

School Principals' Reflective Leadership Skills through the Eyes of Science and Mathematics Teachers

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Reflective leadership plays a key role in successfully maintaining the operation in organizations and in achieving their far and near objectives. In order to enable this success in school organizations, each employee in the school should make an effort for development and effective operation of the school organization. A reflective school leader is effective in enabling and sustaining this success by utilizing their reflective leadership traits. The aim of this research is to determine the reflective leadership levels of school principals by science and math teachers' viewpoints. Sample of the research is composed of a total of 147 volunteer teachers 68 of whom serve as science teachers and 79 as math teachers in high schools in Çorum city center. Data have been collected through "reflective leadership" scale adapted to Turkish language by Ersozlu and Castelli (2016). According to the research findings, it is understood that science and math teachers consider school principals' reflective leadership traits to be at middle level. With regard to gender, age, branch and years of experience; no difference is found in teachers' perceptions on reflective leadership of school principals.

Keywords: reflection, reflective leadership, science and math teachers.

INTRODUCTION

"Reflective thinking" can also be described as deep thinking. Reflective thinking and practice skills which also have a very significant place in the extent of management as in all fields of education, play key role in ensuring success and sustainability in school organizations. Reflective leaders encourage their followers to learn from their experiences and this occurs through reflective learning (Castelli, Marx and Egleston, 2014). A reflective school leader is a leader with high level of self-awareness and awareness regarding the people around, who can analyze how everyone in the organization shall contribute to both organizational culture and effectiveness, find ways on how to naturally channel those characteristics of people into the operation of the organization, come up with efficient solutions to emerging problems during the entire process, and transform the organization into a contented and productive environment. Accordingly, a reflective leader should be a critical

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thinking, problem solving person with metacognitive awareness and reasoning skills, and who is able to generate creative ideas. It is crucial that a reflective leader has high-level thinking abilities. How these competences are perceived and assessed by others is of importance as much as possessing them. Therefore, the evaluation of school principals' level of reflective leadership according to the perception of his/her own employees, especially the most important factor in education; teachers', is one of the authentic aspects of this study. Another aspect is that these teachers were chosen from the branches of science and math where the teachers need to use their high-level thinking skills. As it is thought that science and math teachers have a high capability of numerical thinking, they can also be expected to have a higher level of thinking skills. Numerical thinking involves other thinking skills such as critical, creative, and logical thinking skills which hold a big part in relative thinking. Thereby it was reasoned that they would have an important role in understanding and revealing the school principal's high-level thinking skills. It is hard to come across similar works done on this subject in literature. Therefore, it is expected that this study will fill this void and provide a perspective especially for scientists who work in the field of Stem.

Main aim of this research is to determine the reflective leadership levels of school principals by science and math teachers' viewpoints. To this end, answers were sought to the following research questions.

1. How do science and math teachers in high schools perceive the level of reflective leadership of their school principals?
2. How do science and math teachers perceive the reflective leadership levels (Lower, Middle, Higher) of their school principals in terms of safe and open environment, purpose, and challenging assumptions?
3. What is the relationship of science and math teachers' gender, age, branch, years of experience as a teacher to their perception of the principal's reflective leadership level in high schools?

LITERATURE REVIEW

Reflective leadership

Experience by itself is not sufficient for the realization of learning. Reflection (past-oriented deep thinking) needs to accompany experience. Reflective thinking helps the individual to gather a meaning from their experiences and use this knowledge as a guide for future actions (Daudelin, 1996). Without reflection that provides learning through experience, behavior and thinking schemes cannot gather together to create the necessary changes (Osterman, 1990). According to Daudelin (1996) reflection means moving one step back from the experiences and thinking attentively and insistently, thus inferring past and present events to create experience that will guide future actions.

Cooper and Boyd (1998) defined reflection to be not only what one did or does but also focusing on thinking and understanding. Good pupils think about their own thinking and know how to reflect their experience to future behavior. Decisions made upon reflective analysis are not random, they are intentional and thoroughly analyzed (Rolheiser and Stevahn, 1998).

The concept of reflective practices has a historical basis and a place in works of Dewey, Piaget and Lewin. (Imel, 1992) These names generally argued in their work that experience is the foundation of learning, but they also emphasized that reflection is a very important concept for learning to happen (Imel, 1992). Later and more contemporary works also stressed that reflective practices are effectual and necessary to create the intended amelioration in educational institutions. (Biggs, 2001; Campoy, 2000; Drake & McBride, 2000; L. W. Kahne & Westheimer, 2000)

Reflection helps the individual to focus totally on their own work, improves their insight about it and lets them and their colleagues develop professional practices. (Lunenburg & Ornstein, 1996). It sets the scene for the exposure of differences between the theories set forth by individuals and the practices they have implemented based on such theories (Imel, 1992).

Reflective practices provide useful solutions for change and foster it as well. Personal reflection includes cognitive, affective and motivational components. With this personal reflective awareness, the mind observes and discovers experience itself. The possible outcome of personal reflection is the consistency of thoughts, feelings, motive and behavior (Goleman, 1995).

Reflective practices help uncover implicit questions. These vague questions that usually lead to inner contradictions and restrictions and their disclosure provides the opportunity for widening the perspective and producing different alternatives (Rosenberg, 2009). The real aim of reflective practices is to let the individual gain awareness, openness and a deeper sense of success. This deep satisfaction of success is unbound to place, time and things. It is far from the person's experience and inhabits the mind (Goleman, 2004).

Reflection is used in many fields and the analysis of research in the field of education shows many works in pedagogical practices (Husu et al., 2008; Loughran, 2002). Reflection is also considered as a tool for leadership in the analysis of compelling professional problems and situations (Boucher, 2007; Daudelin, 1996; Hill, R. 2005).

Brookfield (1998), suggests that an individual who is incapable of reflection will also be unsuccessful in every action to solve the problem. In the same way, a leader will have difficulty in defining the problem and develop practices in that end without reflection (Densten & Gray, 2001; Brookfield, 1998). Reflection is a dynamic process that lets the leaders manage situations and challenges through various precepts and ideas and helps them change their course to a direction they prefer (Daudelin, 1996). Pellicier (2001) emphasized that without thorough thinking, people are under the risk of being restricted in their actions and leaders who act without reflection cannot gain the experiences equal to their work time but have a bad work experience all the way through.

Leaders, who witness the continuity of their development, actively reflect upon conceptual problems and risks. In this way, leaders continue to grow and they recognize their personal strengths and weaknesses. In the meantime, leaders who practice reflection develop a leadership model that supports investigation, originality, and reality-based decisions. Successful leaders continuously analyze what they know and what they need to know with an aim to identify dangers on hand (Densten and Gray, 2001). This is related to being open to continuous learning through the inspection of personal presumptions and current practices. The leader who gains this perspective of learning is open to transformations that will affect his/her life thereafter (Amey, 2004). Transformation is related to change and through reflective practices the individual welcomes change in a healthy and enthusiastic manner, and responds accordingly. In sum, reflective practices is a system of change that develops individuals' thought processes (Rogers, 2001) and thusly help them bring forth different aspects and actions (Osterman, 1990). Leaders at an administrative position who can apply reflective skills during their leadership as a tool become prominent as reflective leaders.

METHODOLOGY

In this study, it has been examined that how science and math teachers perceive the level of their school managers' reflective leadership. The level of reflective leadership is determined with "reflective leadership scale" adapted to Turkish by

Ersozlu and Castelli and with some demographic questions. In this study the purposeful sample method is used and among the 28 high schools in the city center of Çorum, 68 science teachers and 79 math teachers (N=147) voluntarily working in 23 high schools filled the scale. A total of 87 female and 139 male teachers attended the scale including 37 female and 31 male science teachers, and 50 female and 108 male teachers.

Data gathering tool

The "Reflective Leadership Scale" is developed by Egleston, Castelli and Marx (2015) as 15 questions and 3 sub-dimensions. The purpose of this scale is to determine the level of school manager's reflective leadership according to the perception of teachers. The psychometric characteristics of the scale adapted to Turkish by Ersozlu and Castelli (2016) is as follows: The scale is 5-likert scale (strongly agree- strongly disagree) and it includes 15 questions. During the scale adaptation process, following the language adaptation, exploratory factor analysis was done with the gathered data. The coefficient of KMO of the scale was .945 and Bartlett test was significant ($X^2 = 5029.069$, $p < .000$). According to this data, the scale, as in the original one, keeps its original structure and it has yield with three factors. Respectively, the first factor explains %62.65 of the total variance and the second factor %8.939 of the total variance and %7.732 of the total variance explain. As the communalities of the scale range between .647 and .861, factor loads change between .831 and .567. Cronbach Alpha coefficient for total scale is .95, the first factor is found (safe and open environment) .93, the second factor (purpose) .93 and the third factor (challenging assumptions) is found .91. The total item correlations of the scale vary between .651 and .802. The demographic question form (gender, age, branch, years of experience) was used to get the demographic information at the top of the scale questions.

Data analysis

First, descriptive statistics were used in order to determine the levels of reflective leadership. While determining the levels of the reflective leadership, normal distribution curve was acquired by adding and subtracting a standard deviation from the mean of the reflective leadership levels of school principals. According to this, the mean of the reflective leadership level was 55.9292 while the standard deviation was 12.37576. The lowest point taken from the scale was 15 and the highest one was 75. Therefore, the points between 15-43 were considered as low level, while 44-68 range was considered as middle level, and 69-75 range as high level. Mean and percentage points were used in order to determine the reflective leadership levels of the school principals based on the perception of science and math teachers. The significant differences between the teachers' perceptions of school principals' reflective leadership levels and the independent variables such as teachers' gender, age, branch, years of experiences were analyzed with the techniques of t-test and One-way Anova. The correlations between the reflective leadership and its sub-dimensions were determined by Pearson correlation technique.

RESULTS

Science and Math teachers' perceive levels of reflective leadership of school principals and its sub factors (safe and open environment, purpose, and challenging assumptions)

First of all, the scale's pertinence for the purposes of analysis within the scope of this study was determined by looking at the correlation coefficients among the sub-dimensions of reflective leadership. Accordingly, the relationships between the reflective leadership and its sub-dimensions are shown in Table 1. The Cronbach Alpha coefficients are also summarized in Table 1.

There is a highly positive relationship between the reflective leadership and its sub-dimensions (see Table 1). While the highest correlation is between the purpose and total scale, there is also a high level of correlation between each sub-dimension as well as between sub-dimensions and the total scale.

In order to determine the level of the school principals' reflective leadership according to science and math teachers' perceptions, normal distribution curve was used. Because the first and the second question of the research consist the reflective leadership and its sub dimensions, they were evaluated together. Accordingly, School principals' levels of reflective leadership and its sub-dimensions are shown in Table 2.

While the lowest point taken from the scale is 15, the highest point is 75. Thus, the points between 15-43 are considered as low level, while 44-68 range is considered as medium, and 69-75 range as high. The reflective leadership scale has 15 questions and each sub-dimension of the scale has minimum and maximum points which are between 5 and 25, and the total points vary between 15 and 75 points. When evaluated also from this aspect, it is seen that math teachers have a higher mean than that of science teachers. In this case, math teachers find school principals' reflective leadership traits higher. When looked at the total mean, it is seen that the science and math teachers find the school principals' reflective leadership traits medium level with the mean of 56.

Reflective leadership levels (Lower, Middle, Higher)

Table 3 shows the classification of math and science teachers' perceptions of the school principals' reflective leadership levels and its sub-dimensions as low, middle and high.

Table 1. The Correlations between the Reflective Leadership Scale and its Sub-Dimensions

	Safe and open environment	Purpose	Challenging assumptions	Total
Safe and Open Environment α=.93	1	.765	.706	.912
Purpose α=.93		1	.739	.916
Challenging Assumptions α=.91			1	.896
Total α=.95				1

Table 2. Means and Percentages of Reflective Leadership Levels of School Principals

	Science Teachers		Math Teachers		Total	
	X	Ss	X	Ss	X	Ss
Safe and Open Environment	18.55	4.24	19.39	4.97	19.14	4.77
Purpose	18.79	4.20	18.93	4.45	18.89	4.37
Challenging Assumptions	17.26	4.71	18.16	4.37	17.89	4.48
Reflective Leadership	54.61	12.27	56.49	12.27	55.92	12.37

Table 3. Perceived reflective leaderships categorized by lower, middle and higher levels

		X	Sd
Safe and Open Environment	Low	10.12	6.32
	Middle	20.18	5.91
	High	24.39	2.55
	Total	19.14	4.77
Purpose	Low	10.84	3.22
	Middle	19.70	2.73
	High	24.47	1.07
	Total	18.39	4.37
Challenging Assumptions	Low	10.60	2.32
	Middle	18.49	2.61
	High	23.91	.73
	Total	17.89	4.48
Reflective Leadership	Low	31.57	3.17
	Middle	58.37	2.97
	High	72.78	1.37
	Total	55.92	12.37

As understood from Table 3, math and science teachers generally perceive their school principal's reflective leadership level as medium level. As for the second factor "purpose" dimension's high level mean is seen higher from the first factor "safe and open environment" dimension and "challenging assumptions" dimension. For the entire scale, "reflective leadership" level was found to be at middle level.

The correlation between high school science and math teachers' gender, age, years of experience and perception of reflective leadership levels (lower, middle, higher) as a teacher and their perception of the principal's reflective leadership level.

In order to analyze the third question of this research, first of all the significance of difference between gender and perceived reflective leadership levels was assessed using an independent t-test. For the age, branch and years of experience, One-Way Anova technique was used. Finally, in order to assess the significance of difference between the levels of teachers' perception of the school principals' reflective leadership levels, One-Way Anova was used.

Gender, age, branch, and years of experience

No significant difference was seen between the teachers' gender and their perception of the school principals' reflective leadership levels $t(224) = -.461, p > .05$.

No significant difference was seen between the teachers' age and their perception of the school principals' reflective leadership level $F(5, 220) = 1.773, p > .05$.

No significant difference was seen between the teachers' branch and their perception of the school principals' reflective leadership level $t(224) = -1.045, p > .05$.

No significant difference was seen between the teachers' length of service and their perception of the school principals' reflective leadership level $F(4, 221) = 1.565, p > .05$.

DISCUSSION AND CONCLUSION

The main aim of this research was to evaluate the level of reflective leadership skills of school principals through the perspective of science and math teachers. Results showed that science and math teachers perceive the level of reflective

leadership skills of their principals to be middle. Even though math teachers were found to perceive the reflective leadership skills of their school leaders to be higher than science teachers, it was seen from further questioning that there was no significant difference between branches.

Again the last question of the research showed that gender, age, or seniority had no significant impact on science and math teachers' perception of the reflective leadership levels of school principals. Another finding resulted from this last question was that the second dimension of perceived reflective leadership level of school principals, the dimension of "purpose" had a higher average than the first factor, "safe and open environment" and the third factor "challenging assumptions". Skillful reflective leaders firstly have to define their goals very clearly and then evaluate themselves and their thoughts continuously and make the necessary changes in their personal and professional practices according to the results of this evaluation (Chapman and Anderson, 2005). Hence, findings of this research were found to be supportive of the examples in literature.

The general finding of the research was that teachers perceive their school principal's level of reflective leadership as middle. Reflective leadership is closely correlated with transformational leadership in the literature. Waldman (1994) emphasizes that the transformational leadership approach has to consider leaders' differing viewpoints and values. Some researchers suggest that reflective leadership is a way to accomplish transformational leadership (Ollila, 2000). All researchers agree on the point that transformational leadership is a skill necessary for all organizations due to its personal and organizational effects (Tucker & Russell, 2004).

This close relationship between reflective leadership and transformational leadership show us that all organizations need a reflective leader. Based on the findings of this study, which showcases a section of Turkey, the fact that teachers perceive their school principals' reflective leadership skills to be at middle level is very hope-inspiring. This finding not only shows that reflective leadership is a natural asset of school principals without any specific training on the subject, but also that this skill can be enhanced through training (Sullivan & Wiessner, 2010). School principals' awareness on their relationship with their followers as reflective leaders can be risen (Ollila, 2000) and their awareness of themselves and others can be further developed. In this way, a big contribution can be made to their reflective leadership skills, which -in a way- means life-long learning as well.

As a result, teachers perceive their school leader's level of reflective leadership as middle. Their perception of school principals is not affected by the gender, age, branch, or seniority. This study puts forward very important findings regarding the reflective leadership levels of school leaders in Turkey. Further studies need to be made to find out if there is a difference in the perception of reflective leadership levels of school leaders of teachers from other branches and between other personal characteristics of school leaders and their reflective leadership skills.

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