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Empowering Educational Management: Teachers' Insights into School Principals' Use of Six-Sigma Methodology

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Research Article

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Abstract

Background/purpose. This study aims to identify strengths and areas for improvement in educational management by assessing the extent to which Jordanian school principals in Mafraq apply the Six Sigma (SS) methodology. The research addresses the need to understand how effectively SS principles are being implemented to enhance school management processes, focusing on teachers' perceptions.

Materials/methods. A convenient sample of 383 teachers participated in the study. A survey comprising 36 items was used, distributed across five main domains: the Identification domain, the Measurement domain, the Analysis domain, the Improvement domain, and the Control domain. The survey data were analyzed to evaluate the extent of SS application and the impact of demographic variables such as gender, academic qualifications, and years of experience.

Results. The findings indicate that teachers perceived a moderate application of SS methodology among school principals. Among the five domains, the Improvement domain ranked highest, while the Control domain ranked lowest, revealing a gap in understanding the importance of post-process control measures. Statistically significant differences in perceptions were observed based on gender, academic qualifications, and years of experience.

Conclusion. The study concludes that SS methodology is moderately applied by Jordanian school principals. It recommends that we encourage training teachers and school principals on Six Sigma methodology and how to apply it in an educational setting.

1. Introduction

Educational settings serve as the cornerstone for societal progress and development. Consequently, these institutions must undergo continuous improvement to keep pace with societal demands and the rapid changes occurring in the dynamic global environment of the 2020s. Educational management, a crucial domain within the field of education sciences, plays an essential role in driving improvements in academic settings. It encompasses all school activities to achieve societal objectives through education (Abu-Salem, 2008), particularly in efficiently utilizing financial and human resources to reach desired outcomes. Contemporary educational leaders must possess both traditional managerial skills and the ability to innovate and enhance educational performance (Al-Sueud, 2013).

Since the early 1990s, integrating Total Quality Management (TQM) into educational institutions has highlighted the significance of performance management within this sector. TQM has proven effective in fostering advancements across multiple aspects of education, including administrative processes, teaching quality, and institutional management. A notable development arising from TQM is the implementation of the Six Sigma (SS) methodology, a data-driven strategy originally developed in the business realm and adapted for educational contexts (Susilana, 2013).

This study aims to assess the extent of Six Sigma methodology implementation among school principals in Jordan, specifically in the Mafraq Governorate, from the teachers' perspective. This research leverages existing theoretical literature and methodological tools from previous studies, both foreign and Arab. The unique contribution of this study lies in its focus on evaluating the application of the Six Sigma methodology among Jordanian school principals in the Mafraq Governorate.

2. Literature Review

2.1. Educational Program

SS emphasizes the need to achieve stable and predictable operational outcomes and reduce process variability, thereby streamlining organizations, eliminating waste, and creating value, which ultimately leads to improved organizational performance (Tan et al., 2022, p. 280).

More specifically, SS is designed to improve the quality of outputs through rigorous analysis and the development of actionable solutions, increasing efficiency while minimizing losses (George, 2005). It is one of the most renowned total-quality methodologies, utilizing specific tools and models to improve productivity and profitability. It leverages statistical sciences, analysis, and development to enhance the condition of an organization, increasing performance efficiency and promoting continuous improvement (Kremcheeva & Kremcheev ,2019; Sabtu, et al., 2024). It also functions as a strategic approach for improving business operations and achieving maximum benefit by employing statistical methods aimed at preventing errors in performance whenever possible and meeting the needs of the customers and beneficiaries of an institution (Alessandro and Jiju, 2017). This is achieved by following a scientific approach based on data-driven leadership regarding performance levels and working to enhance the efficiency and effectiveness of an institution’s processes (Abdel-Aziz, 2014). It also enables comparisons between all operations, and the information obtained can then be used to inform approaches to achieving customer satisfaction (Park, 2003).

2.1. The Need for Six Sigma in Education

As highlighted in the preceding section, the application of SS in education is multifaceted. It can be viewed narrowly as a statistical tool for quality monitoring or, more broadly, as a comprehensive organizational strategy for continuous improvement (Al-Hawamdeh & Al-Sharman, 2017). It employs

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the DMAIC process—Define, Measure, Analyze, Improve, Control—which focuses on systematically addressing and solving problems. See Figure 1.

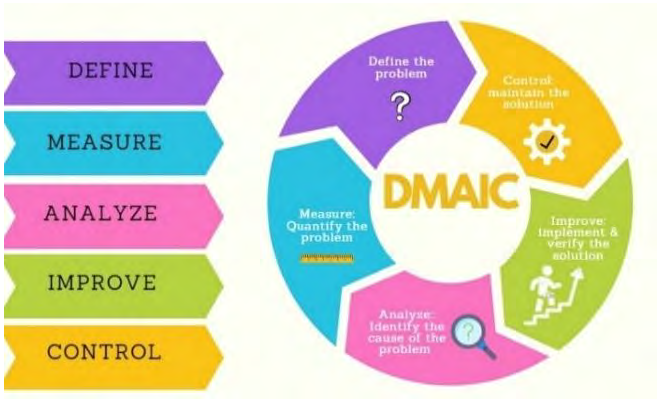

Figure 1. Six-Sigma Methodology (DMAIC)

Simons (2013) asserts that SS enhances efficiency and service delivery, prevents errors, and ensures that processes meet the needs of beneficiaries. This approach is particularly critical in educational management, where aligning organizational practices with the expectations of students, parents, and staff is essential. Nadeau (2017) further highlights the core principles of SS: focusing on beneficiaries, making data-driven decisions, proactive pre-planning, continuous improvement, collective teamwork, and balancing speed, quality, and cost reduction.

These principles demonstrate how SS can be applied to scholastic management to enhance performance, minimize deficiencies, and ensure continuous improvements in educational processes (Ibrahim, 2016). However, research on its implementation in educational settings, particularly in specific regions, remains limited.

Several studies, such as that conducted by Al-Arifan (2021) in Kuwait, have explored the readiness of educational institutions to apply the SS methodology and identified a strong desire to adopt it as a tool to enhance productivity and quality. Oteer (2018), however, investigated the application of SS in educational administrative processes in Palestine and found that adoption was uneven: improvement efforts were ranked low, while monitoring and measurement were ranked medium. In addition, Oteer also found that female managers were more willing to adopt SS, especially those with more than 15 years of experience.

Al-Hawamdeh and Al-Sharman (2017) investigated the applicability of SS principles in educational management. Their research revealed that school principals and supervisors in Jordan were well-qualified to adopt SS practices, especially in planning and teamwork. However, challenges remain in areas such as quality control, continuous improvement, and customer satisfaction. Similarly, Shoeibi and Zahmat (2015) applied the DMAIC model of SS in Iranian higher education institutions, the results of which indicated that SS significantly improved the quality of teaching and increased student enrollment in universities, especially in areas such as industrial engineering, economics, and accounting.

2.2. Historical Context and Current Challenges

Notwithstanding the numerous benefits of SS, its application in educational institutions faces several obstacles. For instance, Al-Dehani (2010) found that school principals in Kuwait, despite having the authority and knowledge to implement the DMAIC model, cited bureaucratic resistance and a lack of autonomy as barriers to full implementation. Similarly, Oteer (2018) identified

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challenges in the Palestinian educational departments, especially in the “analysis” and “improvement” phases where significant performance constraints emerged.

These issues are consistent with the results of Jenicke et al. (2008), who noted that although SS can be used to develop performance indicators, adapting the model to fit the unique structure of educational institutions is a challenge. The environment in which SS thrives in companies is fundamentally different from that of schools and universities. Anand (2006) also discussed this gap, noting that discussions about quality management in universities are often theoretical and fail to provide adequate practical solutions to the problems of the educational sphere.

This is supported by Rahman (2022), who reported that SS projects in education often focus on theoretical frameworks without paying sufficient attention to actionable practical solutions. However, when SS was integrated through hands-on projects with local companies, it benefited students by offering realistic learning experiences that complement classroom instruction.

Specialized training programs are another decisive factor in determining the success of SS in education. Both Al-Khelaiwi (2023) and Al-Sharman (2005) stressed the importance of providing customized training for education leaders and staff. For example, Al-Khelaiwi (2023) proposed an SS-specific approach to improving administrative performance in the Saudi Ministry of Education, emphasizing the need for training in statistical tools and SS principles in educational contexts. Moreover, both studies highlighted the need to address institutional resistance and lack of resources, whether financial, human, or informational, as major barriers to wider adoption.

In general, these studies reveal the potential SS offers for improving the management of education and its processes. In addition, they highlight the need for customized solutions and strategic planning to address the specific challenges associated with the application of SS in educational institutions. Implemented effectively, SS promises to improve management efficiency, elevate teaching quality, increase student satisfaction, and enhance overall institutional performance.

2.3. Study Problem Statement & Significance

The rapid advancement of information technology presents significant challenges to educational institutions, necessitating fundamental changes in both teaching strategies and administrative procedures. To address these challenges, it is essential to improve teachers' competencies, which will enhance their effectiveness and open opportunities for improvement at various levels of management, ultimately leading to an overall improvement in the quality of education (Al-Hassan, 2014).

The Jordanian Ministry of Education has prioritized reforming the educational model to enhance the learning process. This initiative is part of a broader educational development project aimed at fostering a knowledge-based economy and utilizing human resources in Jordan as a crucial asset for social development across various sectors and dimensions (Al-Hawamdeh & Al-Sharman, 2017).

Numerous studies (e.g., Alkhlewi, 2023; Alwarsh, 2022; Ahmed et al., 2022; Awad, 2022; Al-Badawi, 2021; Al-Barbari et al., 2019; Tawfiq & Abdul Muttalib, 2019; Brits, 2018; Al-Samawi & Al-Sarrab, 2018; Halqan & Abdel-Aziz, 2014) support the idea that Six Sigma methodology is useful for problem-solving through the identification, measurement, analysis, and development of procedures.

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This study explores how Six Sigma is applied in Jordanian schools, with a particular focus on Mafraq Governorate, from the perspective of teachers. It seeks to address two important questions:

1. How do teachers perceive the level of Six Sigma methodology application by principals in educational schools within the Mafraq Governorate?

2. Are there significant differences in teachers' assessments of the Six Sigma methodology application by school principals in the Mafraq Governorate based on gender, academic qualifications, and years of experience?

By tackling these questions, the study aims to bridge a gap in the existing research on Six Sigma's practical application in Jordanian schools. Most previous studies have focused on applying this methodology in universities, while schools have been largely overlooked. This neglect is problematic because schools are the foundational stage for building students' skills and values, and thus, improving the quality of education at this level has a long-term impact on society as a whole. This study also highlights teachers' perspectives on the use of Six Sigma by school principals, providing a new outlook on the effectiveness of this methodology in improving school management and the quality of education. It also demonstrates how Six Sigma can contribute to empowering educational leadership and enhancing the effectiveness of schools.

Therefore, this study has added valuable insights to the current literature, it also shows that there is still a long way to go for researchers to explore the impact of Six Sigma in schools more deeply and on a broader scale, both nationally and internationally.

3. Methodology

3.1. Design

To fulfill the objectives of the study, a descriptive survey method was chosen because it is well suited for educational research, particularly when assessing attitudes, opinions, demographics, and work environments (Adas, 1999). The survey allowed for a systematic collection of data from a large sample, providing insights into the current state of SS application in schools

3.2. Study Sample

According to the Jordanian Ministry of Education statistics (2023), the study population consisted of all (3.452) teachers working in public schools in the Mafraq Governorate in the academic year 2022/2023. A convenient method of sampling was used to select a sample of 383 teachers—representing approximately 13.2% of the total teacher population—from public schools in Mafraq during the first semester of the 2023-2024 academic year. While this percentage may seem small, it is consistent with Krejcie & Morgan's (1970) table for calculating sample sizes, which suggests that a sample of 383 is appropriate for a population of this size. Before beginning the study, the researchers obtained approval from the Dean of the Faculty of Educational Sciences to proceed with data collection. Data was gathered using a questionnaire designed for this purpose. Table 1 outlines the sample distribution according to three significant demographic factors: gender, years of experience, and educational qualifications.

Table 1. Distribution of the Sample According to Three Key Demographic Variables

Variables		Number	Percentage
Gender	Male	228	59.5
	Female	155	40.5
Educational Qualification	Bachelor	256	66.8
	Postgraduate	127	33.2

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Years of Experience	Less than 5 years	79	20.6
	From 5 to less than 10 years	153	39.9
	More than ten years	151	39.4
Total		383	100%

3.3. Study Instrument

Drawing on theoretical literature and previous relevant studies (Hassab, 2017; Al-Saeed, 2017; Al-Otaibi, 2017; Vijaya Sunder, 2016; Reosekar & Junnarkar, 2015), a questionnaire was developed to evaluate the application of the SS methodology within Jordanian schools. Tailored to fit the Jordanian educational context, the questionnaire comprised two sections: the first gathered personal demographic information from the respondents, while the second contained 36 items aimed at measuring the extent to which school principals apply the SS methodology, as perceived by teachers. These items were organized into the five key domains of the SS methodology: identification, measurement, analysis, improvement, and control.

3.4. Questionnaire Validity

3.4.1. Face Validity

The face validity of the questionnaire was confirmed by presenting it to seven professors from Jordanian universities specializing in educational administration, pedagogy, measurement and evaluation, and Arabic language. These experts were asked to review and provide feedback on the instrument, particularly regarding the clarity of the items, the quality of the wording, and the relevance of each item to the field it was intended to measure. They were also asked to suggest modifications or the omission of any items not aligned with the objectives of the research. Following their recommendations, the original 40 items designed to assess the application of the SS methodology by school principals in Mafraq, as perceived by teachers, were revised to 36 items.

3.4.2. Construct Validity

To determine the construct validity of the scale, we extracted the correlation coefficients between each item and the overall score for the tool, and between each item and the domain to which it belongs, in an exploratory sample (taken from outside the study sample) consisting of 30 individuals. These are presented in Table 2. The correlation coefficients for the items, concerning the tool as a whole, ranged from (0.44 to 0.85), with an overall range of (0.55 to 0.86).

Table 2. Rank and Correlation Coefficients between Each Item and Domain, and Each Item and the Overall Score

Rank	Correlation coefficient with the domain	Correlation coefficient with the overall score	Rank	Correlation coefficient with the domain	Correlation coefficient with the overall score	Rank	Correlation coefficient with the domain	Correlation coefficient with the overall score
1	**.73	*.44	13	**.69	**.63	25	**.75	**.75
2	**.79	**.66	14	**.84	**.73	26	**.68	**.72
3	**.65	**.49	15	**.71	**.76	27	**.69	**.65
4	**.58	**.47	16	**.72	**.62	28	**.65	**.51

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5	**.79	**.79	17	**.78	**.79	29	**.66	**.64
6	**.84	**.70	18	**.65	**.61	30	**.59	*.46
7	**.79	**.81	19	**.80	**.75	31	**.71	**.65
8	**.68	**.75	20	**.72	**.78	32	**.66	**.64
9	**.73	**.59	21	**.79	**.85	33	**.75	**.61
10	**.72	**.66	22	**.55	**.66	34	**.86	**.75
11	**.74	**.69	23	**.70	**.78	35	**.77	**.79
12	**.82	**.71	24	**.77	**.79	36	**.68	**.64

* Statistically significant at p ≤ 0.05.
** Statistically significant at p ≤ 0.01.

All correlation coefficients were acceptable and statistically significant; therefore, no items were removed. Additionally, the correlation coefficients between each domain and the overall score, along with the inter-domain correlation coefficients, were calculated. These are presented in Table 3, which shows that all correlations were acceptable and statistically significant, confirming the construct validity of the scale.

Table 3. Correlation Coefficients between the Domains and between Each Domain and the Overall Score

	The Identification Domain	The Measurement Domain	The Analysis Domain	The Improvement Domain	The Control Domain	The Overall Score
The Definition Domain	1					
the Measurement Domain	**.705	1				
The Analysis Domain	**.670	**.804	1			
The Improvement Domain	**.841	**.904	**.951	1		
The Control Domain	**.861	**.894	**.921	*.872	1	
The Overall Score	**.832	**.874	**.934	*.868	**.876	1

* Statistically significant at p ≤ 0.05.
** Statistically significant at p ≤ 0.01.

3.5. Questionnaire Reliability

To assess the reliability of the tool, the internal consistency coefficient (Cronbach's Alpha) for each domain was calculated. The results are presented in Table 4.

Table 4. Internal Consistency Coefficients for all Domains

Domain	Cronbach's alpha
Identification	0.82

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Measurement	0.82
Analysis	0.83
Improvement	0.80
Control	0.86

Notably, all values exceeded 0.80, underscoring the high level of reliability of the tool and strong internal consistency across its five domains.

3.6. Statistical Analysis

Using SPSS software, the data were processed as follows to answer the study questions:

- The first question was evaluated using means and standard deviations.

- The second question was evaluated using means and standard deviations as well as a multivariate analysis of variance (MANOVA), a VIF & tolerance calculation, and the LSD test.

4. Results

4.1. The Results of the First Research Question

How do teachers perceive the level of Six Sigma methodology application by principals in educational schools within the Mafraq Governorate? To answer this question, the means and standard deviations were calculated. See Table (5).

Table 5. Study Sample Responses on Six Sigma Methodology Domains

Rank	#	Domain	Mean	SD	Level
1	4	Improvement	3.30	.92	Moderate
2	2	Measurement	3.29	.82	Moderate
3	1	Identification	3.28	.81	Moderate
4	3	Analysis	2.98	.86	Moderate
5	5	Control	2.95	.80	Moderate
		The total	3.16	.85	Moderate

Table (5) shows that the overall score for the degree of Six Sigma methodology implementation among school principals in Mafraq Governorate, as perceived by teachers, was moderate, with a mean of (3.16) and a standard deviation of (0.85). The means across the tool's domains ranged between (2.95-3.30). The domain "Improvement" ranked first, with the highest mean of (3.30) and a standard deviation of (0.92), indicating a moderate level of application. In contrast, the "Control" domain ranked last, with a mean of (2.95), a standard deviation of (0.80), and also a moderate level. The means and standard deviations for each domain were calculated based on the sample's responses to individual items, following the order of the domains in the tool, as outlined below:

4.1.1. The 'Identification' Domain

The means, standard deviations, and ranks, for the identification domain's items were calculated, as shown in Table 6.

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Table 6. Descriptive Statistics for 'Identification' Domain Responses

Rank	#	Item	Means	SD	Level
1	3	The principal establishes a schedule to be followed in managing work and executing tasks according to the Six Sigma methodology.	4.11	.52	High
2	6	The principal encourages different work teams in the school to use open and unrestricted communication methods.	3.98	.84	High
3	4	The principal seeks to understand the opinions of parents and beneficiaries regarding the school's graduates.	3.87	.90	High
4	7	The principal works to promote the culture of Six Sigma and its objectives within the school.	3.74	.71	High
5	2	The principal strives to understand the needs of the community and its various institutions regarding the school.	3.33	.64	Moderate
6	1	The principal raises teachers' awareness of the administrative activities and processes to which the Six Sigma methodology can be applied.	2.86	.81	Moderate
7	5	The principal is keen to design accurate work mechanisms for all educational activities taking place in the school.	2.21	.87	Low
8	8	The principal is committed to training teachers to complete tasks correctly from the first attempt to avoid potential errors.	2.09	.76	Low
		Total	3.28	.23	Moderate

Table (6) shows that the means ranged from (2.09 to 4.11). Item (3) ranked first with a mean of (4.11) and a standard deviation of (0.52), indicating a high level, while item (8) ranked last with a mean of (2.09) and a standard deviation of (0.76), indicating a low level. The overall mean for the "identification" domain was (3.28), with a standard deviation of (0.23), reflecting a moderate level.

4.1.2. The 'Measurement' Domain

The means, standard deviations, and ranks were calculated for the 'Measurement' domain items. See Table (7).

Table 7. Descriptive Statistics for 'Measurement' Domain Responses

Rank	#	Item	Mean	SD	Level
1	11	The principal establishes the necessary criteria for implementing and evaluating the tool plan.	3.97	.70	High
2	12	The principal collects performance data and translates it into easily measurable values.	3.91	.76	High
3	13	The principal establishes a timetable for executing the required tasks.	3.80	.79	High

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4	10	The principal seeks to translate the needs of all beneficiaries of school activities into manageable metrics.	3.72	.74	High
5	9	The principal identifies those responsible for providing data and the methods used to obtain it.	2.87	.62	Moderate
6	14	The principal puts mechanisms in place to monitor work and help identify the extent to which desired goals have been achieved.	2.62	.55	Moderate
7	15	The principal involves teachers in designing tools to measure the processes and activities occurring within the school.	2.14	.86	Weak
		Total	3.29	.28	Moderate

Table (7) shows that the means ranged from (2.14 to 3.97). Item (11) ranked first with a mean of (3.97) and a standard deviation of (0.70), indicating a high level, while item (15) ranked last with a mean of (2.14) and a standard deviation of (0.86), indicating a low level. The overall mean for the 'Measurement' domain was (3.29), with a standard deviation of (0.28), reflecting a moderate level.

4.1.3. The 'Analysis' Domain

The means, standard deviations, and ranks were extracted for the 'Analysis' domain items. See Table (8).

Table 8. Descriptive Statistics for 'Analysis' Domain Responses

Rank	#	Item	Means	SD	Level
1	21	The principal works to design precise measurement tools to translate outcomes into quantitative forms.	3.91	.66	High
2	19	The principal analyzes the gap between current performance and targeted performance.	3.73	.65	High
3	20	The principal is keen to choose an efficient coordinator for the work teams within the school.	3.44	.66	Moderate
4	17	The principal distributes tasks among team members and specifies the tools to be used.	2.60	.70	Moderate
5	18	The principal contributes to understanding the current state of various educational processes and activities among team members.	2.50	.78	Moderate
6	16	The principal forms work teams and identifies appropriate measurement tools for educational processes and activities.	2.45	.74	Moderate
7	22	The principal encourages work teams to use statistical tools related to the Six Sigma methodology to measure task completion.	2.22	.78	Low
		Total	2.98	.26	Moderate

Table (8) shows that the means ranged from (2.22 to 3.91). Item (21) ranked first with a mean of (3.91) and a standard deviation of (0.66), indicating a high level, while item (22) ranked last with a mean of (2.22) and a standard deviation of (0.78), indicating a low level. The overall mean for the 'analysis' domain was (2.98), with a standard deviation of (0.26), reflecting a moderate level.

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4.1.4. The 'Improvement' Domain

The means, standard deviations, and ranks were extracted for the items of the 'Improvement' domain'. See Table (9).

Table 9. Descriptive Statistics for 'Improvement' Domain Responses

Rank	#	Item	Means	SD.	Level
1	25	The principal proposes innovative solutions to address identified problems.	3.90	.79	High
2	27	The principal plans to address the causes of identified errors to prevent their recurrence.	3.85	.79	High
3	24	The principal establishes mechanisms for reviewing errors identified in processes and activities.	3.78	.68	High
4	23	The principal develops a set of action plans to improve processes.	3.40	.57	High
5	26	The principal analyzes the achieved results and compares them to the targeted outcomes.	3.35	.87	Moderate
6	28	The principal encourages work teams to share experiences to enhance their performance.	2.67	.80	Moderate
7	29	The principal improves the environment and provides a conducive organizational climate to enhance teachers' performance in the school.	2.13	.76	Low
Total			3.30	.29	Moderate

Table (9) shows that the means ranged between (2.13-3.90), where item (25) came in first place with a mean of (3.90), with a standard deviation of (0.79), and with a high degree, and item (29) came in last rank, with an arithmetic mean (2.13), with a standard deviation of (0.76) and at a low degree. The arithmetic mean of the total score for the 'Improvement' domain was (3.30), with a standard deviation of (0.29) at a moderate degree.

4.1.5. The 'Control' Domain

The means, standard deviations, and ranks were extracted for the items of the 'Control' domain. See Table (10).

Table 10. Descriptive Statistics for 'Control' Domain Responses

Rank	#	Item	Means	SD.	Level
1	36	The principal sets controls to guarantee that the performance will not decline after improving it.	3.87	.72	High
2	35	The principal sets a group of plans to implement and review the enhanced processes.	3.69	.68	High
3	30	The principal reviews the results of tasks assigned to each team and their alignment with the established criteria.	3.44	.69	Moderate

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4	34	The principal establishes mechanisms to regulate work methods and improve alternatives to develop new processes.	2.71	.72	Moderate
5	32	The principal evaluates the previous outputs of each work team.	2.47	.79	Moderate
6	33	The principal assesses the outputs of the school's operational system (students, teachers) and their alignment with Six Sigma methodology goals.	2.27	.83	low
7	31	The principal ensures channels for feedback between work teams within the school.	2.19	.71	low
		Total	2.95	.27	Moderate

Table (10) shows that the means ranged from (2.19 to 3.87). Item (36) ranked first with a mean of (3.87) and a standard deviation of (0.72), indicating a high level, while item (31) ranked last with a mean of (2.19) and a standard deviation of (0.71), indicating a low level. The overall mean for the 'Control' domain was (2.95), with a standard deviation of (0.27), reflecting a moderate level.

4.2. The Results of the Second Research Question

Are there significant differences in teachers' assessments of the Six Sigma methodology application by school principals in the Mafraq Governorate based on gender, academic qualifications, and years of experience?

To answer this question, the means and standard deviations were calculated. See Table (11).

Table 11. Means and Standard Deviations for Principals' Application of the Six-Sigma Methodology by Gender, Qualification, and Years of Experience

Variable	Categories		Identification	measurement	analyzing	improvement	control	The Tool as a whole
Gender	Male	Mean	3.2443	3.2494	2.9699	3.2187	2.9004	3.1285
		S.D	.24302	.31379	.32041	.33587	.25267	.19701
	Female	Mean	3.3044	3.3668	3.005	3.4276	3.0313	3.2151
		S.D	.22221	.22967	.16075	.16075	.28022	.10762
Scientific qualification	Bachelor	Mean	3.2729	3.2840	2.9754	3.2394	3.0229	3.1589
		S.D	.25562	.30271	.28661	.31300	.24831	.19614
	Graduate Studies	Mean	3.2943	3.3228	3.0022	3.4319	2.8133	3.1729
		S.D	.19193	.25594	.23048	.20871	.26299	.10765
Years of Experience	Less than 5 years	Mean	3.1282	3.0307	2.8843	3.1537	2.9349	3.0264
		S.D	.17099	.19634	.21100	.32973	.22966	.14256
	From 5 to less than ten years	Mean	3.3652	3.4603	3.0915	3.3063	3.0924	3.2631
		S.D	.26653	.21876	.25419	.26647	.24332	.15177
	10 years and more	Mean	3.2732	3.2706	2.9281	3.2914	2.8221	3.1345
		S.D	.18842	.27904	.27547	.27955	.25124	014281

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Table (11) shows noticeable variations in the means and standard deviations regarding the application of the Six Sigma methodology among school principals within the Mafraq Governorate, based on teachers' perspectives. These variations are attributed to differences in variables such as gender (male, female), educational qualification (bachelor's degree, postgraduate studies), and years of experience (less than 5 years, 5 to less than 10 years, and 10 years or more). To assess the significance of these differences, multiple regression analysis was conducted to examine the application of the Six Sigma methodology among school principals within Mafraq Governorate from the teachers' perspectives. See Table (12).

Table 12. Multiple Regression Analysis of the Impact of Gender, Qualification, and Experience on School Principals' Application of Six-Sigma Methodology

Source of variance	Domain	Sum of squares	Freedom degrees	Mean of squares	(F) value	Statistical significance
Gender hotleng= 0.282 a= 0.000	Identification	.913	1	.913	20.137	*.000
	Measurement	.169	1	.169	3.266	.072
	Analysis	.126	1	.126	2.359	.125
	Improvement	3.055	1	3.055	45.016	*.000
	Control	.967	1	.967	16.966	*.000
	Total	.134	1	.134	7.427	*.007
Scientific qualification hotleng= 0.377 a= 0.000	Identification	.594	1	.594	13.111	*.000
	Measurement	1.875	1	1.875	36.136	*.000
	Analysis	4.516	1	4.516	84.684	*.000
	Improvement	1.310	1	1.310	19.307	*.000
	Control	.191	1	.191	3.346	.068
	Total	.989	1	.989	54.669	*.000
Years of experience wilx= 0.552 a= 0.000	Identification	3.836	2	1.918	42.315	*.000
	Measurement	10.743	2	5.372	103.546	*.000
	Analysis	7.368	2	3.684	69.088	*.000
	Improvement	.836	2	.418	6.161	*.002
	Control	1.271	2	.636	11.147	*.000
	Total	3.739	2	1.870	103.328	*.000
The error	Identification	17.134	378	.045		
	Measurement	19.610	378	0.052		
	Analysis	20.157	378	.053		
	Improvement	25.652	378	.068		
	Control	21.551	378	.057		
	Total	6.840	378	.018		
Total	Identification	4141.875	383			
	Measurement	4194.796	383			
	Analysis	3438.796	383			
	Improvement	4212.694	383			
	Control	3368.857	383			
	Total	3844.435	383			

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* Statistically significant at the significance level (α ≥0.05).

Table (12) indicates statistically significant differences at the significance level of (α ≤ 0.05) due to the effect of gender in several areas: the 'Identification' domain, the 'Improvement' domain, and the 'Control' domain, all favoring the females. Additionally, the overall tool also showed a significant difference in favor of females.

The table also reveals statistically significant differences at the same significance level (α ≤ 0.05) attributed to the effect of academic qualification in all Six Sigma methodology domains, except for the control domain. These differences favored participants with postgraduate qualifications. Moreover, Table (12) highlights statistically significant differences due to years of experience, with all fields of Six Sigma application showing differences favoring those with (5 to less than 10 years of experience).

To identify the pairwise differences between the categories of the "years of experience" variable, the (LSD) test was used. However, before conducting the LSD test we calculated the variance inflation factor (VIF) and tolerance values to assess multicollinearity between the independent variables. See Table 13.

Table 13. The Variance Inflation factor &Tolerance Values between Variables

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics		
Variables	B	Std. Error	Beta	t	Sig.	Tolerance	VIF	
Gender		.054	.063	.161	.869	.393	.997	1.003
Educational Qualification		-.068-	.099	-.193-	-.683-	.500	.428	2.337
Years of Experience		.095	.063	.427	1.513	.142	.427	2.341

Based on Table (13), all VIF values are below three, indicating no multicollinearity between the independent variables. Additionally, the table reveals that the tolerance values are greater than 0.1, further confirming the absence of multicollinearity among the independent variables. According to this result, we performed the LSD test to further investigate the pairwise differences among the categories of the principals' years of experience, and the results are presented in Table (14).

Table 14. Least Significant Difference Test for Pairwise Differences in Six-Sigma Application by Principals' Years of Experience

Domain	Years of experience	Means	Less than 5 years	From 5 and less than 10 years	10 years and more
Identification	Less than 5 years	3.12	-	-	-
	From 5 to less than 10 years	3.36	*0.000	-	-
	More than ten years	3.27	*0.000	*0.000	-
Measurement	Less than 5 years	3.03	-	-	-
	From 5 to less than 10 years	3.46	*0.000	-	-
	More than ten years	3.27	*0.000	*0.000	-

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Analyzing	Less than 5 years	2.88	-	-	-
	From 5 to less than 10 years	3.09	***0.000**	-	-
	More than ten years	2.92	***0.000**	***0.000**	-
Improvement	Less than 5 years	3.15	-	-	-
	From 5 to less than 10 years	3.37	***0.000**	-	-
	More than ten years	3.30	***0.000**	*0.028	-
Control	Less than 5 years	2.82	-	-	-
	From 5 to less than 10 years	3.09	*0.001	-	-
	More than ten years	2.93	***0.000**	***0.000**	-
Total	Less than 5 years	3.02	-	-	-
	From 5 to less than 10 years	3.26	***0.000**	-	-
	More than ten years	3.13	***0.000**	***0.000**	-

Table (14) shows statistically significant differences at the significance level of ($\alpha \leq 0.05$) due to the variable of "years of experience" in all areas of the Six Sigma methodology application. These differences were found between the experience category of "less than 5 years", and the category of "5 to less than 10 years", as well as the category of "more than 10 years". The findings show that the "5 to less than 10 years" category demonstrated more effectiveness than the "less than 5 years" category by achieving the highest means in the majority of domains (such as Identification, Measurement, Improvement, and Total). Furthermore, the category of "10 years or more" was more statistically significant than the category of "less than 5 years" across all domains, although the category of "5 to less than 10 years" frequently exceeded the former. These results demonstrate how crucial experience is to the successful implementation of the Six Sigma methodology, especially the experience ranging from five to less than ten years. See Figure 2.

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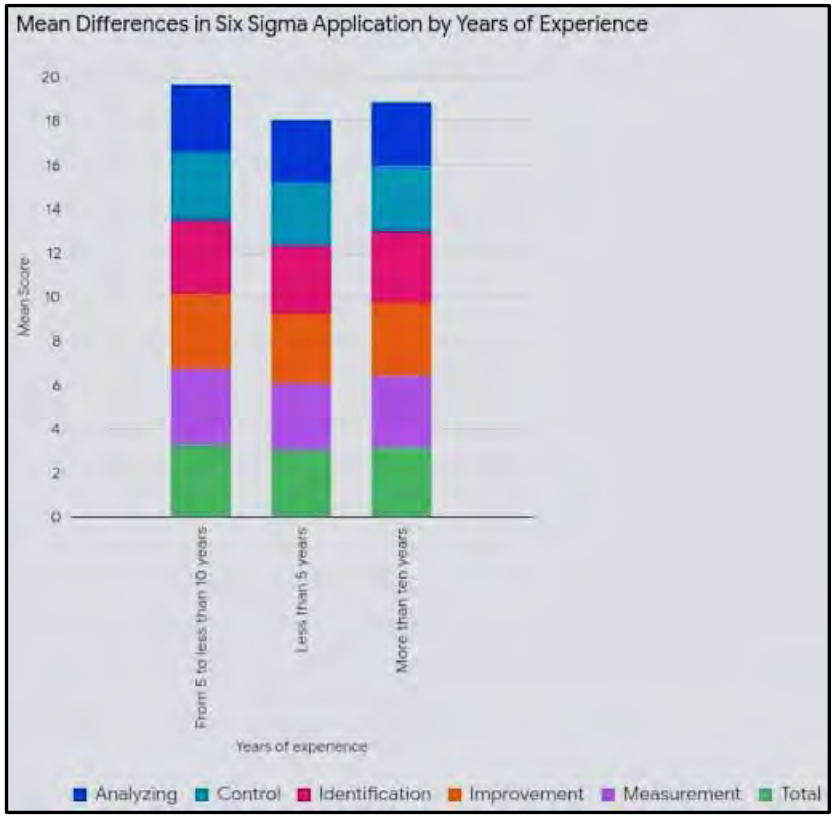

Figure 2. The Mean Differences in Six-Sigma Application Across The 'Years of Experience' Categories

5. Discussion

5.1. The Results of the First Research Question

In response to the first research question, results revealed that teachers perceived the school principals in Mafraq Governorate to apply SS moderately. The results are similar to Alessandro and Jiju's, (2017), Kremcheeva & Kremcheev's (2019), and Sabtu's (2024) findings, which all asserted Six Sigma as a quality improvement methodology in education, particularly for enhancing teaching practices and institutional processes. The Improvement domain was ranked highest, also at a moderate level. This suggests that principals recognize the importance of continuous improvement in education. However, the Control domain was ranked lowest, indicating a potential gap in understanding the need for post-process control measures, a crucial aspect of SS. These findings align with those of (Jenicke, et al., 2008), Al-Hawamdeh, and Al-Sharman (2017), but contrast with those of Oteer (2018) who reported a lower level of SS application. The use of SS in particular domains is next examined:

5.1.1. The 'Identification' Domain

The findings suggest that school principals attach enormous importance to creating a structured schedule as a roadmap for effectively completing their tasks. This consistency between intended actions and their actual implementation is a core principle of the SS methodology, emphasizing its significance in efficient school management.

Nevertheless, it appears that school principals do not prioritize training teachers to carry out tasks correctly from the outset to minimize mistakes. This lack of focus may stem from the heavy administrative burdens that school leaders encounter. Furthermore, financial limitations and crowded classrooms, which exacerbate teachers' workloads, impede the execution of comprehensive training programs. These outcomes align with the findings of Nadeau (2017) but contradict the

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findings of Oteer (2018), which reported a moderate level of attention in this domain and also contradict the high ratings reported by Al-Hawamdeh and Al-Sharman (2017) concerning information management.

5.1.2. The 'Measurement' Domain

The results indicate that school principals are proactively working to establish the standards necessary for the implementation and evaluation of performance plans. Creating these standards is a crucial responsibility of school leadership, as it is essential for the success of both administrative and educational processes. Principals prioritize these standards because they serve as a guide, helping them convert plans into actionable steps. This approach facilitates the collection of accurate performance feedback and the development of corrective measures, ensuring the successful implementation of the performance plan.

However, principals often fail to involve teachers in designing tools to measure school processes and activities, which received a low ranking. This may stem from the perception that teachers, due to their diverse specializations, lack the necessary expertise to create such measurement tools, compelling principals to take on this responsibility themselves. This result follows that of Vijaya Sunder (2016), who also emphasized the importance of involving teachers in the measurement process. Additionally, Oteer's (2018) study found a moderate level of interest in this domain.

5.1.3. The 'Analysis' Domain

The results demonstrate that principals place a strong emphasis on analyzing the gap between current and targeted performance. This focus likely reflects their recognition of the importance of identifying and addressing performance discrepancies to achieve desired goals and improve overall school standards. By concentrating on these gaps, principals aim to rectify any inconsistencies between actual and expected performance.

Nevertheless, in some cases, principals seldom encourage work teams to utilize statistical tools specific to the SS methodology for measuring task completion, with this item ranking lowest in importance. This may be due to the belief that measuring task completion falls under the purview of school administrations rather than school staff who may lack the necessary specialized knowledge. Consequently, there is insufficient encouragement for work teams to leverage SS-related statistical tools to assess their progress. This result aligns with that of Park (2003) who believed that the effective use of statistical tools is a cornerstone of Six Sigma, and their absence can significantly impair the analysis process. On the other hand, this finding contrasts with Oteer's (2018), which reported a lower score in the analysis domain.

5.1.4. The 'Improvement' Domain

The results indicate that principals frequently suggest innovative solutions to address identified problems, as this aspect ranked first with a high degree of emphasis. This can be attributed to the fact that one of the key traits of successful school administrations is their proactive approach to preventing errors and developing effective solutions when issues arise, ensuring the smooth functioning of the school. Principals are committed to continuously innovating solutions to address challenges both before and during task implementation. With the evolution of management concepts, an effective manager is now viewed as someone who generates creative and unconventional solutions—an essential trait for dealing with obstacles to workflow. Consequently, school principals are increasingly expected to exhibit innovation and creativity, which aligns with modern management practices.

Conversely, principals demonstrated limited effort in improving the organizational climate to enhance teachers' performance, as this aspect ranked last with a low degree of application. This could

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be due to a lack of financial resources, overcrowded classrooms, and the heavy workload placed on teachers, all of which hinder the creation of a supportive and motivating work environment. These findings are consistent with those of George (2005), Al-Hawamdeh, and Al-Sharman (2017), who reported medium-level results in the improvement domain but differ from those of Oteer (2018), whose findings indicated a low level in the follow-up improvement domain.

5.1.5. The 'Control' Domain

The results indicate that principals prioritize setting controls to prevent performance from declining after improvements, with this aspect ranking first and receiving a high degree of importance. This focus can be attributed to the belief that, particularly with the adoption of comprehensive quality standards like the SS methodology, it is essential not just to improve performance but also to implement measures that ensure continuous progress. Success is seen not as simply reaching the top but as maintaining that level of excellence, which requires ongoing effort and oversight.

By contrast, principals placed less emphasis on establishing feedback channels between work teams within the school, which was rated weak. This may be due to the heavy workloads faced by team members (teachers), which can hinder effective communication. Additionally, some school administrations believe that each team operates within its specialized area, with little overlap between teams, leading them to collect feedback from individual teams separately rather than encouraging cross-team communication. This was affirmed by Simons (2013), who emphasized how crucial feedback methods are to maintaining Six Sigma enhancements, arguing that their lack might cause a communication breakdown and obstruct long-term performance.

5.2. The Results of the Second Research Question

The results revealed statistically significant differences related to gender regarding the identification, improvement, and control domains, all in favor of the female group. The overall results also favored the female group. This may be attributed to the commitment of female teachers to stay updated on practices that enhance the efficiency of the educational system. Consequently, their interest in adopting the SS methodology (Define, Improve, Control) has emerged as a crucial strategy for ensuring the success of educational institutions and propelling them toward excellence. This outcome is consistent with Oteer (2018) and Tan et al. (2022), who also reported statistically significant differences related to gender.

In addition, the results revealed statistically significant differences based on academic qualifications across all areas of SS implementation, except the control domain, in favor of individuals with postgraduate degrees. This focus on higher qualifications may stem from the accumulation of both academic and practical experience acquired during graduate studies, which positively influences teachers' understanding of total quality management requirements, including SS methodology. Consequently, this has enhanced the success of their educational institutions. However, this finding aligns with Al-Saeed (2017) but contrasts with the conclusions of Oteer (2018), Al-Hawamdeh, and Al-Sharman (2017), who reported no statistically significant differences concerning academic qualifications.

The findings also indicated statistically significant differences based on years of experience in all aspects of applying the SS methodology, with the group of 5 to 10 years displaying the most favorable results. This may be because principals with more experience typically develop broader insights and deeper comprehension, allowing them to understand and implement SS requirements more effectively. This observation is in line with Al-Samawi and Al-Sarrab (2018), and Oteer (2018), who identified significant differences related to long years of experience.

6. Conclusion

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This research reveals that, according to teachers, school principals in Mafraq Governorate apply the SS methodology at a moderate level, indicating their recognition of the importance of continuous improvement in education. The improvement domain was ranked highest, while the control domain ranked lowest, indicating a lack of understanding regarding the importance of post-process control measures.

In the study, female teachers outperformed males in the SS application, likely due to their commitment to improving the efficiency of the educational system. Additionally, academic qualifications also play a critical role, as postgraduate individuals tend to implement SS more effectively in most domains. Reflecting the influence of their advanced academic and practical experience. Finally, teachers with five to less than ten years of experience demonstrate a stronger understanding of SS applications, showing the importance of experience in SS implementation.

Accordingly, it is important to provide targeted training for teachers and school principals on Six Sigma methodology, and how to apply it in an educational setting, focusing more on domains with lower performance such as 'Control'. School principals also need to team up with teachers to design tools for assessing school processes and activities. Creating and maintaining a conducive climate for teachers' performance is essential.

7. Limitations

When generalizing the results of this study, it should be done with caution, as the study was limited to schools in Mafraq Governorate. Cultural and contextual factors must be considered when applying this methodology in other academic settings. The reliance on questionnaires in this study highlights the need for future research to incorporate mixed methods, such as interviews and observations, to prevent participants' bias. Additionally, involving students and parents in future studies and exploring their perspectives is crucial.

Declarations

Authors Contributions. (LM: Original paper author, MS: Statistical analysis, MH: Data analysis
RZ. critical revision of the manuscript, supervision, and final approval, KH: Technical support.
AN. Arabic- English Translation).
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Data Availability Statement. The data supporting this study's findings are available from the corresponding author (RZ) upon reasonable request.
Acknowledgments. During the preparation of this work, the authors used the (Quillbot and Wordtune service) to assist with language proofreading and translation. The authors declare that they reviewed and edited the final output as needed and take full responsibility for the content of the published article.

References

Abu-Salem, F. K. (2008). *The reality of cooperation between school management and English language supervisors in developing their teachers' performance and the means to activate it.* (dissertation). Islamic University, Gaza. https://search.emarefa.net

Adas, A. (1999). *Essentials of Educational Research* (3rd ed.). Amman, Jordan: Al-Furqan Publishing.

Ahmed, A. M., Elansary, M. S., & Mashaan, S. M. (2022). Implementation of the Six Sigma methodology in the educational process. *Journal of Educational Sciences*, *1*(50), 78–108.

https://doi.org/https://maeq.journals.ekb.eg/article_220247_416e20494f7b5988a45872b8e160a281.pdf

Al-Arifan, A. (2021). *The Reality of the Readiness of Kuwaiti Educational Institutions to Use the Six Sigma Methodology for Comprehensive Quality from the Point of View of Their School Principals, 37*(2), 332–354. https://doi.org/https://mfes.journals.ekb.eg/article_154287_2c309b774a369c7022d943e2da32a0e5.pdf

Al-Badawi, M. (2021). Developing administrative practices for academic leaders according to the six-sigma methodology from the point of view of department heads : an applied study in the accredited faculties of Alexandria University. *Journal of Education of Sohag University*, *2*(82), 624–718. https://doi.org/https://edusohag.journals.ekb.eg/article_137589_fedb78ff9cb156080fc80fa988084905.pdf

Al-Barbari, M. A., AbdelAzim, H. Z., & Al-Azzazi, A. A.-R. (2019). The practices of university leaders in implementing Six Sigma in some American universities and the possibility of benefiting from it in Egyptian universities: a field study. *Journal of Faculty of Education*, *30*(118), 415–442. https://doi.org/https://jfeb.journals.ekb.eg/article_61182_232711b2b48acb2a68b96190adef1fcc.pdf

Al-Dahish, K., Al-Dahish, A. R., & Radwan, S. (2006). *Educational administration and planning... theoretical foundations and practical applications*. Al-Rashed Library Publishers. https://aljameah.com

Al-Dehani, S. (2010). The possibility of applying Six Sigma principles and their obstacles in school administration in schools in the State of Kuwait. *Journal of Education, 24*(96), 15–69. https://doi.org/10.34120/joe.v24i96.2057

Alessandro, Laureani & Jiju, Antony (2017) Leadership and Lean Six Sigma: a systematic literature review. Total Quality Management and Business Excellence, pp 1-29. https://doi.org/10.1080/14783363.2017.1288565

Al-Harbi, K. G. (2021). Educational leadership styles for leaders and their impact on the job performance of teachers in public education schools in Medina. *International Journal of Educational and Psychological Sciences*, *69*(1), 11–85. https://doi.org/https://ijeps.journals.ekb.eg/article_240734_081958c73dbbbcb387c6827c720c4cb6.pdf

Al-Hassan, M. (2014). The possibility of applying Six Sigma mechanisms to evaluate and develop the quality of educational leadership in educational supervision in Al-Ahsa Governorate (Benin). *Journal of Educational Sciences*, *25*(99), 343–391. https://search.emarefa.net

Al-Hawamdeh, R. F., & Al-Sharman, M. M. (2017). The possibility of applying Six Sigma approaches in school administration in Jerash governorate from the perspective of educational principals and supervisors. *The Islamic University Journal of Educational and Psychology Studies*, *26*(4), 698–717. http://search.shamaa.org.

Al- Khelaiwi, L. S. (2023). A Proposed Methodology of Six Sigma for Enhancing the Administrative Performance of Employees in the Planning and Development Agency at the Ministry of Education in the Kingdom of Saudi Arabia. *Journal of Educational Sciences*, *48*(198). https://doi.org/https://jsrep.journals.ekb.eg/article_294046_bb2eb2e726fe5f8a7683a01360d0bc28.pdf

Al-Otaibi, A. G. (2017). Requirements of Six Sigma entry application to improve performance quality at Shaqra University. *Studies and Educational Sciences, 44*(4), 277–297. https://doi.org//archives.ju.edu.jo/index.php /edu/article/view/11187/8421

Al-Saeed, S. (2017). Six Sigma as an Approach to the Quality Achievement in Some of the Egyptian Higher Education Institutions: A Field Study. *Journal of Education, 49*(2), 11–94. https://doi.org/https://doi.org/10.12816/0043130

Al-Samawi, A. R., & Al-Sarrab, N. (2018). A proposed vision of mechanisms for applying the Six Sigma approach to improve the quality of administrative performance in educational institutions Higher education in the Republic of Yemen. *Al-Saeed Journal of Humanities and Applied Sciences, 2*(1), 5–25. https://doi.org/https://alsaeeduni.edu.ye/images /magazine/3/R1.pdf

Al-Shaman, A. (2005). Application of Six Sigma in the educational field. *Journal of King Saud's University, 18*(1), 89–136. https://jes.ksu.edu.sa

Alsueud, R. (2013). *Educational leadership concepts and prospects*. Dar Safaa for Publishing and Distribution. https://www.neelwafurat.com

Alwarsh, A. A. (2022). *Lean six-sigma leadership in higher education. ProQuest LLC*, Ed.D. Dissertation, Bowling Green State University. https://www.proquest.com/docview/2773882340

Anand, G. (2006). *Continuous improvement and operation strategy: Focus on Six Sigma programs* (dissertation), The Ohio State University. https://www.coursehero.com/file/30967886/Continuous-improvement-and-operations-stpdf/

Awad, H. (2020). Requirements for applying the Six Sigma method to develop administrative work in kindergarten. *Journal of Childhood and Education, 1*(41), 341–374. https://doi.org/https://journals.ekb.eg/article_174057_83b99c7798d20b36fb109836f8e17d47.pdf

Brits, H. J. (2018). A quest for waste reduction at institutions of Higher Learning: Investigating the integration of Six Sigma and lean Six Sigma methodologies with Total Quality Management. *South African Journal of Higher Education*, *32*(4). https://doi.org/10.20853/32-4-2582

George, M. L. (2005). *Lean six sigma: Combining Six sigma quality with Lean Speed*. McGraw-Hill. https://dl.acm.org/doi/10.5555/579945

Halqan, A. A., & Abdel-Aziz, A. (2014). Application Requirements of Six Sigma Methodology to Improve Performance of Administrative Apparatusat Hafr Albatin Faculty. *Journal of Education, 1*(38), 373–446. https://doi.org/https://edusohag.journals.ekb.eg/article_127680_cc1d0122f99b33254ebe53c758490dd2.pdf

Hassan, M. (2017). Towards improving the quality of operations in higher education institutions under the six-step methodology. *Studies Economic Issue*, *8*(2), 181–196. https://doi.org/https://www.asjp.cerist.dz/en/article/90454

Ibrahim, I. M. (2016). Developing the administration of middle schools in the State of Kuwait from the perspective of educational quality standards. *Al Azhar University*, *35*(170), 799–848. https://doi.org/https://jsrep.journals.ekb.eg/article_34017_e471eee2010e37e298885c5c9a6c775f.pdf

Jenicke, L. O., Kumar, A., & Holmes, M. C. (2008). A framework for applying Six Sigma improvement methodology in an academic environment. *The TQM Journal*, *20*(5), 453–462. https://doi.org/10.1108/17542730810898421

Jordanian Ministry of Education. (2023). The Statistical Report for the Academic Year 2022-2023. https://moe.gov.jo/sites/default/files/tqryr_hsyy_2022-2023_nhyy.pdf

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610. https://doi.org/10.1177/001316447003000

Kremcheeva, D.. Kremcheev, E. (2019). Implementation of the Six Sigma method in the educational process, *Journal of Physics Conference Series 1384(1)*:012022. http://doi.org/10.1088/1742-6596/1384/1/012022

Nadeau, S. (2017). Lean, Six Sigma and Lean Six Sigma in higher education: A review of experiences around the world. *American Journal of Industrial and Business Management*, *07*(05), 591–603. https://doi.org/10.4236/ajibm.2017.75044

Oteer, R. (2018). The Extent of Using Six Sigma Concepts DMAIC Model in the Development of Educational Administrative Processes. *Jordanian Journal of Educational Sciences, 14*(1), 85–98. https://doi.org/https://journals.yu.edu.jo/jjes/Issues /2018/Vol14No1/7.pdf

Park, S. H. (2003). *Six Sigma for Quality and Productivity Promotion*, Published by the Asian Productivity Organization, Tokyo, Japan. https://reader.1lib.sk/read/597e955c5a86ed8935307a96659afc53f7a187fa7731ad98c0d1e2ecd76be0c0/683509/a4fe47/six-sigma-for-quality-and-productivity-promotion.html

Ramasubramanian, P. (2012). Six Sigma in Educational Institutions. *International Journal of Engineering Practical Research*, *1*(1), 1–5. https://doi.org/ia800308.us.archive.org

Reosekar, R. S., & Junnarkar, N. D. (2011). Quality Improvement through Systematic Approach-Six Sigma. *Journal of Engineering Education Transformations*, *24*(3), 1–7. 10.16920/jeet/2011/v24i3/113457

Sabtu, S. H., Effendi, M., & Matore, E. M. (2024). Systematic literature review on the implementation of the Six Sigma approach in education. *International Journal of Evaluation and Research in Education (IJERE) 13*(1), 262-270. http://doi.org/10.11591/ijere.v13i1.26196

Shoeibi, M., & Zahmatdoost, E. (2015). The role of Six Sigma in improving the quality of higher education institutions. *Financial & Business Management (IFBM)*, *3*(6), 93–98. (4) (PDF) The Role of Six Sigma in Improving the Quality of Higher Education Institutions (researchgate.net)

Simons, N. (2013). The Business Case for Lean Six Sigma in Higher Education. *ASQ Higher Education Brief*, *6*(3), 1–6. https://doi.org/https://docplayer.net/8474716-The-business-case-for-lean-six-sigma-in-higher-education.html

Susilana, R. (2013). Development of Quality Assurance System in Culture and Nation Character Education in Primary Education in Indonesia. *The Malaysian Online Journal of Educational Science*, *1*(2), 17–24. https://doi.org/https://files.eric.ed.gov/fulltext/EJ1086212.pdf

Tan, O.K., Lim, P.J., Lim, K.Y., Ong, C.H., Goh, C.F., & Kadir, B. (2021). Critical success factors for Lean Six Sigma in business school: A view from the lecturers. *International Journal of Evaluation and Research in Education (IJERE)*.), *11*(1). pp 280-289. http://doi.org/10.11591/ijere.v11i1.21813

Tawfiq, S., & Abdul Muttalib, A. (2019). The future of STEM schools from the perspective of Six Sigma and the scenario approach. *Journal of Faculty of Education*, *30*(118), 1–88.

https://doi.org/https://jfeb.journals.ekb.eg/article_61135_1e8cd0dd601a2e95507ee0d0be44c2c8.pdf

Vijaya Sunder, M. (2016). Lean Six Sigma in higher education institutions. *International Journal of Quality and Service Sciences*, *8*(2), 159–178. https://doi.org/10.1108/ijqss-04-2015-0043

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Appendix 1

Study's Instrument

Dear Respondent:

This research aims to assess the extent to which Jordanian school principals in Mafraq apply the Six Sigma methodology from the teachers' perspectives to identify strengths and areas for improvement in educational management. We kindly request your participation by completing this survey. Please do not include your name on the questionnaire. If you encounter any questions you feel uncomfortable answering, feel free to skip them. Your participation is voluntary, and all responses will remain confidential and anonymous. We greatly appreciate your time and cooperation. Thank you for your valuable assistance.

Part (A) Demographic Questions:

Q1 Gender: A) Male B) Female
Q2 Educational Qualifications: A) Bachelor's degree B) Postgraduate degree
Q3 Years of Experience:
A) Less than 5 years B) 5 to less than 10 years C) More than 10 years.

Part (B) Questionnaire Items:
How would you rate each of the following statements on a scale of 1 to 5 (five for strong agreement, four for agreement, three for neutrality, two for disagreement, and one for strong disagreement)?

#	Item	Agreement Degree				
		Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
1.	The principal raises teachers' awareness of the administrative activities and processes to which the Six Sigma methodology can be applied.					
2.	The principal strives to understand the needs of the community and its various institutions regarding the school.					
3.	The principal works to establish a schedule to be followed in managing work and executing tasks according to the Six Sigma methodology.					
4.	The principal seeks to understand the opinions of parents and beneficiaries regarding the school's graduates.					
5.	The principal is keen to design accurate work mechanisms for all educational activities taking place in the school.					
6.	The principal encourages different work teams in the school to use open and unrestricted communication methods.					
7.	The principal works to promote the culture of Six Sigma and its objectives within the school.					
8.	The principal is committed to training teachers to complete tasks correctly from the first attempt to avoid potential errors.					
9.	The principal identifies those responsible for providing data and the methods used to obtain it.					
10.	The principal seeks to translate the needs of all beneficiaries of school activities into manageable metrics.					
11.	The principal establishes the necessary criteria for implementing and evaluating the tool plan.					
12.	The principal collects performance data and translates it into easily measurable values.					
13.	The principal establishes a timetable for executing the required tasks.					
14.	The principal puts mechanisms in place to monitor work and help identify the extent to which desired goals have been achieved.					
15.	The principal involves teachers in designing tools to measure the processes and activities occurring within the school.					
16.	The principal forms work teams and identifies appropriate measurement tools for educational processes and activities.					
17.	The principal distributes tasks among team members and specifies the tools to be used.					
18.	The principal contributes to understanding the current state of various educational processes and activities among team members.					
19.	The principal analyzes the gap between current performance and targeted performance.					

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#	Item	Agreement Degree				
		Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
20.	The principal is keen to choose an efficient coordinator for the work teams within the school.					
21.	The principal works to design precise measurement tools to translate outcomes into quantitative forms.					
22.	The principal encourages work teams to use statistical tools related to the Six Sigma methodology to measure task completion.					
23.	The principal develops a set of action plans to improve processes.					
24.	The principal establishes mechanisms for reviewing errors identified in processes and activities.					
25.	The principal proposes innovative solutions to address identified problems.					
26.	The principal analyzes the achieved results and compares them to the targeted outcomes.					
27.	The principal plans to address the causes of identified errors to prevent their recurrence.					
28.	The principal encourages work teams to share experiences to enhance their performance.					
29.	The principal improves the environment and provides a conducive organizational climate to enhance teachers' performance in the school.					
30.	The principal reviews the results of tasks assigned to each team and their alignment with the established criteria.					
31.	The principal ensures channels for feedback between work teams within the school.					
32.	The principal evaluates the previous outputs of each work team.					
33.	The principal assesses the outputs of the school's operational system (students, teachers) and their alignment with Six Sigma methodology goals.					
34.	The principal establishes mechanisms to regulate work methods and improve alternatives to develop new processes					
35.	The principal sets a group of plans to implement and review the enhanced processes.					
36.	The principal sets controls to guarantee that the performance will not decline after improving it.					

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Appendix 2

Ethical Approval

Dear Editor,

Greetings,

I want to confirm that I approved the execution of the study entitled: "Empowering Educational Management: Teachers' Insights on School Principals' Use of Six Sigma Methodology", and that the study design ensures the privacy of the participating individuals. All necessary measures have been taken to safeguard the confidentiality of personal information and its use solely for scientific research purposes.

I assure you that all participants in the study were informed about the nature of the research and their free and informed consent was obtained. We have adhered to the highest ethical standards to ensure that the collected data will be used responsibly and no personal information of the participants will be disclosed.

Additionally, please note that the faculty's dean is responsible for approving or declining human risk studies, functioning similarly to an Institutional Review Board (IRB). This protocol ensures that all research is conducted ethically and that the rights and welfare of the participants are protected.

Please accept my sincere thanks and appreciation.

Sincerely,

Prof. Yousef Migdadi

The Dean of the Faculty of Educational Sciences

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