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Power Loss (Entropy) Scale in Schools: Validity and Reliability Study

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ABSTRACT

The research aims to develop a measurement tool with validity and reliability for measuring loss of power (entropy) in schools. The study group of the research consists of a total of 596 teachers working in 15 public schools in Van Province in the 2023-2024 academic year. As a result of the application of Exploratory Factor Analysis (EFA) to 381 teachers to ensure construct validity, a scale with 26 items and four factors, 1. People-oriented work environment and parents, 2. Energy use and environment, 3. Technology, 4. Achievement of goals and supervision—was created. The total variance rate of the scale was obtained as 63.29%. The factor load values of the items in the scale are between 509 and 829. It was also confirmed by confirmatory factor analysis (CFA) that the scale measures a four-factor structure. In addition, a 26-question scale was studied with a study group consisting of 215 teachers in the confirmatory factor analysis. According to the answers of the study group, the Cronbach Alpha internal consistency coefficient and item total correlations were analyzed. While Cronbach Alpha values were found to be 93, 95, 88, and 92 for each factor and 97 for the whole scale, the lowest value among the item total correlations of the items in the factors was 535, and the highest value was 832. The scale created in the study will be applicable and functional as a valid and reliable measurement tool for schools and valid for other educational organizations and as an Entropy Scale with the results of the validity and reliability analysis carried out and applied.

Keywords:
Schools, loss of power, open systems

1. Introduction

The inability of organizations to adapt to changing conditions is expressed as a situation that causes them to lose power and eventually disappear. The increase in the speed of change with globalization deeply affects schools, which are educational organizations, like all organizations. In particular, the loss of power (entropy) experienced by schools, which are educational organizations, creates problems in terms of achieving goals, and it can carry the risk of eliminating the effects and functions created by the school in individual and social terms as well. In this context, it is inevitable that the loss of power will have repercussions for all stakeholders of the school and the environment. Educational organizations are also defined as systems, and in this respect, all approaches and practices related to the system are valid for schools. Power loss can be defined as the loss of energy in organizations and structures, which is expressed as the failure to use human resources, time, tools, and equipment functionally; failure to adapt to innovations; deviation from goals; poor quality in products; lack of communication; and disorder. In the context of education, power loss (entropy) is shown as conflicts in school organizations, failure to solve problems, non-compliance with rules and disorder, ineffectiveness of education and training programs, burnout of teachers and administrators, failure to achieve goals, and also minimum use of human and material resources allocated to education.

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Social systems are divided into two as open and closed systems (Güney, 2019; Temüroğlu, 2021). While open systems are systems that receive information and materials from the outside (Güney, 2019: 11), are open to internal and external influences, and are renewed by reacting to changes (Temüroğlu, 2021; Ipek, 2008; Yalçınkaya, 2002), closed systems are systems that do not receive any input from the outside and are destroyed by entropy over time (Güney, 2019), have little or no internal dynamics, and are closed to the external environment (Temüroğlu 2021). The long-term survival of a system depends on its ability to reduce entropy (Biliç, 2023). The higher the entropy of the system, the more uncertain the system is (Jing, 2012). For this reason, closed systems can disappear very quickly. Open systems, on the other hand, can follow and adapt to changing conditions by accessing environmental energy and information thanks to their dynamic characteristics (Biliç, 2023). This shows the importance of the environment for the organization.

Since organizations are open systems that interact with the environment (Bursalıoğlu, 2022; Özdemir, Sezgin, and Koşar, 2022), schools are communities described as organizations with social and open system features (İpek, 2008; Yalçınkaya, 2002; Sezgin, 2005). Due to these characteristics, schools should be in constant communication with their environment and its sub-systems, keep their relations with the social environment dynamic and continuous, and keep up with development and changes (Özdemir et al., 2012; Cited: Özdemir, Sezgin, and Koşar 2022). Schools that do not follow the changes experience entropy over time.

The concept of entropy was first considered in the literature by Rudolph Clausius in 1965 as a measure of disorder and uncertainty in a system (Zhang - Gu et al., 2011; Akt Ömürbek, Eren, and Dağ, 2017). Entropy was defined as the tendency of order towards disorder by mathematicians in the 19th century (Arnheim, 2001; Kaleli, 2020), and in physics, it was expressed as uncertainty and decay in a system (Kaleli, 2020). These statements show that entropy is a negative force and undesirable in systems.

The common idea in the concept of entropy is that entropy is a property of the community, not of an element or component. Entropy is a phenomenon that every organization has to deal with in its management. As entropy is a phenomenon that destroys the universe, it can also destroy organizations by leading them to chaos (William, 2020). The decrease in entropy in a certain region can be achieved despite the increase in entropy in other regions (Taslaman 2006). This shows that entropy can be reduced in small steps in systems. The decrease in entropy reduces uncertainty and disorder and increases work efficiency. This helps people use free energy to do their work instead of dealing with disorder (Ram, 2022). Some entropy is produced in energy conversion, and as a result, some of the energy becomes unusable. In energy conversion, some entropy is generated, and as a result, some of the energy becomes unusable. Living organisms continue their lives by reducing the chaos (entropy) created by using the energy they receive from their environment (Alpan, 2011) and strive for this.

The fact that it is used in almost every aspect of our lives increases the importance of understanding it.Albert Einstein explained that the law of entropy is more important than the law of gravity and the theory of relativity and explained why thermodynamics influenced him so much by saying, “The simpler a theory is in its claims and the more concepts it relates, the more impressive it is” (Biliç, 2023). The law of entropy, one of the most important laws of physics, meets all the criteria that are important for being a successful scientific theory, such as being based on observation and experiment, being able to misunderstand, the ability to see ahead, and successful mathematical explanation (Taslaman 2006). This shows that it has a high level of impact on societies.

Today, we are passing through a period when the biggest economic crisis has occurred, unemployment has increased, income distribution has been continuously deteriorating, ecological problems have become dangerous, the danger of nuclear war has increased, and concepts such as crisis, risk, chaos, and complexity management are frequently heard (Alpan, 2011). The concept of entropy that has become an integral part of daily life is a concept directly related to problems such as loss disorder, uncertainty, chaos, complexity, disorganization, miscommunication, pollution, aging, deterioration, decay, death, and bankruptcy (Alpan & Efil, 2011; Gök, 2014).

In order to reduce these concepts, negative entropy needs to be created. Some environments need to be created for negative entropy. One of these is the production of information. In order for information to produce negative entropy, the quality of knowledge should be emphasized, and useful information should be shared widely by using technologies. In addition, it is important to give importance to simplicity, plainness, and flexibility in process design and to direct specializations to areas that will increase the quality of life and prevent the increase in entropy. The development of renewable energy sources, the development of

purification and recycling technologies, alternative solutions to health and raw material problems, the expansion of access to information, and the creation of a global water management system can be given as examples of innovation activities that can be carried out through global cooperation (Alpan, 2011).Therefore, such activities should be emphasized.

Every kind of activity creates chaos and disorder, and this leads to an increase in entropy. For this reason, entropy needs to be managed and kept under control in systems. An important development began in the 1960s, and organizations were no longer closed systems but open systems that were affected by the environment and provided inputs and outputs to the environment. In this regard, an important development began in the 1960s, and organizations were no longer considered closed systems but open systems that are affected by the environment and give inputs and outputs to the environment. Today, reasons such as economic crises that occur with globalization, competition between countries, decreasing product life cycles, increasing customer demands, accelerating change, and increasing the speed of communication increase the uncertainties in the environment. This high-entropy environment complicates the work of managers and increases the need to create organizations that can cope with complexities. This triggers the emergence of many management models. The common goal of these management models is to cope with entropy, enabling organizations to adapt faster to an evolving and changing world to survive and continue to grow. However, it is seen that the management models are insufficient in terms of entropy on a global scale (Alpan, 2011).

Management entropy is defined differently in different schools with different perspectives. Ren Peiyu (1997) defines management entropy as the ratio of the termed management performance (Liu, 2023), while Lu (2023: 183) explains it as one of the important factors affecting the survival and progress of enterprises. The entropy method was developed as an objective method in the allocation of weights depending on the decision (Jati and Dominic, 2017). (Entropi yöntemi, karara bağlı olarak ağırlıkların tahsis edilmesinde objektif bir yöntem olarak geliştirilmiştir (Jati ve Dominic, 2017). Total Entropy Management is a management model that aims to efficiently control all kinds of entropy sources and reduce entropy production in order to create prosperity, happiness, and sustainable life peace on a global scale (Alpan, 2011). However, in order to be successful and institutionalized in modern management, many other factors must also be taken into account (Tembhare, Amrendra, and George, 2021). The entropy method allows us to make objective analyses on quantitative data (Demirci, 2023).

The loss of power (entropy), which is of critical importance for schools, which are educational organizations, has started to become a frequently encountered problem and has started to cause deviations from the goals of schools. In this context, it has started to be expressed by all stakeholders that schools are faced with the situation of not being able to meet individual and social expectations by moving away from them. It is clear that a measurement tool for the loss of power in schools and its causes is of critical importance in terms of related studies and research. Determination of the loss of power and its level can be expressed as a necessary situation to solve this problem.

1.1. The Purpose of Research

The aim of the research is to develop a valid and reliable measurement tool for measuring and determining the level of entropy in schools based on teachers' perceptions. It is aimed at a measurement tool for determining the power losses of schools and other organizations that will contribute to the field and studies. In schools, which are educational organizations, it is aimed to determine the causes of problems such as conflicts, lack of motivation of employees, burnout, loss of resources, inadequacy of technological tools, lack of supervision, evaluation, and turnover of teachers, which have been frequently brought up recently and expressed as power loss (entropy). Since the power loss (entropy) in schools constitutes a critical process in terms of sustainability, it is of vital importance to determine the variables affecting this problem and to solve the problem. This study aims to develop a scale that can be used functionally by schools as educational organizations that have a direct impact on social life and have transformative power. Another aim is to help all stakeholders in schools (administrators, teachers, students, parents, etc.) to develop approaches and practices to identify the causes of power loss and prevent it.

2. Methodology

In this study, it was aimed to develop a tool that would produce valid and reliable results to measure the level of entropy in schools based on the perceptions of teachers'. This research is a scale development study designed with a quantitative method. Exploratory Factor Analysis and Confirmatory Factor Analysis were applied in the scale development process. Correlation and Cronbach's alpha analyses were also applied. Accordingly, the study is a scale development study. The research was designed in a survey model.

2.1. Working Group

In the study, data were collected from 381 people to perform Exploratory Factor Analysis and from 215 people to perform Confirmatory Factor Analysis. Descriptive statistics of the study group are given in Table 1.

Table 1. *Descriptive Statistics of the Study Group*

	First Study Group		Second Study Group	
	f	%	*f*	%
Gender				
Woman	197	51.7	114	53
Man	184	48.3	101	47
Age				
23-30	76	19.9	31	14.4
31-40	223	58.5	113	52.6
41-50	68	17.8	58	27
51 and above	14	3.7	13	6
Education Level				
Associate degree graduate	-	-	1	0.5
Bachelor's degree	331	86.9	155	72.1
Master's degree graduate	46	12.1	56	26
PhD graduate	4	1	3	1.4
Branch				
Classroom teacher	139	36.5	39	18.1
Science	22	5.8	14	6.5
Mathematics	40	10.5	41	19.1
English	28	7.3	14	6.5
Turkish	23	6	21	9.8
Literature	13	3.4	8	3.7
Guidance	20	5.2	10	4.7
Physics	2	0.5	-	-
Biology	-	-	1	0.5
Chemistry	2	0.5	2	0.9
Other branches	92	24.1	65	30.2
School				
Primary School	159	41.7	45	20.9
Secondary School	151	39.6	122	56.7
High School	71	18.6	48	22.3

When Table 1 is examined, it is seen that the first study group has a similar distribution in terms of gender. The majority of the group (58.5%) was between 31 and 40 years of age. There were no participants under the age of 23 in the study group. The vast majority of the participants were undergraduate graduates (86.9%). Most of the data were collected from classroom teacher participants. Finally, when the distribution of the schools where the participants work is analyzed, there are similar distributions in primary and secondary schools; a relatively smaller portion of the group (18.6%) works in high school. The gender distribution in the second study group is also close to each other. The vast majority of the group (72.1%) has a bachelor's degree. Mathematics teachers participated the most in the study. When the distribution of the study group according to the schools they work in is examined, it can be seen that the teachers who work in secondary schools participated in the study the most (56.7%).

Validity and reliability evidence was presented during the data analysis phase. Exploratory factor analysis was reported in the validity evidence. Before moving on to factor analysis, the univariate and multivariate normality of the data set was examined. Univariate normality was examined with skewness and kurtosis values and standard z-scores. Standard z-values for the items are in the range of -/+1. Along with normality, linearity, multicollinearity, and sample size are other assumptions of the technique (Ayan and Yalçın, 2023). A linearity examination was performed with scatter diagrams. Multicollinearity was examined with a correlation matrix and Barlett's sphericity test result. All correlations between expressions are not statistically significant and above 90. The sphericity test result is significant (x2=11215.456,p<.01). KMO value is 947. There is no multicollinearity problem in the data set. The data set is approximately nine times the number of items. The analysis was done with the SPSS 22.0 package program.

Confirmatory Factor Analysis was examined for another validity proof. When the assumptions of the technique were examined, kurtosis and skewness coefficients for single and multivariate normality, standard z scores, and Mahalanobis values were examined. The kurtosis and values of the items were in the range of -/+1. Although the kurtosis values were mostly in the range, some items exceeded -1.00 very little. However, this situation was ignored because the sample was large enough. Standard z-scores were in the range of -/+3. A Q-Q plot examination was performed for multivariate normality. Scatter diagrams were used in the linearity examination. The correlation matrix was performed with Mplus 8.

2.2. Ethical

This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Dicle University Human Research Ethics Committee. Approval Decision No. 04.06.2024-717958.

3. Findings

The findings obtained from the study are explained under the titles of findings for Exploratory Factor Analysis (EFA) and findings for Confirmatory Factor Analysis (CFA).

3.1. Exploratory Factor Analysis

There are decisions that need to be made when performing the Exploratory Factor Analysis of the developed scale. These are the factor extraction technique and the rotation method. In the study, the Principal Components Analysis was selected as the factor extraction technique, and the varimax method was selected as the rotation technique. Finally, it was decided that the lowest factor loading would be 50. In making this decision, the fact that factor loadings of 50 and above were suggested during the scale development process was taken into consideration.

Hair et al. (2009) evaluated factor loadings of 30-40 as the lowest acceptable value (minimally acceptable) and described 50 and above as practically significant.

PCA was run with 44 items. There were no items that did not load on any sub-dimension. Overlapping items were removed in order (m10, m19, m12, m11, m13, m22, m24, m16, m32, m40, m38, m39). In the next step, items with standard factor loadings below Sın (m1, m8, m23, m14) were removed. As a final step, a two-item sub-dimension was formed. However, since measurement theories suggest that latent variables should be measured with at least 3 indicators (items), these items were also removed from the scale (m15, m37). At the end of all examinations, a 4-factor structure with 26 items was obtained. The scree plot is given in Figure 1.

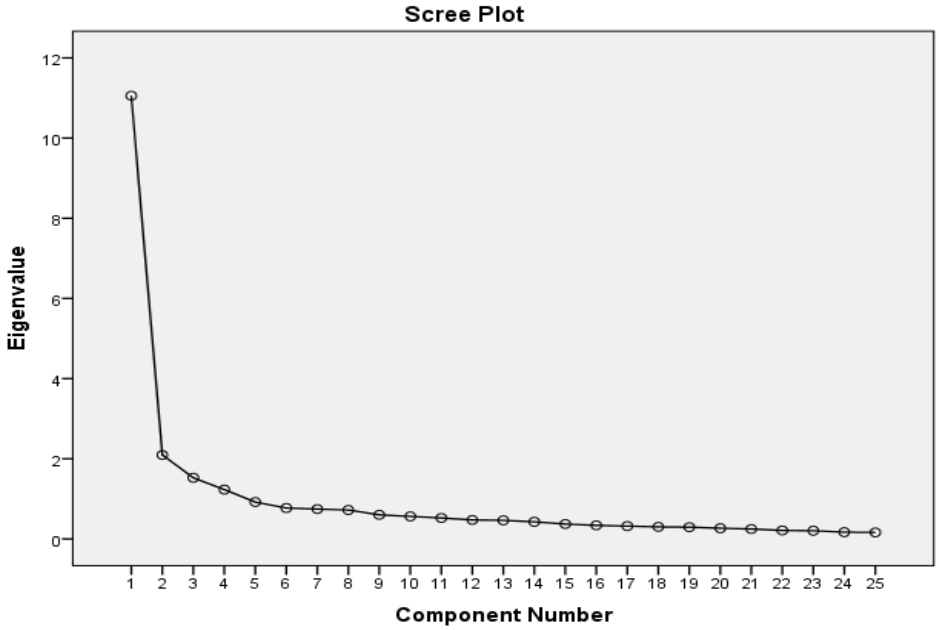


Figure 1. Slope Accumulation Chart

When looking at the Slope Accumulation graph, it can be seen that the graph starts to flatten, and there are 4 dimensions with eigenvalues greater than 1.00. The standard factor loadings and explained variance ratios for 26 items collected in four dimensions are given in Table 2.

Table 2. *Standard Factor Loadings Obtained as a Result of TRA*

	Item No.	Standard Factor Loading	Variance Explained	Correlation with Subscale	Item Total Correlation
First dimension	M26	0.71	19.54	.609**	.445**
	M35	0.709		.722**	.628**
	M27	0.699		.804**	.706**
	M36	0.687		.666**	.554**
	M28	0.677		.788**	.706**
	M30	0.624		.820**	.781**
	M29	0.619		.800**	.776**
	M34	0.564		.743**	.693**
	M33	0.551		.759**	.730**
	M25	0.528		.706**	.668**
	M31	0.515		.775**	.743**
Second Dimension	M6	0.802	18.04	.870**	.737**
	M7	0.754		.807**	.678**
	M5	0.749		.852**	.727**
	M2	0.729		.776**	.656**
	M1	0.718		.784**	.688**
	M3	0.715		.770**	.605**
	M4	0.672		.779**	.654**
Third Dimension	M18	0.704	13.58	.805**	.616**
	M17	0.667		.714**	.548**
	M21	0.642		.785**	.597**
	M20	0.626		.800**	.680**
Fourth Dimension	M44	0.829	12.13	.891**	.642**
	M43	0.807		.863**	.608**
	M42	0.772		.835**	.586**
	M41	0.509		.752**	.750**
Total			63.29		

When Table 2 is examined, there are 11 items in the first dimension. The variance explained by this dimension is $19.54. The factor loadings in this dimension vary between 52 and 71. The second sub-dimension is 7. The

item explains 18.04% of the variance. Standard factor loadings range from 67 to 80. There are 4 items in the third sub-dimension. The explained variance is 13.58. Standard factor loadings range from 63 to 70. There are 4 items in the last sub-dimension. The explained variance is $12.13. The standard factor loadings in this sub-dimension range from 51 to 83. The total variance explained by 25 items in the 4 sub-dimensions is approximately 64. When the correlations of the items with the subscale and the total scale score are examined, the item correlations with the first subscale vary between 61 and 82, the item correlations with the second subscale vary between 77 and 87, the item correlations with the third subscale vary between 71 and 80, and finally the item correlations with the fourth subscale vary between 75 and 69. All correlations are statistically significant (p<.01). When the item-total scale score correlations are examined, it is seen that the lowest value is 44 and the highest value is 78 (p. 01).

Table 3. *Descriptive Statistics of the Items Decided to Remain in the Scale As a Result of PCA Table*

	$\bar{x}$	Ss	En Düşük	En Yüksek	Çarpıklık	Basıklık
M1	3.42	1.1	1	5	-0.222	-0.586
M2	3.05	1.15	1	5	0.139	-0.794
M3	2.74	1.25	1	5	0.17	-0.959
M4	3.21	1.26	1	5	-0.168	-0.918
M5	3.28	1.22	1	5	-0.141	-0.919
M6	3.4	1.16	1	5	-0.276	-0.737
M7	3.05	1.13	1	5	0.106	-0.756
M17	3.49	1.03	1	5	-0.297	-0.428
M18	3.31	1.16	1	5	-0.195	-0.803
M20	3.32	1.05	1	5	-0.33	-0.448
M21	3.32	1.1	1	5	-0.325	-0.576
M25	3.29	1.2	1	5	-0.317	-0.687
M26	3.3	1.18	1	5	-0.301	-0.68
M27	3.26	1.09	1	5	-0.355	-0.394
M28	3.27	1.11	1	5	-0.313	-0.379
M29	3.43	1.08	1	5	-0.506	-0.134
M30	3.53	1.07	1	5	-0.588	-0.131
M31	3.32	1.16	1	5	-0.321	-0.548
M33	3.39	1.18	1	5	-0.328	-0.694
M34	3.63	1.09	1	5	-0.503	-0.375
M35	3.15	1.09	1	5	-0.158	-0.555
M36	3.26	1.1	1	5	-0.369	-0.371
M41	3.51	0.97	1	5	-0.307	-0.167
M42	3.47	1.14	1	5	-0.391	-0.611
M43	3.33	1.27	1	5	-0.403	-0.858
M44	3.43	1.23	1	5	-0.432	-0.703

When the descriptive statistics given in Table 3 are examined. It can be seen that the participant group generally agreed with items at a moderate level.The standard deviation values are relatively low, which suggests the homogeneity of the group in terms of the measured feature. When the skewness and kurtosis values are examined, it can be seen that the kurtosis of item 15 is very slightly outside the cutoff point. This situation is insignificant when the size of the data set is taken into account (n = 381). Cronbach's Alpha Reliability Coefficients of the model determined according to PCA results are given in Table 4.

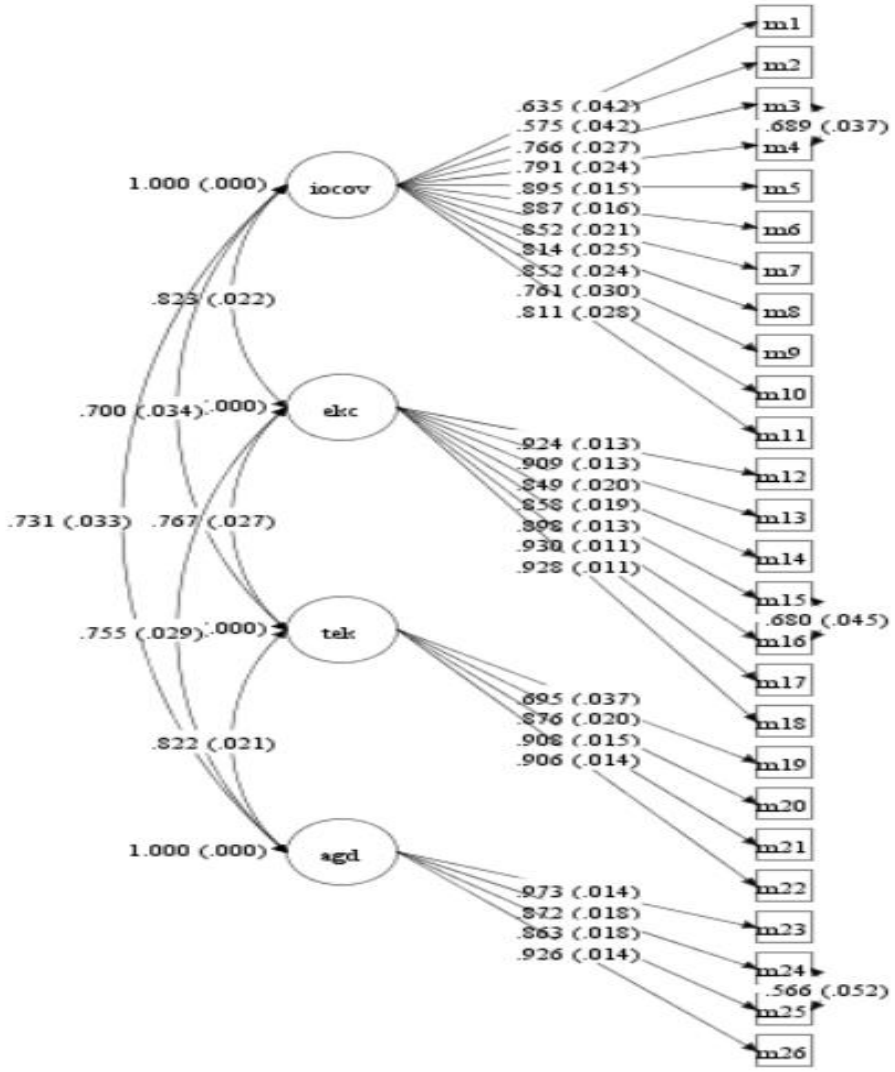
Table 4. *Reliability Estimates Based on PCA Results*

	Cronbach's alpha	Omega
First Dimension	0.92	0.9
Second Dimension	0.91	0.91
Third Dimension	0.78	0.78
Fourth Dimension	0.86	0.87
Total	0.96	0.96

Reliability coefficients are reported in Table 4. Accordingly, all estimated reliability coefficients indicate good or high reliability. It is possible that the few items in the third and fourth sub-dimensions with the lowest reliabilities affected reliability. As mentioned, all reliability coefficients are above the cut-off point. The developed scale produces valid and reliable results.

3.2. Confirmatory Factor Analysis

A confirmatory factor analysis study is a validity study that determines whether the structure revealed as a result of an exploratory factor analysis study is confirmed or not. In this context, a group that is demographically similar but different from the group in which exploratory factor analysis was conducted was used for this study. The path diagram of the confirmatory Factor Analysis conducted with a total of 26 items in 4 factors is given in Figure 2.



ioçov: human-oriented work environment and parents; ekc: energy use and environment; tek: technology; agd: achievement of goals and control

Figure 2. Confirmatory Factor Analysis Path Diagram

According to Figure 2, all path coefficients are statistically significant (p<.05). The standardized path coefficients ranged between.64 and.90 in the people-oriented work environment and parents subscale; between.85 and.93 in the energy use and environment subscale; between.70 and.91 in the technology scale; and finally between.86 and.97 in the goal realization and supervision subscale. Hair et al. (2009) state that factor loadings of .50 and above are necessary. All these path coefficients are quite high. Table 5 shows the model data fit indices and criterion values for the CFA model (Brown, 2006; Hooper et al., 2008; Kline, 1998; MacCallum et al., 1996; Schermelleh-Engel et al., 2003; Wheaton et al., 1977.)

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Table 5. *Fit Values for CFA Model*

Benchmark value		Model Value	Decision
Chi-squared /sd	<5	915.405/290	Good fit
TLI	>.95	0.958	Perfect fit
CFI	>.95	0.963	Perfect fit
RMSEA	<=.10	0.1	Acceptable fit
SRMR	<.10	0.046	Good fit

When Table 5. is examined, it is seen that the fit indices obtained from the model range from acceptable to excellent fit. This shows that the model was validated. The descriptive statistics of the items for the second group of the study, the CFA group, are given in Table 6.

Table 6. *Item Statistics for CFA Group*

	$\bar{x}$	Sd	Lowest	Highest	Skewness	Kurtosis
M1	3.1	1.12	1	5	-0.034	-0.719
M2	3	1.05	1	5	-0.187	-0.675
M3	3.12	1.06	1	5	-0.149	-0.671
M4	3.27	1	1	5	-0.173	-0.519
M5	3.34	1.1	1	5	-0.308	-0.68
M6	3.43	1.06	1	5	-0.553	-0.346
M7	3.11	1.16	1	5	-0.128	-0.811
M8	3.03	1.14	1	5	-0.122	-0.755
M9	3.48	1.14	1	5	-0.427	-0.617
M10	2.96	1.08	1	5	-0.081	-0.643
M11	3.11	1.03	1	5	-0.088	-0.531
M12	3.26	1.12	1	5	-0.157	-0.679
M13	2.95	1.18	1	5	0.159	-0.819
M14	2.67	1.19	1	5	0.4	-0.679
M15	2.84	1.29	1	5	0.167	-1.055
M16	3.06	1.2	1	5	0.169	-1.022
M17	3.1	1.16	1	5	-0.018	-0.95
M18	2.91	1.15	1	5	0.137	-0.781
M19	3.26	1.06	1	5	-0.136	-0.548
M20	3.15	1.12	1	5	-0.227	-0.751
M21	3.27	1.1	1	5	-0.115	-0.643
M22	3.1	1.14	1	5	0.006	-0.783
M23	3.24	1.06	1	5	-0.103	-0.72
M24	3.18	1.16	1	5	-0.085	-0.834
M25	3.14	1.25	1	5	-0.088	-1.024
M26	3.2	1.25	1	5	-0.132	-1.013

When Table 6. is analyzed, the mean of the responses to the items varies between 2.67 and 3.48. Standard deviation values are not high; the responses to the items are similar. In each item, the lowest 1 was marked and the highest 5 were marked. According to skewness and kurtosis values, the distribution is normal. The kurtosis values showed a very small deviation. Considering the size of the data set, it can be concluded that it is normally distributed. Table 7 presents the descriptive statistics of the subscales and total scale scores.

Table 7. *Descriptive Statistics of Subscales and Total Scale Score*

	$\bar{x}$	Sd	Lowest	Highest	Skewness	Kurtosis
1. People-Oriented Work Environment and Parents	34.95	9.2	11	55	-0.318	-0.402
2. Energy Use and Environment	20.8	7.31	7	35	0.188	-0.847
3. Technology	12.78	3.79	4	20	-0.126	-0.504
4. Realization of Objectives and Audit	12.77	4.24	4	20	-0.042	-0.921
Total Scale Score	81.30	21.85	31	130	-0.129	-0.385

When the standard deviations of the subscales and total scale scores are analyzed in Table 7, it is seen that the most heterogeneous characteristic of the participants is the total scale score, and the most homogeneous characteristic is the technology subscale. Both the subscales and the total scale score are within the normal distribution limits. Table 8 shows the correlations of the items with the subscale and total scale scores.

Table 8. *Correlation of Items with Subscale and Total Scale Scores*

Subdimension Name	Article No:	Subscale Correlation	Item Total Score Correlation
1.People-Oriented Work Environment and Parents	M1	.657**	.584**
	M2	.626**	.535**
	M3	.813**	.704**
	M4	.812**	.723**
	M5	.869**	.780**
	M6	.852**	.781**
	M7	.837**	.776**
	M8	.765**	.744**
	M9	.782**	.775**
	M10	.733**	.686**
	M11	.736**	.721**
	M12	.840**	.831**
2.Energy Use and Environment	M13	.870**	.817**
	M14	.855**	.769**
	M15	.883**	.785**
	M16	.905**	.803**
	M17	.911**	.813**
	M18	.913**	.832**
3.Technology	M19	.759**	.593**
	M20	.868**	.738**
	M21	.905**	.743**
	M22	.888**	.745**
	M23	.813**	.819**
4. Realization of Objectives and Audit	M24	.928**	.740**
	M25	.923**	.726**
	M26	.927**	.752**

**<.01

The correlations between the items in the People-Oriented Work Environment and Parents subscale and the subscale are between .63 and .87; the correlations between the items in the Energy and Environmental Use subscale and the subscale are between .84 and .91; the correlations between the items in the Technology subscale and the subscale are between .76 and .90; and finally, the correlations between the items in the Realization of Goals and Supervision subscale and the subscale are between .81 and .93. All correlations were moderate to high, positive, and statistically significant (<.01). The correlations of the items with the total scale are between .54 and .83. These correlations are also moderate to high, positive, and statistically significant (<.01). Table 9 shows the correlations of the subscales with each other and with the total scale score.

Table 9. *Subscales and Total Score Correlations (Pearson Product Moment Correlation Coefficient)*

	1	**2**	**3**	**4**	**5**
1.People-Oriented Work Environment and Parents	1				
2.Energy Use and Environment	.763**	1			
3.Technology	.648**	.708**	1		
4. Realization of Objectives and Audit	.683**	.696**	.727**	1	
5.Total Scale Score	.921**	.914**	.825**	.841***	1

**<.01

All correlations in Table 9 are statistically significant at the .01 level. Accordingly, there were positive and high correlations between the People-Oriented Work Environment and Parents subscale and Energy Use and Environment and Total Scale Score, and positive and moderate correlations with technology and goal

realization and the supervision subscale. The Energy Use and Environment subscale was positively and highly correlated with the Technology and Total Scale Score and positively and moderately correlated with the Realization of Goals and Experience subscale. There are positive and moderate relationships between the technology subscale, goal realization and supervision subscale, and the total scale score.

Cronbach's Alpha and McDonald's Omega reliability estimation results for the subscale and total scale scores of the study group for which data were collected for confirmatory factor analysis are given in Table 10.

Table 10. *Reliability Estimates Based on CFA Results*

	Cronbach's Alpha	McDonald's Omega
1. People-Oriented Work Environment and Parents	0.93	0.93
2. Energy Use and Environment	0.95	0.95
3. Technology	0.88	0.88
4. Realization of Objectives and Audit	0.92	0.93
Total Scale Score	0.97	0.97

Table 10 shows the Cronbach's Alpha and McDonald's Omega reliability coefficients of the subscale and total scale scores. Accordingly, although the technology subscale had the lowest reliability coefficient, it showed high reliability. All subscales and total scale score reliability coefficients are quite high. The scale can be used to obtain reliable results.

4. Discussion and Conclusion

In the study, a valid and reliable measurement tool was developed to measure the entropy level in schools based on the perceptions of teachers working in public schools. In the development phase of the scale, firstly, the literature was reviewed, and an item pool consisting of 75 items was created for the scale. This item pool was transformed into a structure consisting of 7 sub-dimensions and 44 items with the advice of field experts. The draft scale was completed by all 381 teachers working in public (state) schools. The KMO test in the data set in the draft scale is .947. Linearity was examined with scatter diagrams. Multicollinearity was examined by the correlation matrix and Barlett's test of sphericity. All correlations between the statements are statistically significant and not above .90. The sphericity test result was significant ($x2946 = 11215.456$, $p<.01$). The construct validity of the scale was first tested with EFA. CBA was run with 44 items. There were no non-loading items in any sub-dimension. Overlapping items were removed in order (m10, m19, m12, m11, m13, m22, m24, m16, m32, m40, m38, m39). In the next step, items with standard factor loadings below .50 (m9, m8, m23, m14) were removed. As a final step, a two-item sub-dimension was formed. However, since measurement theories suggest that latent variables should be measured with at least 3 indicators (items), these items were also removed from the scale (m15, m37). At the end of all examinations, a 4-factor structure with 26 items was obtained. The total variance explained by the scale was found to be 63.29%. The factor loadings of the items in the scale ranged between .509 and .829. Considering the contents of the items in the factors and the studies in the literature, the first factor was named as people-oriented working environment and parents, the second factor as energy use and environment, the third factor as technology, and the fourth factor as realization of goals and supervision. Within the scope of the construct validity of the scale, the 4-factor structure revealed by EFA was also confirmed by CFA. For CFA analysis, the 26-question scale finalized as a result of EFA was applied to 215 teachers. It was observed that the fit indices obtained from CFA ranged from acceptable to excellent fit. This shows that the established model was confirmed. Thus, it was determined that the findings of EFA and CFA provided construct validity for the four-factor scale. The reliability of the scale was examined by looking at the Cronbach Alpha internal consistency coefficient and item-total correlation values. Cronbach's alpha values were found to be .93, .95, .88, .92, and .97 for each factor and .97 for the whole scale, respectively, while the lowest and highest item-total correlations of the items in the factors were .535 and .832, respectively. The findings obtained during the scale development process show that the scale is reliable. In this context, the results of the validity and reliability analysis confirm that the 'Power Loss Entropy Scale in Schools' with its four-factor and 26-item structure can be applied and used as a valid and reliable measurement tool in the studies to be conducted in the field.

The power loss (entropy) scale in schools can reveal the causes and level of energy loss (loss of human and material resources, technological inadequacy, lack of supervision, etc.) in educational organizations and

schools in a very short time. This also increases the functionality of the scale and makes it more useful. It can be characterized as a very practical and easy scale for schools and school administrators to apply and evaluate. In this context, especially the statements of teachers, who are among the most important elements and stakeholders in the school, about the loss of power through the scale are important information and parameters. Apart from this, it can be said that it is a scale that can be applied not only to teachers but also to all internal and external stakeholders of the school. It can be argued that the scale will allow the school to overcome these problems in the future and contribute to the creation of a strong vision, since the loss of power that occurs in the educational process in schools is seen as the greatest risk and danger that transforms the school into an ineffective, dysfunctional, irrelevant, and non-preferred organization.

Its most important contribution to educational administration can be expressed as being a functional scale that educational administrators can use for all stakeholders in school organizations. It leads to the development of new regulations and approaches for the elimination of misperceptions and information about power loss and the development of new regulations and approaches for the elimination of power losses. Revealing the impact and role of power losses in the realization of goals in educational administration. In addition, it can be said that it will contribute to the prediction of the consequences of power losses in terms of educational activities by educational administrators.

It is suggested that the developed scale, 'Entropy Scale of Power Loss in Schools,' can be applied to all school levels (preschool, primary education, secondary education, and higher education) as well as by applying the opinions of the stakeholders in the organization in order to reveal the power losses in other organizations. It is recommended that it can be used as an effective and functional scale in determining the level of this power loss since other organizations other than school organizations are faced with power losses (entropy).

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Appendix 1. Power Loss (Entrophy) Scale in Schools

	People oriented work environment and parents	İnsan Odaklı Çalışma Ortamı ve Veliler
1	When necessary,the opinions of all skateholders (teachers,students,parents, administrators) are taken into consideration in solving problems that arise at school.	Okulda çıkan sorunların çözümünde gerektiğinde tüm paydaşların (öğretmen, öğrenci, veli,yönetici) görüşü alınır.
2	Personnel(teachers, administrators,employees)stay at the school for a long time and do not require transfer.	Okulda personeller (öğretmen, yönetici, çalışanlar) uzun süreli kalır ve tayin istemezler.
3	Instıtutional culture has been established and formed in the school	Okulda kurum kültürü yerleşmiş ve oluşmuştur.
4	The sense of belonging at school has developed.	Okulda aidiyet duygusu gelişmiştir.
5	The quality of education has an importance at school.	Okulda eğitimin niteliğine önem verilir.
6	Efforts are made to create an atmosphere of trust in the school.	Okulda bir güven ortamının oluşmasına çalışılır.
7	School stuff is supported to participate in practices (in service training, symposiums,etc). to renew and strengthen themselves.	Okulda çalışanların kendilerini yenilemeleri ve güçlenmesi için uygulamalara (hizmetiçieğitim, sempozyum vb.) katılmaları desteklenir.
8	Individual creativity is supported at school	Okulda bireysel yaratıcılık desteklenir.
9	In general, efforts are made to increase the academic performance of the school.	Genel olarak okulun akademik performansının yükseltilmesine çalışılır.
10	Students'parents express their satisfacionwith the school at every opportunity they have	Öğrenci velileri okuldan memnun olduklarını her fırsatta dile getirirler.
11	There is a good relationship between parents and teachers at school.	Okulda öğretmenler ile veliler arasında sağlıklı bir iletişim vardır.
	Energy use and the enviroment	**Enerji Kullanımı ve Çevre**
12	Environmentally friendly projects are supported at school	Okulda çevre dostu fikirler desteklenir.
13	Environmentally friendly projects are supported at school	Okulda çevre dostu projeler geliştirilir.
14	The school itself has its own energy saving plan	Okulun kendine ait bir enerji tasarruf planı vardır.
15	There is a waste management in the school	Okulda atık yönetimi vardır.
16	Instruction studies are provided at school.	Okulda geri dönüşüm ile ilgili bilgilendirme çalışmaları yapılır.
17	Awareness of protecting nature and environment is developed in school	Okulda doğayı ve çevreyi koruma bilinci geliştirilir.
18	The idea of sustainable growth is accepted at school	Okulda sürdürülebilir bir büyüme düşüncesi kabul edilir.
	Technolgy	**Teknoloji**
19	Simple and plain educational tools are prefered	Basit ve sade eğitim araçları tercih edilir.
20	School is renewing itself against technological developments(smart boards internet ,etc..	Okul teknolojik gelişmeler (akıllı tahta, internet vb.) karşısında sürekli kendini yenilemektedir.
21	Physical place improvements begin with minor changes	Okulda fiziki mekân iyileştirmelerine ufak değişikliklerle başlanır.
22	It starts with small steps at first, In the improvement and innovation of materials(buying a projector, computer,.smart board, etc.)	Okulda maddi kaynakların iyileştirmesinde ve inovasyonunda (okula projeksiyon cihazı,bilgisayar, akıllı tahta alma vb.) ilk önce küçük adımlarla başlanır.
	Achieving goals and supervision	**Amaçların Gerçekleştirilmesi ve Denetim**
23	Appropriatre behaviors for the goals are developed at school.	Okulda amaçlara uygun davranışlar geliştirilir.
24	The school principal supervises the teachers in order to ensure that the education process is qualified in the classroom	Okul müdürü, eğitim sürecini nitelikli kılmak için sınıf ortamında öğretmenleri denetler.
25	The school principal meets with the teachers in the class and determines a suitable before supervising	Okul müdürü, denetim öncesinde öğretmenle görüşüp denetim için uygun bir zaman belirlerler.
26	The school principalmeets with the teacher and evaluates the situation wit the teacher after supervising.	Okul müdürü, denetim sonrasında öğretmenle bir araya gelip bir durum değerlendirmesi yapar.