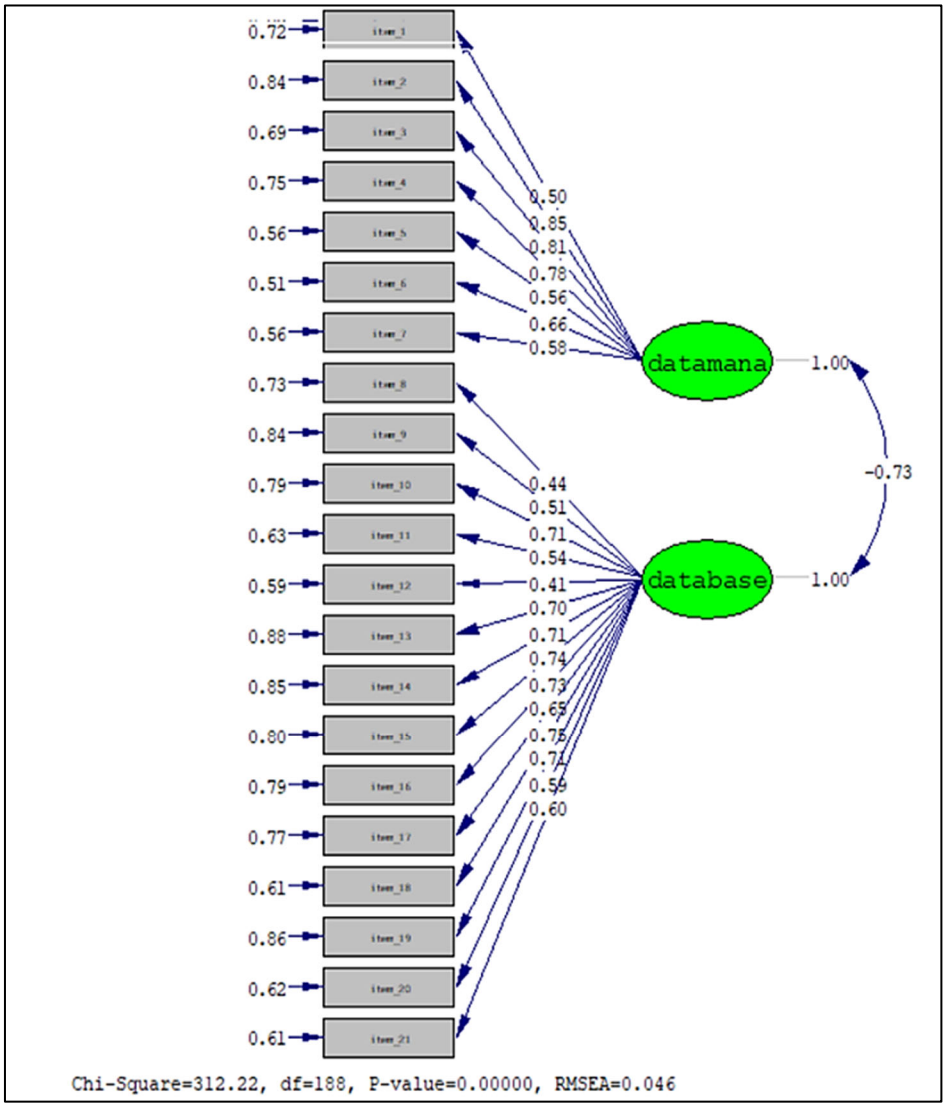

Figure 1. The first order path diagram of the evaluative scale of data-based management applications in education

In the light of the findings of the confirmatory factor analysis, the two factorial structure which had been established through exploratory factor analysis was confirmed by the findings of the analysis. The conformity indexes of confirmatory factor analysis display that the two factorial structure which had been established by the principal component analysis are robust. Cronbach's Alpha reliability coefficient was calculated to be .953. Moreover, for each item of the scale, the item-total correlations were calculated and the item-total correlations are presented in Table 6;

Table 6. The Item-Total Correlations

Factor 1	Item No	Item	Item-total correlations
Data-based management applications	7	I can interpret visual data like graphics	.718
	13	I can benefit from educational databases in administration	.711
	14	I can benefit from technology to make use of data	.724
	15	I can ensure data privacy when necessary	.725
	16	I utilize data to improve instructional processes	.703
	17	I take data into account for decisions of distribution of sources	.622
	18	I benefit from data in communication processes effectively	.656
	21	I make use of data in planning processes	.750
	22	I utilize data about teachers for setting up teams	.659
	23	I benefit from data in supervision and evaluation processes	.729
	25	I make use of data effectively to solve administrative problems	.673
	26	I benefit from data for the justification of administrative decisions	.633
	27	I can ensure data sharing at school	.710
	28	I can utilize data from the environment of the school in administration	.703

Factor 2	Item No	Item	Item-total correlations
Data literacy and management	1	I can explain the term "data" and its scope	.695
	2	I have enough knowledge about the types of data	.676
	3	I have information about the tools to collect data	.653
	4	I know the instruments to analyze data	.589
	5	I can interpret the analyzed data	.653
	6	I know which sources of data are important for administration	.683
	12	I know the significance of performance data for administration	.682
KMO=.960; Bartlett's Test of Sphericity=.000; Chi-Square=2855.68			

Table 6 includes the item-total correlations and Büyüköztürk (2013) asserts that items which have correlation coefficients higher than .30 can be regarded to have a distinguishing efficiency. In the same way, Field (2009) finds items having an item-total correlation higher than .30 encouraging. These findings can be regarded as the evidence of the reliability of the scale items. As the final analysis, to test the reliability of the scale, Cronbach's Alpha reliability coefficient was calculated, and it was found out to be .953. Coolican (2013) asserts that the Cronbach's Alpha values between the values of .75 and 1 are the indication of good reliability. Singh (2007) puts forward that the values over .70 are regarded to be verification of good reliability. In the light of these findings, the two-factor scale was regarded to be a reliable scale.

CONCLUSION and SUGGESTIONS

In this study, it was aimed to create a valid and reliable scale to evaluate the data-based management applications in education. The study was carried out in three main stages. In the first phase an item pool was created by the literature review and guidance of the experts in the area of data-based management applications in general and the realm of education. During this stage, some items were combined, some words in some items were changed with better ones and some items were totally omitted from the item pool. The draft scale was formed of 28 items. In the second stage, first application was carried out in the form of a survey design with a sample of 227 participants. In this phase, exploratory factor analysis was carried out and a two-factorial structure was discovered.

The scale will be rated as five point Likert scale consisting of degrees of "completely (5)", "great extent (4)", "average (3)", "seldom (2)", "never (1)". The assessment will be fulfilled through means. For the factor "data-based management applications", if the mean is "high", it will be interpreted as the fact that school administrators utilize data in administrative processes. If the mean is low, it will be the sign of not making use of data in managerial processes at school. For the factor "data literacy and management", high mean will show that administrators are data literate, and they are sufficient in data management processes and procedures. On the other hand, the low mean will be regarded as the sign of deficiency in data literacy and data management. A total score will not be obtained from the scale. There are no reverse coded items in the scale.

Depending on the scope, context and meaning of the items included in the factors, the first factor was denominated as "data-based management applications" and the second one was denominated as "data literacy and management". The first factor consisted of 14 items and the second one consisted of seven items. The first factor mainly consists of items aiming at determining the capabilities of school administrators in terms of data-based management applications. The second factor consists of items aiming at discovering the knowledge level of administrators for "data" and "data management" concepts. In the second phase, to test the two-factorial structure, a second application was carried out with a new sample of 313 school administrators. The confirmatory factor analysis verified the two-factorial structure of the scale. Finally, to test the internal reliability of the scale, reliability analysis was carried out. The Cronbach's Alpha coefficient was calculated to be .953. Coolican (2013) and Singh (2007) denote that any Cronbach Alpha score over .75 should be regarded as an indication of strong reliability. Hair et al. (2014) assert that even a score higher than .60 could be regarded as acceptable. The Cronbach Alpha coefficient displays the internal reliability and consistency of the scale. The reliability was also tested by split-half method. Split-half reliability is a reliability test in which a test is split into two parts and scores from the two halves are correlated

(Kline, 2016). Coolican (2013) denotes that a score obtained from split-half method should be over .75 to be able to regard a scale as reliable. In the analysis, the score was calculated to be .917.

All these findings display that "the evaluative scale of data-based management applications in education" is a reliable and valid scale. In the application process, it is recommended that factor 2 which has been denominated as "data literacy and management" be designed to be at the beginning of the scale as data literacy and management are regarded as the precursors of data-based management applications. The scale was formed to assess the effectiveness and efficiency of data-based management applications at schools. The scales to evaluate the application in a more specific basis could be created for primary, secondary, and high schools on even for universities. The more specific scales in terms of scope could yield more context sensitive results leading to improving the administrative applications in educational institutions.

Data is a never depleting organizational resource and the only one not to run out when consumed by all shareholders. In this regard, data can serve as an important tool for educational management and administration. The term "data based" denotes establishing a "data-based culture" in any kind of organizations. If this can be achieved, it can pave the way to establishing a "trust" culture in organizations, an understanding for the priorities of the organizational goals, an inquisitive environment, an organizational learning context (Anderson, 2015). In our age, schools have data about their students, teachers and employees and school administrators can make use of these data to make teaching and learning contexts more effective (Wayman et al., 2012). Therefore, data can also play an important role for developing instructional leadership skills of school administrators. As a result, data-based approach can play an important role in developing management, administrative and leadership skills of school administrators resulting in a more efficient and effective schools. In this regard, the scale developed can be an effective tool to shed light on the current situation of the data-based management applications in education.

The most important limitation of the study is that it focuses on only three dimensions of data-based management; they are data-based management applications, data literacy and data management. However, data-based management constitutes many other components such as data culture and data-based leadership. Further research may also focus on each of the management processes such as data-based decision making, planning, organizing etc. Furthermore, a qualitative study can also lead to a deeper understanding about the data-based management applications at schools. This study focused only on schools but data-based approach in educational management needs a broader scope, therefore scales for higher level of educational management institutions can also be developed.

REFERENCES

Allen, G. D. (2017). Hierarchy of knowledge-from data to wisdom. *International Journal of Current Research in Multidisciplinary (IJCRM), 2*(1), 15-23. http://www.ijcrm.com/publish_article/edition_8/IJCRM_2123.pdf

Anderson, C. (2015). *Creating a data driven organization: Practical advice from the trenches.* Sebastopol, CA: O'Reilly Media, Inc.

Büyüköztürk, Ş. (2013). *Sosyal bilimler için veri analizi el kitabı.* Pegem Akademi.

Can, A. (2013). *SPSS ile bilimsel araştırma sürecinde nicel veri analizi.* Pegem Akademi.

Cemaloğlu, N. (2007). Okul yöneticilerinin liderlik stillerinin farklı değişkenler açısından incelenmesi. *Türk Eğitim Bilimleri Dergisi*, *5*(1), 73-114. https://dergipark.org.tr/en/download/article-file/256353

Christensen, L. B., Johnson, R. B. & Turner, L. A. (2015). *Research methods, design, and analysis* (12th ed). Pearson Education Limited.

Cohen, L., Manion, L. & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.

Çokluk, Ö., & Kayrı, M. (2011). Kayıp değerlere yaklaşık değer atama yöntemlerinin ölçme araçlarının geçerlik ve güvenirliği üzerindeki etkisi. *Kuram ve Uygulamada Eğitim Bilimleri, 11*(1), 289-309. https://docplayer.biz.tr/217014-Kayip-degerlere-yaklasik-deger-atama-yontemlerinin-olcme-araclarinin-gecerlik-ve-guvenirligi-uzerindeki-etkisi.html

Çokluk, Ö., Şekercioğlu, G. & Büyüköztürk, Ş. (2018). *Sosyal bilimler için çok değişkenli istatistik: SPSS ve LISREL uygulamaları* (5. bs). Pegem Akademi.

Coolican, H. (2013). *Research methods and statistics in psychology* (5th ed). Routledge.

Çubukçu, Z., & Girmen, P. (2006). Ortaöğretim kurumlarının etkili okul özelliklerine sahip olma düzeyleri. *Sosyal Bilimler Dergisi, 16*(2006), 121-136. https://dergipark.org.tr/en/download/article-file/843732

Curuksu, J. D. (2018). *Data driven: An introduction to management consulting in the 21st century.* Springer International Publishing AG.

Datnow, A. & Park, V. (2014). *Data-driven leadership.* John Wiley & Sons, Inc.

Datnow, A. & Park, V. (2015). Five (good) ways to talk about data. *Educational Leadership, 73*(3), 10-15. http://www.thecircleofdata.com/uploads/7/8/8/2/78829528/five__good__ways_to_talk_about_data_-_dd_mod_5.pdf

Dixon, R. (2003). *The management task (3rd ed).* Butterworth-Heinemann.

Dougherty, C. (2015). *How school district leaders can support the use of data to improve teaching and learning.* ACT Inc.

Duranay, P. Y. (2005). Ortaöğretim kurumlarının etkili okul özelliklerini karşılama düzeyleri. Yüksek Lisans Tezi, Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü, Denizli.

Ertürk, R., & Memişoğlu, S. P. (2018). Öğretmenlerin etkili okula yönelik görüşleri. *International Journal of Social Science, 68*(Summer, 2018), 55-76. https://jasstudies.com/DergiTamDetay.aspx?ID=7665

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed). Sage Publications Ltd.

Finn, M. (2016). Atmospheres of progress in a data-based school. *Cultural Geographies, 23*(1), 29-49. https://doi.org/10.1177/14744740155754

Gökçe, F., & Kahraman, P. B. (2010). Etkili okulun bileşenleri: Bursa ili örneği. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 23*(1), 173-206. https://dergipark.org.tr/en/download/article-file/153403

Gomez-Mejia, L. R. & Balkin, D. B. (2012). *Management: People, performance, change.* Pearson Education, Inc.

Greenacre, M. J. (2013). *Correspondence analysis.* In T. O. Little (Edt). The Oxford handbook of quantitative methods (p. 665-677). Oxford University Press.

Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed). Pearson Education Limited.

Hartong, S., & Förschler, A. (2019). Opening the black box of data-based school monitoring: Data infrastructures, flows and practices in state education agencies. *Big Data & Society, 6*(1), 1-12. https://doi.org/10.1177/2053951719853

Heiman, G. W. (2011). *Basic statistics for the behavioral sciences* (6th ed). Wadsworth, Cengage Learning.

Hitt, M. A., Black, J. S. & Porter, L. W. (2012). *Management* (3rd ed). Pearson Education, Inc.

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed). Guilford Press.

Knapp, M. S., Copland, M A. & Swinnerton, J. A. (2007). Understanding the promise and dynamics of data-informed leadership. *Yearbook of the National Society for the Study of Education, 106(1),* 74-104. https://doi.org/10.1111/j.1744-7984.2007.00098.x

Kothari, C. R. (2004). *Research methodology: Methods and techniques.* New Age International (P) Ltd., Publishers.

Ladley, J. (2012). Data governance: *How to design, deploy, and sustain an effective data governance program.* Morgan Kaufmann.

Leary, L. M. (2015). *It is the data revolution and the year of evaluation, is your organization ready?: Assessing organizational data culture to create an ideal data ecosystem* (Unpublished master's thesis). SIT Graduate Institute, Washington, DC.

Lunenburg, F.C. & Orstein, A. C. (2013). *Eğitim yönetimi (6. bs)* (Çev. Gökhan Arastaman). Nobel Akademik Yayıncılık Eğitim Danışmanlık Tic. Ltd. Şti.

Luo, M. (2008). Structural equation modeling for high school principals' data-driven decision making: An analysis of information use environments. *Educational Administration Quarterly*, *44*(5), 603-634. https://doi.org/10.1177/0013161X08321506

Marsh, H. W., Balla, J. R., & McDonald, R. P. (1988). Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological bulletin*, *103*(3), 391.

Marsh, J. A., & Farrell, C. C. (2015). How leaders can support teachers with data-driven decision making: A framework for understanding capacity building. *Educational Management Administration & Leadership*, *43*(2), 269-289. https://doi.org/10.1177/1741143214537229

Martin, W. E. & Bridgmon, K. D. (2012). *Quantitative and statistical research methods: From hypothesis to results.* Jossey-Bass.

Memduhoğlu, H. B., & Karataş, E. (2017). Öğretmenlere göre çalıştıkları okullar ne kadar etkili? *Eğitim Bilimleri Araştırmaları Dergisi*, *7*(2), 227-244. https://acikerisim.siirt.edu.tr/xmlui/bitstream/handle/20.500.12604/2476/51.%20Etkili%20Okul.pdf?sequence=1&isAllowed=y

Milli Eğitim Bakanlığı, (2018). 2023 *eğitim vizyonu.* Ankara: Milli Eğitim Bakanlığı. https://www.gmka.gov.tr/dokumanlar/yayinlar/2023_E%C4%9Fitim%20Vizyonu.pdf

Morrison, R. (2015). *Data-driven organization design: Sustaining the competitive edge through organizational analytics.* Kogan Page Limited.

Muthen, L. K., & Muthen, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. Structural Equation Modeling: *A Multidisciplinary Journal*, *9*(4), 599-620. https://psychology.concordia.ca/fac/kline/sem/qicss2/muthen2002.pdf

Paine, K. D. (2007). *Preface.* In W. T. Paalberg (Ed.), Measuring public relationships: The data-driven communicator's guide to success (pp. 13-16). KDPaine & Partners, LLC.

Robbins, S. P. & Coulter, M. (2012). *Management* (11th ed). Pearson Education, Inc.

Rowley, J. (2007). The wisdom hierarchy: Representations of the DIKW hierarchy. *Journal of Information Science*, *33*(2), 163-180. https://doi.org/10.1177/0165551506070706

Sanders, J. (2016). Defining terms: Data, information and knowledge. *Proceedings of SAI Computing Conference 2016, July 13-15, 2016, London,* UK. https://ieeexplore.ieee.org/document/7555986

Selwyn, N. (2016). 'There's so much data': Exploring the realities of data-based school governance. *European Educational Research Journal*, *15*(1),54-68. https://doi.org/10.1177/1474904115602

Singh, K. (2007). *Quantitative social research methods.* Sage Publications Inc.

Stockemer, D. (2019). *Quantitative methods for the social sciences: A practical introduction with examples in SPSS and stata.* Springer International Publishing.

Tabachnick, B. G. & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed). Pearson Education, Inc.

Toprak, M. (2011). *İlköğretim okullarında görev yapan öğretmenlerin okul etkililiğine ilişkin görüşleri (Adıyaman ili örneği).* Yüksek Lisans Tezi, Fırat Üniversitesi Sosyal Bilimler Enstitüsü, Adıyaman. http://acikerisim.firat.edu.tr/xmlui/bitstream/handle/11508/16598/285887.pdf?sequence=1&isAllowed=y

Wayman, J.C., Spring, S. D., Lemke, M. A. ve Lehr, M. D. (2012). *Using data to inform practice: Effective principal leadership strategies.* Proceedings of 2012 annual meeting of the American Educational Research, Association, Vancouver, British Columbia, Canada. http://www.waymandatause.com/wp-content/uploads/2013/11/Wayman-Spring-Lemke-Lehr-Principal-Data-Use-Strategies.pdf

Ethical Pledge of the Paper

It is pledged by the authors that scientific, ethical and citation rules are obeyed; any falsification related to data is done; chief editor of the Manisa Celal Bayar University Journal of the Faculty of Education has no responsibility regarding any ethical issues related to paper, all the responsibility is on the authors and this paper wasn't sent any other journal under consideration of publication.

Ethical committee : Gazi University Ethics Commission

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SUPPLEMENTS

Supplement 1

Table 7. The Original Turkish Form of the Scale

Faktör 1	Madde No	Analiz Süreci Madde No	Madde
Veriye dayalı yönetim uygulamaları	8	7	Grafik gibi görsel verileri yorumlayabilirim
	9	13	Eğitime ilişkin veri tabanlarından (EBA, E-Okul) yönetsel süreçlerde yararlanabilirim
	10	14	Veriden yararlanma hususunda teknolojiden yararlanabilirim
	11	15	Gerektiğinde veri gizliliğini sağlayabilirim
	12	16	Veriden öğretimsel süreçlerin geliştirilmesinde yararlanırım
	13	17	Kaynakların dağıtımına dönük kararlarda veriyi temel alırım
	14	18	Veriden iletişim süreçlerinde etkili biçimde faydalanırım
	15	21	Veriden planlama süreçlerinde yararlanabilirim
	16	22	Öğretmenlere ilişkin veriden takım kurma süreçlerinde yararlanırım
	17	23	Veriden denetim ve değerlendirme süreçlerinde yararlanabilirim
	18	25	Yönetsel sorunların çözümünde veriyi etkili kullanabilirim
	19	26	Veriden yönetsel kararların gerekçelendirilmesinde yararlanırım
	20	27	Okul içinde veri paylaşımını sağlayabilirim
	21	28	Yönetimde okulun çevresinden elde ettiğim verilerden yararlanabilirim
Faktör 2	Madde No	Analiz Süreci Madde No	Madde
Veri okuryazarlığı ve veri yönetimi	1	1	Veri kavramını ve kapsamını açıklayabilirim
	2	2	Veri türleri hakkında yeterli bilgiye sahibim
	3	3	Veri toplama araçları hakkında bilgi sahibiyim
	4	4	Veri analiz araçları hakkında bilgi sahibiyim
	5	5	Analiz edilmiş veriyi yorumlayabilirim
	6	6	Hangi veri kaynaklarının yönetim açısından önemli olduğunu bilirim
	7	12	Performans verilerinin yönetim açısından önemini biliyorum