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SCHOOL ADMINISTRATORS' LEVEL OF USING SCIENTIFIC PROBLEM-SOLVING SKILLS IN ORGANISATIONAL PROBLEMS

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ABSTRACT

This study was designed to identify high school administrators' level of using scientific problem-solving techniques in organisational problems based on their own views. The population of the study comprised of administrators (principals, chief deputy principals and deputy principals) working at high schools in Kırklareli city centre in 2014-2015 school year. No sampling method was used since the whole population was reached within the study. Survey model was adopted, and the "Scale of School Administrators' Level of Using Scientific Problem-Solving Processes and Techniques in Organisational Problems" developed by Sağır and Göksoy (2012: 1-11) in 5-point Likert type was used as the data gathering instrument. The scale was adapted to the Kırklareli sample and the Cronbach's Alpha coefficient was 0,95. The findings revealed a difference in the administrators' level of using scientific problem-solving techniques based on various variables. The study showed that in overall, the school administrators "usually" used the scientific problem-solving process in the organisational problems they encountered, but stated that they did not have the ability necessary to solve organisational problems. It is suggested that policies such as requiring educational administrators to have a Master's degree, and organising in-service training should be developed to ensure that they have the ability to solve organisational problems.

Key Words: School Administrator, High School, Problem-Solving, Organisational Problems, Scientific Problem-Solving Techniques

INTRODUCTION

In today's world, the problems people face have become more complex compared to the past. Solutions of these problems that require creative thinking, are accepted as important and difficult situations, and described as situations that direct individuals to search for reasons and results through questions or a set of questions (TDK, 2015:1) show more diversity.

Many factors are observed to affect the problem-solving efforts of people who deal with more problems today. The idea to produce a solution for an issue is directly related to individuals' perceiving that issue as a problem. As long as there is an outcome and a goal that individuals want to reach, problem solving is possible. There is no absolute way of problem solving techniques, there are various alternatives. It is also known that educational institutions face many different problems and administrators produce various methods to solve these problems.

From the perspective of schools, a problem is a situation that inhibits, slows down or disrupts achieving the school aims. As the administration starts trying to eliminate such obstacles, the problem-solving process begins. To keep the individual-institution dimensions of the social system in balance with a sense of mission, and operationalize the elements around them for achieving the school aims, school administrators should do their job effectively and perform successful administrative behaviours. In many studies on our education

system, many different institutional and structural problems were observed. Knowing which scientific problem-solving techniques are used in solving thee problems is seen as necessary to produce new policies. In educational institutions, particularly high schools where students receive education before they choose their career pathways, this necessity becomes more important. In this regard, it is of significance to know the levels of using scientific problem-solving techniques in organisational problems by administrators working at high schools. Accordingly, there was a need to conduct this study.

The aim of this study was to identify high school administrators' level of using scientific problem-solving process and techniques in organisational problems based on their own views and offer suggestions to practitioners based on these views.

To educate 21st century individuals who have adopted constant development as their philosophy of life, think analytically, have developed problem-solving and decision-making skills, are open and flexible to team work, seek information and can access to it, have high qualifications and try to develop themselves, believe, are assertive and confident, and have national and universal values, each school should be turned to a high-quality school. This requires changes that would improve education, and thus, the participation of families, school administrators and all other relevant members of the society in addition to students, and coordination of constant development efforts (Gülşen, 2003: 68-69). However, ensuring changes can reveal various problems. The word "problem" comes from "problema" which derived from the Greek word "proballo" meaning an obstacle that comes in way (Sungur, 1992: 129). According to Morgan (2009: 133), a problem is a situation of conflict that obstructs individuals in reaching a goal. On the other hand, problem solving is the process of overcoming the experienced difficulties in the process of reaching a goal by investigating the reasons and consequences (Büyüköztürk, 2013: 24-26; Karasar, 2012: 54; TDK, 2015: 1).

Problem situations are solved through certain stages. In the literature, these stages are briefly described as follows: (Büyüköztürk, 2013: 24-26; Karasar, 2012: 29-30; Yıldız, 2003: 29):
1. Realisation and Definition of the Problem: The first stage in the problem-solving process is to define the problem. It should be noted that a realistic definition of the problem with all its aspects considering various variables is of great importance.
2. Analysing the Problem: Before solving the problem, it should be analysed thoroughly, and information such as its limits, dimensions, reasons and necessities should be identified.
3. Developing Alternative Solutions: In this stage, ideas and possibilities regarding the solution are put forward. Here, it should not be forgotten that creative thinking is active. Possible solutions are offered after revising the information related to the problem, and the appropriate solution is aimed to be found by examining the positive and negative aspects of these solutions.
4. Implementing the Solution Chosen: In this stage, one of the important points is to follow the implementation process. In this way, whether the solution of the problem yielded the desired result becomes clear.
5. Evaluation the result: To identify the effectiveness of the solution and whether new problems have arisen, the results should be evaluated in a realistic way. Another point that should be taken into account is the ideas arguing that there should be standards in evaluation.

There is no absolute way of solving problems. There are various alternatives that exist and are tested to solve problems. Solving problems effectively is a kind of art. Many techniques are used in solving problems. Some of these techniques are described below (Arcaro, 1995: 108; Çalık, 2003: 178; Erdoğan; 2000: 27; Ernest, 1992: 143; Gülşen, 2000: 44-53; Langfort & Cleary, 1995: 96, 177; Yüksel, 2004: 1):
Brainstorming: The basis of brainstorming is enabling individuals to generate ideas by postponing judgements and forming group conditions (Yüksel, 2004: 1).
Pareto Chart: The essence of this chart is the thinking that the factor that is less than 20%, but has vital importance is responsible for 80% of the problems and deficiencies in the system. It is formed by ordering the bars that represent the effects or frequency of the problem side by side. In fact, the pareto chart is a column chart in which factors and processes are ordered in descending flow, importance and frequency (Arcaro, 1995: 108; Gülşen, 2000: 48).

Decision Tree Analysis: In this technique, advantages and disadvantages of each alternative are specified. Then, the alternative with the highest value is chosen. This technique provides individuals with a setting for them to structure their ideas and recognise the information needed (Erdoğan; 2000: 27).
Force-Field Analysis: It is a method that enables sorting the elements that support and limit the solution visually. In this method, the goal is to enhance the driving forces to be used in solving the problems and prevent the limiting forces. The primary aim of this analysis is to define the dynamic and inhibiting forces perceived in actualizing a proposed change (Arcaro, 1995: 101; Langfort & Cleary, 1995: 177).
PDCA (Plan-Do-Check-Act) or Deming Cycle: The PDCA cycle developed by W. E. Deming is one of the most important tools in ensuring the constant development process and is the process development implementation of the scientific method (Ernest, 1992: 143). This process includes repetitive steps such as data gathering, analysing, interpreting, evaluating and planning (Gülşen, 2000: 49; Langford & Cleary; 1995: 96).
Fishbone Diagram: It is also known as the cause-effect diagram. In this diagram, the primary reasons behind the problems that arise in organisation processes and systems, and the sub-reasons are identified and solutions can be offered towards the result. This technique is used to reveal the possible reasons behind a problem and the sub-effects of these reasons. In this way, it provides input related to the problem (Çalık, 2003: 47; Gülşen, 2000: 46-47).
Team Work: It refers to the small groups formed to solve a problem in organisations in general. After identifying the problem and analysing it, they present the most suitable solution to the administration. The solution of the problem is searched with the participation of all group members by using mutual development, supervision, quality check and progression techniques on a constant self-development basis (Ishikawa, 1997:142).
SWOT Analysis: It is a solution technique in which the opportunities and threats in the environment of the organisation as well as its strengths and weaknesses are identified and analysed particularly in the strategic planning process (Schermerhorn, 1989: 142).
Team Work: It refers to the formation of a group to identify, analyse and offer solutions for various problems in their area of expertise in the organisation. Such group come together regularly and propose different solutions for problems (Efil, 1999: 202).
Six Thinking Hats Technique: This technique in which individuals learn separating their feelings from reasoning, and their creativity from knowledge background enables individuals to do one thing at a time. Each of the hats in this technique represents a certain type of thinking. Its aim is to provide an opportunity to perform a defined role-play, direct attention, produce alternative solutions by not performing a role-play based on suitability and certain set of rules (De Bono; 2008: 1-20; Koray, 2004: 3).
Nominal Group Technique: In this technique, groups can be formed based on the problem. Since it is a written technique, the decision-making process becomes more effective by enabling individuals to reflect their feelings and ideas in a short period without being affected from other individuals in the group to reduce conflicts within the group (Çalık, 2003: 178).
Flow Diagram: It is a schema that visualizes the functioning of a process or rule in an organisation. Individuals who participate in the process with a schema prepared have a guide for what to do, which stages to follow and possible ways between the beginning and end of the process. The flow diagram enables recording and understanding the decisions, writing the process accurately and clearly, and connecting the elements. In education, flow diagrams can be effectively used in many ways such as introducing a new education system to school administrators or a broader community, lesson planning by teachers, choosing new teachers, and educational processes (Çetin, Akın & Erol,1998: 339; Gülşen, 2000: 44-45).

METHOD

The population of the study conducted in survey model comprised of administrators (principals, chief deputy principals and deputy principals) working at high schools in Kırklareli city centre in 2014-2015 school year. No sampling method was used since the whole population was reached within the study. 13 of the administrators participated in the study (19,70%) were female while 53 (80,30%) were male.

Survey model was adopted, and the "Scale of School Administrators' Level of Using Scientific Problem-Solving Processes and Techniques in Organisational Problems" developed by Sağır and Göksoy (2012: 1-11) in 5-point

Likert type was used as the data gathering instrument. The scale was adapted to the Kırklareli sample and the Cronbach's Alpha coefficient was 0,95.

The weights assigned to the extent of agreement for the propositions in the scale and the limits of these weights are as follows: "Never: 1.00-1.80", "Rarely: 1.81-2.60", "Sometimes: 2.61-3.40", "Usually: 3.41-4.20", "Always: 4.21-5.00".

In data analysis, SPSS was used, statistical analyses were performed, and frequencies, percentages and arithmetic means were determined. In addition, the data were evaluated and interpreted in terms of the gender variable using the Independent Samples T-Test.

FINDINGS AND COMMENTS

In this section, the data obtained related to the school administrators' level of using scientific problem-solving process and techniques were interpreted by the help of the statistical information presented in tables. In the interpretation of the data, package programs were used in the computer environment. Evaluations were carried out based on the information obtained as a result of the interpretations. The tables formed by the help of the data obtained, and the evaluations based on the data in the tables are presented below.

The data related to the school administrators' level of using scientific problem-solving processes in organisational problems were firstly tabulated, and the frequencies, standard deviations and arithmetic means are presented in Table 1.

Table 1: High School Administrators' Views on Their Level of Using Scientific Problem-Solving Processes in Organisational Problems

Item No.	Propositions	Degree of Agreement					$\bar{x}$	SD
		Never	Rarely	Sometimes	Usually	Always		
		f	f	f	f	f		
1	I define organisational problems.	0	1	6	36	23	**4,23**	,67
2	I identify solution alternatives for organisational problems.	0	1	3	43	19	**4,21**	,59
3	I choose the most suitable possible solution for organisational problems.	0	0	5	39	22	**4,26**	,59
4	I take into account the importance of the chosen solution for the school/organisation.	0	0	4	26	36	**4,48**	,61
5	I do planning for implementing the solutions for organisational problems.	0	3	14	23	26	**4,09**	,89
6	I implement the solutions developed for solving organisational problems.	0	2	3	42	19	**4,18**	,65
7	I am creative in solving organisational problems.	0	0	2	42	22	**4,30**	,52
8	I consider the contribution of the solution to the school community.	0	0	10	29	27	**4,26**	,70
9	I prepare reports of the practices implemented in the problem-solving process.	1	1	22	30	12	**3,77**	,81
10	I evaluate the problem-solving process.	1	5	10	34	16	**3,89**	,91
General Arithmetic Mean							**4,17**	---

The high school administrators agreed on the propositions related to the scientific problem-solving processes in organisational problems at the level of "usually" with a mean of $\overline{\chi}$=4,17. When the levels of agreement on the propositions were examined separately, it was observed that the school principals, chief deputy principals and deputy principals agreed on the propositions "I define organisational problems.", "I identify solution alternatives for organisational problems.", "I choose the most suitable possible solution for organisational problems.", "I take into account the importance of the chosen solution for the school/organisation.", "I am creative in solving organisational problems." and "I consider the contribution of the solution to the school community." at the level of "always" with varying arithmetic means.

They showed agreement on the propositions "I do planning for implementing the solutions for organisational problems.", "I implement the solutions developed for solving organisational problems.", "I prepare reports of the practices implemented in the problem-solving process." and "I evaluate the problem-solving process." at the level of "usually" again with varying mean scores.

While the proposition on which the school administrators showed agreement with a $\overline{\chi}$=4,48 mean at the level of "always" was "I take into account the importance of the chosen solution for the school/organisation.", the proposition they showed the lowest level of agreement with a mean of $\overline{\chi}$=3,77 at the level of "usually" was "I prepare reports of the practices implemented in the problem-solving process.".

The difference in the high school administrators' views on their level of using scientific problem-solving processes based on the gender variable was analysed using Independent Samples T-Test, and the propositions in which significant differences were revealed are presented in Table 2.

Table 2: Independent Samples T-Test Results of the High School Administrators' Views on Their Level of Using Scientific Problem-Solving Processes in Organisational Problems Based on the Gender Variable

Item No.	Proposition	Gender	N	Sig	$\overline{\chi}$	SD	Sd	t	p
4	I take into account the importance of the chosen solution for the school/organisation.	Female	13	,000	4.38	,277	64	-3.051	,003
		Male	53		4.92	,627			
7	I am creative in solving organisational problems.	Female	13	,438	4.62	,506	64	-2.486	,016
		Male	53		4.23	,505			
8	I consider the contribution of the solution to the school community.	Female	13	,213	4.69	,480	64	-2.574	,003
		Male	53		4.15	,718			

For the proposition "I take into account the importance of the chosen solution for the school/organisation.", the Levene's test revealed a significant difference ($p<0,05$), which shows that the distribution was not homogeneous. As is seen in the table, the significance value in the Sig. column is 0,003. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I take into account the importance of the chosen solution for the school/organisation." was statistically significant, $p < 0,05$.

For the proposition "I am creative in solving organisational problems.", the Levene's test was found to be non-significant ($p>0,05$), which shows that the distribution was homogeneous. As is seen in the table, the significance value in the Sig. column is 0,16. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I am creative in solving organisational problems." was statistically significant, $p < 0,05$.

For the proposition "I consider the contribution of the solution to the school community.", the Levene's test revealed a non-significant difference ($p>0,05$), which shows that the distribution was homogeneous. As is seen in the table, the significance value in the Sig. column is 0,003. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I consider the contribution of the solution to the school community. " was statistically significant, $p < 0,05$.

The frequencies and arithmetic means related to the high school administrators' views on the predetermined scientific problem-solving techniques -these techniques are those given in a list in advance- they use are presented in Table 3.

Table 3: High School Administrators' Views on Scientific Problem-Solving Techniques They Use in Organisational Problems

Item No.	Propositions (Scientific problem-solving techniques that school administrators use in organisational problems)	Degree of Agreement					$\bar{\chi}$
		Never	Rarely	Sometimes	Usually	Always	
		f	f	f	f	f	
1	I use the cause-effect diagram technique.	3	10	14	27	12	**3.53**
2	I use the tree diagram technique.	6	6	17	27	10	**3.44**
3	I use the six thinking hats technique.	6	9	25	17	9	**3.21**
4	I use the survey technique.	3	6	22	27	8	**3.47**
5	I use the brainstorming technique.	2	3	8	33	20	**4.00**
6	I use the 5N1K (wh questions) technique.	7	1	19	21	18	**3.64**
7	I use the similarity diagram technique.	8	5	17	25	11	**3.39**
8	I use the force-field analysis technique.	8	6	13	23	16	**3.50**
9	I use the relationship diagram technique.	7	8	18	23	10	**3.33**
10	I use the nominal group technique.	7	16	15	21	7	**3.08**
11	I use the case study technique.	1	7	12	30	16	**3.80**
12	I use the team work technique	0	4	19	24	28	**4.15**
13	I use the PDCA cycle.	1	7	16	20	22	**3.83**
14	I use the SWOT analysis technique.	6	3	18	22	17	**3.62**
15	I use the Pareto diagram technique.	11	9	15	15	16	**3.24**
General Arithmetic Mean							**3.55**

The school administrators (principals, chief deputy principals and deputy principals) stated that they used the scientific problem-solving techniques in solving organisational problems at the level of "usually" with an arithmetic mean of $\bar{\chi}$ =3,55. They mostly used the "team work technique" to solve organisational problems while they least used the "nominal group technique". They stated that to solve organisational problems, they "always" used the techniques "cause-effect diagram", "tree diagram", "brainstorming", "5N1K (wh questions), "force-field analysis", "case study", "team work", "PDCA cycle" and "SWOT analysis" with varying arithmetic means. They asserted that they "sometimes" used the techniques "six thinking hats", "similarity diagram", "relationship diagram", "nominal group" and "Pareto diagram" with again varying arithmetic means.

The difference in the high school administrators' views on the scientific problem-solving processes they used based on the gender variable was analysed using Independent Samples T-Test, and the propositions in which significant differences were revealed are presented in Table 4.

Table 4: Independent Samples T-Test Results of the High School Administrators' Views on the Scientific Problem-Solving Techniques They Used in Organisational Problems Based on the Gender Variable

Item No.	Proposition	Gender	N	Sig	$\overline{X}$	SD	Sd	t	p
1	I use the cause-effect diagram technique.	Female	13	,027	4.08	,760	64	-2.051	,015
		Male	53		3.40	1.132			
2	I use the tree diagram technique.	Female	13	,646	4.08	,954	64	-2.328	,017
		Male	53		3.28	1.133			
8	I use the force-field analysis technique.	Female	13	,542	4.23	1.092	64	-2.354	,022
		Male	53		3.32	1.283			
10	I use the nominal group technique.	Female	13	,199	3.62	,961	64	-1.814	,044
		Male	53		2.94	1.216			

For the proposition "I use the cause-effect diagram technique.", the Levene's Test was found to be significant (p<0,05), which shows that the distribution was not homogeneous. As is seen in the table, the significance value in the Sig. column is 0,15. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I use the cause-effect diagram technique." was statistically significant, p < 0,05.

For the proposition "I use the tree diagram technique.", the Levene's Test was found to be non-significant (p>0,05), which shows that the distribution was homogeneous. As is seen in the table, the significance value in the Sig. column is ,017. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I use the tree diagram technique." was statistically significant, p < 0,05.

For the proposition "I use the force-field analysis technique.", the Levene's Test was found to be non-significant (p>0,05), which shows that the distribution was homogeneous. As is seen in the table, the significance value in the Sig. column is ,022. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I use the force-field analysis technique." was statistically significant, p < 0,05.
For the proposition "I use the nominal group technique.", the Levene's Test was found to be non-significant (p<0,05), which shows that the distribution was homogeneous. As is seen in the table, the significance value in the Sig. column is 0,044. Since this value is lower than 0,05, we can say that the relationship between gender and the scores in the proposition "I use the nominal group technique." was statistically significant, p < 0,05.

RESULTS AND SUGGESTIONS

The following results were revealed based on the findings

The school administrators (principals, chief deputy principals and deputy principals) were found to have positive approaches to using scientific problem-solving process and techniques in organisational problems. Among these views, there were significant differences in the propositions "I take into account the importance of the chosen solution for the school/organisation.", "I am creative in solving organisational problems.", and "I consider the contribution of the solution to the school community." based on the gender variable.

The school administrators stated that they recognized the organisational problems, and developed solutions that were suitable to the school in accordance with the principle of contextuality; however, they did not always want to put the solution techniques in writing such as in planning and reporting.

To solve the organisational problems they encountered, the school administrators stated that they mostly used the "team work technique" to solve organisational problems while they least used the "nominal group

technique" among scientific problem-solving techniques. Based on the gender variable, there were significant relationships for the techniques "cause-effect diagram", "tree diagram", "force-field analysis" and "nominal group" that the administrators used.

The following suggestions can be offered based on the results of the study

Since the school administrators (principals, chief deputy principals and deputy principals) were not willing to keep a record of the practices to solve organisational problems such as in planning and reporting that are important steps of scientific problem-solving although they had positive approaches to implementing scientific problem-solving processes, they should go through periodic trainings on scientific problem-solving techniques at academic level.

It would be of significance to reach other stakeholders (e.g. inspectors, teachers, students and parents), obtain their views and make comparisons with the results in this study.

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