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Measuring Leadership Quotient in Educational Leaders: Development and Validation of the ZION Instrument

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A B S T R A C T

This study aimed to develop and validate the Leadership Quotient (LQ) Instrument for educational leaders. Specifically, it sought to identify key competencies based on established leadership frameworks, determine the underlying factors through exploratory factor analysis (EFA), assess the instrument's reliability and validity, and examine the relationships among the identified leadership factors. The EFA results revealed three key factors of leadership: Strategic Leadership and Decision-Making, Adaptability and Change Management, and Interpersonal Leadership. The instrument demonstrated high internal consistency with Cronbach's alpha values exceeding 0.70. Additionally, the LQ instrument showed strong convergent validity with the Multifactor Leadership Questionnaire (MLQ) ($r = 0.998$, $p < .001$). The study successfully developed a reliable and valid tool for assessing educational leaders' competencies. The findings suggest that leadership effectiveness in education relies on a balance of strategic vision, adaptability, and interpersonal skills.

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RESUMO

Este estudo teve como objetivo desenvolver e validar o Instrumento de Quociente de Liderança (LQ) para líderes educacionais. Especificamente, buscou identificar competências-chave com base em estruturas de liderança estabelecidas, determinar os fatores subjacentes por meio de análise fatorial exploratória (AFE), avaliar a confiabilidade e validade do instrumento e examinar as relações entre os fatores de liderança identificados. Os resultados da AFE revelaram três fatores-chave de liderança: Liderança Estratégica e Tomada de Decisão, Adaptabilidade e Gestão de Mudanças e Liderança Interpessoal. O instrumento demonstrou alta consistência interna com valores alfa de Cronbach excedendo 0,70. Além disso, o instrumento LQ mostrou forte validade convergente com o Questionário de Liderança Multifatorial (MLQ) ($r = 0,998$, $p < 0,001$). O estudo desenvolveu com sucesso uma ferramenta confiável e válida para avaliar as competências dos líderes educacionais. As descobertas sugerem que a eficácia da liderança na educação depende de um equilíbrio entre visão estratégica, adaptabilidade e habilidades interpessoais.

Keywords:
Leadership Quotient, Educational Leadership, Instrument Development and Validation, Factor Analysis, Construct Validity

Keywords:
Quociente de Liderança, Liderança Educacional, Desenvolvimento e Validação de Instrumentos, Análise Fatorial, Validade de Construto

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Introduction

Leadership is pivotal to the effectiveness and competitiveness of educational institutions. As educational landscapes evolve, leadership plays a key role in driving institutional success and fostering innovation. Principals, in particular, navigate changes to enhance education quality and create a collaborative, forward-thinking environment (Tanzeh et al., 2021).

Research highlights various leadership models—transformational, distributed, and teacher leadership—that significantly impact organizational behavior and student outcomes (Toprak, 2020). Leadership dynamics have also shifted toward adaptability and resilience, emphasizing the need for versatile leaders who proactively address challenges (Akbar et al., 2022). Visionary leadership is increasingly critical in anticipating and overcoming future obstacles (Candrasari et al., 2021).

Transformational leadership, especially in higher education, fosters collaboration and institutional performance, proving effective during crises like COVID-19 (Antonopoulou et al., 2022). However, while leadership styles are well-studied in healthcare and corporate sectors, educational leadership effectiveness remains underexplored. Existing tools, such as the Innovative Leadership Scale (ILS) for nurses (Sarıoğlu Kemer & Öztürk, 2023), may not fully capture the complexities of educational leadership.

The Professional Standards for Educational Leaders (PSEL) stress the need for school leaders to drive student achievement and equity (CCSSO & NPBEA, 2023), yet most Leadership Quotient (LQ) instruments cater to corporate settings, neglecting relational and educational competencies. Frameworks like those in the Handbook of Global Leadership and Followership take a broad leadership approach but lack a focus on student learning and community engagement (Kirabira, Winston, & Wood, 2023). Likewise, Goleman's emotional intelligence model, though widely recognized, is insufficiently adapted for educational leaders (Riopel, 2019).

There is a pressing need for an education-specific LQ instrument that accurately measures leadership effectiveness. Existing tools fail to reflect the dynamic nature of educational leadership, which involves collaboration, instructional leadership, and school culture development. The limited research on Leadership Quotient Instruments for educators further underscores this gap.

This study aims to develop and evaluate Zeroing In On Numbers (ZION), a new instrument measuring the LQ of educational leaders. The ZION tool will undergo rigorous item generation, expert validation, and pilot testing, followed by exploratory and confirmatory factor analyses. This aligns with psychometric methodologies emphasizing validity and reliability (El-Den et al., 2020). The study will assess ZION's internal consistency and construct validity (Mettert et al., 2020), ensuring its effectiveness in educational contexts. Moreover, psychometrically sound tools are crucial for leadership assessment and

development (Tavakol & Wetzel, 2020), and ZION will align with research emphasizing the need for outcome-driven leadership measurement (Lewis et al., 2023).

Development

This study aimed to develop, validate, and evaluate the Leadership Quotient (LQ) instrument, focusing on assessing core leadership competencies among educational leaders within the Department of Education's Schools Division Office of Mandaluyong City.

The Sequential Exploratory Mixed-Methods Design was used to rigorously evaluate the newly developed Leadership Quotient (LQ) instrument. This design is ideal for the study's goals, which require quantitative instrument verification and qualitative assessment of its practical efficacy and suitability (Gonzaga University, 2024).

The study examined key leadership variables through a structured assessment of educational leaders within the Department of Education's Schools Division Office. The population consisted of 690 educational leaders, representing a diverse range of administrative roles. To ensure fair representation across different leadership levels, the study employed a stratified random sampling technique, allowing for a more accurate reflection of the population's characteristics. Using Raosoft, a widely recognized sample size calculator, the appropriate number of respondents was determined. As a result, 247 educational leaders participated in the study, providing data on the leadership quotient and its associated factors.

The Leadership Quotient (LQ) instrument developed in this study comprised several key parts, each derived from established frameworks that informed the assessment of leadership competencies. The three foundational frameworks that guided the instrument's development were the Professional Standards for Educational Leaders (PSEL), the Interstate School Leaders Licensure Consortium (ISLLC) Standards, and the Emotional Intelligence (EI) framework. From these frameworks, specific competencies were identified that aligned with effective educational leadership. The PSEL emphasized essential areas such as vision and mission, ethics, and community engagement, while the ISLLC standards focused on leadership practices that promoted student learning and school improvement. The EI framework contributed to the identification of competencies related to self-awareness, empathy, and interpersonal skills, recognizing the emotional aspects of effective leadership.

The validation process for the LQ instrument involved several phases, beginning with an expert review to establish both construct and content validity. A panel of experts in educational leadership was assembled to evaluate the relevance and clarity of the instrument items, ensuring that they accurately reflected the identified competencies. The experts provided feedback on the wording, structure, and applicability of each item, allowing for necessary revisions before pilot testing. This collaborative approach enhanced the credibility of the instrument by ensuring that it met professional standards and effectively captured the essence of the competencies being measured.

Following expert validation, the instrument underwent reliability testing to assess its internal consistency. This involved computing Cronbach's alpha, a widely recognized statistical measure that evaluates the reliability of scales by determining how closely related a set of items are as a group. A Cronbach's alpha coefficient of 0.70 or higher was typically considered acceptable, indicating that the instrument yielded consistent results across various contexts.

Subsequently, exploratory factor analysis (EFA) was conducted on the collected data to identify the underlying structure of the LQ instrument. EFA helped determine how well the items grouped together according to the theoretical constructs they were intended to measure, allowing researchers to refine the instrument further. The results of the EFA prompted additional item trimming or restructuring based on the factor loadings, ensuring that each component of the instrument effectively reflected the identified leadership competencies.

To assess the leadership quotient of the respondents, the following measures were used:

Numerical Rating	Mean Ranges	Categorical Response	Verbal Interpretation
4	3.26 - 4.00	Strongly Agree	Excellent
3	2.51- 3.25	Agree	Good
2	1.76 - 2.50	Disagree	Fair
1	1.00 – 1.75	Strongly Disagree	Poor

The data gathering for this study was started by seeking permission from the head of the Department of Education's Schools Division Office of Mandaluyong City. Upon approval of the superintendent, the researcher identified the respondents of the study. Then, questionnaires were distributed. The purpose and instructions for answering the questionnaire were clearly explained to the respondents to ensure their full understanding. They were also informed about the voluntary nature of their participation and assured that their responses would be kept strictly confidential. Afterwards, data cleaning was done for analysis and interpretation.

Results and Discussions

Identified Key Competencies that Constitute the Leadership Quotient (LQ) for Educational Leaders Based on Existing Literature and Frameworks

Using Colaizzi's phenomenological analysis, key leadership quotient (LQ) competencies for educational leaders were examined. Leadership competencies in education are interconnected, forming a holistic framework for effective leadership. Essential qualities include self-awareness, empathy, adaptability, reliability, visionary thinking, integrity, and evidence-based decision-making.

Table 1

Thematic Analysis on Identified Key Competencies Constituting the Leadership Quotient for Educational Leaders

Central Theme	Key Competency	Description	Supporting Literature
Emotional Intelligence and Relationship Management	Self-awareness and Self-regulation	Ability to recognize and control emotions to enhance decision-making and leadership effectiveness.	Gómez-Leal et al. (2021), Zurita-Ortega et al. (2020)
	Empathy and Relationship Management	Building trust-based relationships through understanding the emotions of others.	Gómez-Leal et al. (2021)
Follower-Centered and Adaptive Leadership	Adaptability to Follower Traits	Adjusting leadership style based on the characteristics and cultural backgrounds of subordinates.	Matthews, Kelemen, and Bolino (2021)
	Cultural Sensitivity and Inclusive Leadership	Leading with an awareness of cultural values and inclusivity to enhance engagement.	Al-Atwi and Al-Hassani (2021), Flotman and Grobler (2020)
Collaborative and Team-Oriented Leadership	Reliability and Commitment	Demonstrating dependability and dedication to fostering teamwork and collaboration.	Omer et al. (2022)
	Team Facilitation and Conflict Resolution	Encouraging cooperative dynamics while resolving team conflicts constructively.	Omer et al. (2022)
Innovative and Transformational Leadership	Visionary Thinking	Creating and communicating a clear long-term vision to inspire stakeholders.	Zurita-Ortega et al. (2020), Collins et al. (2024)
	Fostering Innovation	Cultivating an environment that encourages creativity and problem-solving.	Alblooshi, Shamsuzzaman, and Haridy (2021)
Contextual and Situational Leadership	Policy and Structural Awareness	Navigating organizational structures, policies, and formal regulations effectively.	Collins et al. (2024)
	Change Management	Leading through transitions by implementing effective strategies and addressing resistance.	Söling et al. (2022)
Authentic and Ethical Leadership	Integrity and Transparency	Leading with honesty, ethical decision-making, and openness to build trust.	Allen-Ile, Mahembe, and Balogun (2020), Malloy and Kavussanu (2021)
	Servant Leadership	Prioritizing the well-being and development of team members and stakeholders.	Al-Atwi and Al-Hassani (2021), Flotman and Grobler (2020)
Strategic and Organizational Leadership	Evidence-Based Decision-Making	Using data and research-driven approaches to inform leadership actions.	Söling et al. (2022)
	Organizational and Contingency Planning	Structuring leadership initiatives to adapt to challenges and ensure sustainability.	Sun et al. (2024)

Emotional Intelligence and Relationship Management emphasize self-awareness, self-regulation, and empathy, fostering trust-based relationships and improving decision-making (Gómez-Leal et al., 2021; Zurita-Ortega et al., 2020). Leaders with strong emotional intelligence can navigate interpersonal dynamics and create a supportive environment.

Follower-Centered and Adaptive Leadership highlights adaptability, cultural sensitivity, and inclusive leadership, ensuring engagement with diverse stakeholders and flexibility in leadership approaches (Matthews, Kelemen, & Bolino, 2021; Al-Atwi & Al-Hassani, 2021; Flotman & Grobler, 2020). Leaders who adjust their strategies based on situational demands enhance organizational effectiveness.

Collaborative and Team-Oriented Leadership focuses on reliability, teamwork, and conflict resolution, reinforcing cooperative work environments and fostering organizational cohesion (Omer et al., 2022). Strong leaders demonstrate dependability and mediate conflicts constructively to maintain a productive workplace.

Innovative and Transformational Leadership underscores the importance of visionary thinking and innovation as drivers of institutional progress (Zurita-Ortega et al., 2020; Collins et al., 2024; Alblooshi, Shamsuzzaman, & Haridy, 2021). Leaders must articulate a long-term vision and create an environment that encourages creativity and problem-solving.

Contextual and Situational Leadership involves policy awareness and change management, ensuring smooth institutional operations by understanding organizational structures and transitions (Collins et al., 2024; Söling et al., 2022). Leaders with a strong grasp of policy dynamics can effectively guide their institutions through change.

Authentic and Ethical Leadership is rooted in integrity, transparency, and servant leadership, prioritizing ethical decision-making and the well-being of stakeholders (Allen-Ile, Mahembe, & Balogun, 2020; Malloy & Kavussanu, 2021; Al-Atwi & Al-Hassani, 2021; Flotman & Grobler, 2020). Ethical leadership fosters trust and accountability within institutions.

Strategic and Organizational Leadership emphasizes evidence-based decision-making and contingency planning, ensuring leadership actions are structured, data-driven, and adaptable to challenges (Söling et al., 2022; Sun et al., 2024). Effective leaders rely on strategic foresight to navigate complexities and sustain institutional growth.

Colaizzi's analysis underscores that LQ is a composite of emotional, adaptive, collaborative, transformational, ethical, and strategic competencies. These dimensions equip educational leaders to navigate challenges, foster innovation, and uphold ethical governance, balancing personal, interpersonal, and strategic leadership for institutional success.

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy evaluates the suitability of data for factor analysis by quantifying the proportion of variance among variables that might be common variance. An overall KMO value of 0.822 suggests that the dataset is appropriate for factor analysis, as values between 0.8 and 1.0 indicate adequate sampling (Statistics How To, 2023).

Table 2

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

Item	MSA	Item	MSA	Item	MSA	Item	MSA	Item	MSA
Overall	0.822								
LQ1	0.950	LQ11	0.698	LQ21	0.719	LQ31	0.928	LQ41	0.932
LQ2	0.936	LQ12	0.549	LQ22	0.711	LQ32	0.633	LQ42	0.914
LQ3	0.951	LQ13	0.567	LQ23	0.712	LQ33	0.911	LQ43	0.553
LQ4	0.763	LQ14	0.469	LQ24	0.791	LQ34	0.461	LQ44	0.855
LQ5	0.932	LQ15	0.554	LQ25	0.397	LQ35	0.395	LQ45	0.909
LQ6	0.749	LQ16	0.816	LQ26	0.331	LQ36	0.924	LQ46	0.941
LQ7	0.478	LQ17	0.717	LQ27	0.226	LQ37	0.906	LQ47	0.943
LQ8	0.433	LQ18	0.693	LQ28	0.855	LQ38	0.921	LQ48	0.941
LQ9	0.398	LQ19	0.794	LQ29	0.906	LQ39	0.523	LQ49	0.442
LQ10	0.406	LQ20	0.762	LQ30	0.909	LQ40	0.443	LQ50	0.289

However, individual item KMO values vary, with several items falling below the acceptable threshold of 0.5. Specifically, items LQ7 (0.478), LQ8 (0.433), LQ9 (0.398), LQ10 (0.406), LQ25 (0.397), LQ26 (0.331), LQ27 (0.226), LQ34 (0.461), LQ35 (0.395), LQ40 (0.443), LQ49 (0.442), and LQ50 (0.289) exhibit low KMO values, indicating that these items may not share sufficient variance with other items to warrant inclusion in the factor analysis. Such low values suggest that these items might not be measuring the same underlying constructs as the others (IBM, 2022).

In the context of developing leadership assessment tools, ensuring high sampling adequacy is crucial. For instance, a study on the Leadership Practices Inventory (LPI) employed exploratory factor analysis (EFA) to refine its measurement items, emphasizing the importance of evaluating the dimensionality of constructs to ensure the tool's validity (HRMARS, 2021). Similarly, research on the Leader Vitality Scale (LVS) utilized EFA and confirmatory factor analysis (CFA) to establish a hierarchical structure with distinct factors, underscoring the necessity of rigorous statistical evaluation in leadership assessments (Frontiers, 2023).

Given the low KMO values for certain items in the Leadership Quotient Questionnaire, it is advisable to consider removing or revising these items to enhance the overall sampling adequacy. This process aligns with best practices in scale development, where items that do not contribute to the underlying construct are modified or excluded to improve the instrument's reliability and validity (Choward, 2024).

While the overall KMO indicates that the dataset is generally suitable for factor analysis, the presence of items with low individual KMO values suggests a need for careful item evaluation.

Table 3

Bartlett's Test of Sphericity

χ^2	*df*	*p*
Inf	*1225*	*<.001*

Table 3 presents the results of Bartlett's Test of Sphericity, a statistical test used to determine whether the correlation matrix of the ZION Leadership Quotient Questionnaire is significantly different from an identity matrix. This test assesses the suitability of the data for Exploratory Factor Analysis (EFA) by evaluating the presence of sufficient correlations among variables.

The test yielded a χ^2 (chi-square) value of infinity (Inf) with 1,225 degrees of freedom (df) and a p-value of < .001. These results indicate a highly significant relationship among the items in the questionnaire, confirming that the correlation matrix is not random. A significant Bartlett's test suggests that the variables share common variance, making them appropriate for factor extraction.

In the context of questionnaire validation, this finding supports the assumption that the ZION Leadership Quotient items measure related constructs and are suitable for factor analysis. This is an essential step in verifying the structure of the questionnaire, as it ensures that the items can be grouped into meaningful factors that reflect different dimensions of leadership.

The Exploratory Factor Analysis (EFA) of the ZION Leadership Quotient Questionnaire used Principal Axis Factoring with an Oblimin rotation, identifying four distinct leadership factors with strong item loadings above 0.70, confirming the instrument's effectiveness (Hair et al., 2022).

The first factor, linked to leadership attributes and decision-making, includes high loadings on LQ1 (0.816), LQ2 (0.949), LQ4 (0.874), and LQ6 (0.969). These items highlight strategic thinking, vision, and organizational direction, aligning with Northouse's (2021) assertion that clear decision-making enhances leadership effectiveness. Effective leaders drive organizational success and employee motivation through strong decision-making (Bass & Riggio, 2020).

Table 4

Exploratory Factor Analysis - Oblimin

Factor Loadings					
	Factor				
	1	**2**	**3**	**4**	**Uniqueness**
LQ1	0.816				0.0762
LQ2	0.949				0.0386
LQ3	0.716			-0.384	0.1254
LQ4	0.874				0.0672
LQ5	0.810				0.0721
LQ6	0.969				0.0232
LQ7	0.949				0.0386
LQ8	0.877				0.0455
LQ9	0.892				0.0719
LQ10	0.927				0.0513
LQ11			0.724		0.0988
LQ12			0.899		0.0616
LQ13			0.726		0.1059
LQ14			0.930		0.0480
LQ15			0.709		0.0795
LQ16			0.868		0.0555
LQ17			0.972		0.0314
LQ18			0.948		0.0140
LQ19			0.681		0.0883
LQ20			0.869		0.0458
LQ21	0.951				0.0361
LQ22	0.789			-0.370	0.0832
LQ23	0.973				0.0503
LQ24	0.951				0.0361
LQ25	0.815				0.1680
LQ26	0.970				0.0253
LQ27	0.969				0.0232
LQ28	0.978				0.0246
LQ29	0.884				0.0491
LQ30	0.932				0.0487
LQ31	0.947				0.0356
LQ32	0.866				0.0983
LQ33	0.908				0.0858
LQ34		0.955			0.0211
LQ35		0.940			0.0666
LQ36		0.909			0.0348
LQ37		0.962			0.0202
LQ38		0.972			0.0337
LQ39		0.943			0.0205
LQ40		0.788			0.0977
LQ41		0.888			0.0606
LQ42		0.954			0.0283
LQ43		0.736		-0.368	0.1207
LQ44		0.972			0.0337
LQ45		0.888			0.0606
LQ46		0.973			0.0281
LQ47		0.760			0.0977
LQ48					0.9815
LQ49					0.9633
LQ50					0.9507
Note. 'Principal axis factoring' extraction method was used in combination with a 'oblimin' rotation					

The second factor measures emotional intelligence and interpersonal skills, with high loadings on LQ34 (0.955), LQ35 (0.940), and LQ37 (0.962). Emotionally intelligent leaders foster team cohesion, resolve conflicts, and enhance workplace productivity (Goleman,

Boyatzis, & McKee, 2020). The strong loadings indicate that the questionnaire effectively captures this leadership dimension.

The third factor represents ethical leadership and integrity, reflected in LQ11 (0.724), LQ12 (0.899), LQ14 (0.930), and LQ18 (0.948). Ethical leadership promotes trust and a positive organizational culture, reducing unethical behaviors and increasing job satisfaction (Brown & Treviño, 2021). The high loadings confirm the instrument's ability to assess ethical responsibility and fairness.

The fourth factor relates to adaptability and innovation, with LQ43 (0.736), LQ22 (0.789), and LQ3 (0.716) showing significant loadings. Leaders who embrace adaptability drive resilience and long-term success in dynamic environments (Heifetz, Grashow, & Linsky, 2021). The questionnaire effectively captures this essential leadership trait.

Uniqueness values indicate that most items contribute meaningfully to the identified factors, though LQ48 (0.9815), LQ49 (0.9633), and LQ50 (0.9507) exhibit high uniqueness, suggesting the need for refinement (Byrne, 2021). The EFA validates the questionnaire's multidimensional nature in assessing leadership competencies. A Confirmatory Factor Analysis (CFA) is recommended to further validate the factor structure and ensure applicability across leadership contexts (Hair et al., 2022).

Item Retention and Refinement for Enhanced Construct Validity and Reliability

Table 5

Exploratory Factor analysis After Removal of Items

Factor Loadings				
	Factor			
	1	**2**	**3**	**Uniqueness**
LQ1	0.827			0.1078
LQ2	0.977			0.0639
LQ4	0.900			0.0878
LQ5	0.820			0.1074
LQ6	0.999			0.0536
LQ7	0.977			0.0639
LQ8	0.881			0.0966
LQ9	0.922			0.0774
LQ10	0.960			0.0596
LQ21	0.983			0.0462
LQ23	0.984			0.0779
LQ24	0.983			0.0462
LQ25	0.838			0.1692
LQ26	0.981			0.0570
LQ27	0.999			0.0536
LQ28	0.988			0.0528
LQ29	0.887			0.0957
LQ30	0.961			0.0562
LQ31	0.957			0.0684
LQ32	0.882			0.1060
LQ33	0.938			0.0822
LQ34		0.943		0.0645

LQ35		0.954		0.0689
LQ36		0.893		0.0846
LQ37		0.995		0.0330
LQ38		0.980		0.0393
LQ39		0.976		0.0366
LQ40		0.772		0.1496
LQ41		0.911		0.0697
LQ42		0.984		0.0355
LQ43		0.778		0.2513
LQ44		0.980		0.0393
LQ45		0.911		0.0697
LQ46		0.973		0.0481
LQ11			0.739	0.0925
LQ12			0.926	0.0563
LQ13			0.736	0.1037
LQ14			0.957	0.0437
LQ16			0.901	0.0703
LQ17			1.001	0.0432
LQ18			0.973	0.0462
LQ20			0.853	0.0963
Note. 'Principal axis factoring' extraction method was used in combination with a 'oblimin' rotation				

The process of item retention and refinement is critical in ensuring the validity and reliability of any assessment instrument. Exploratory Factor Analysis (EFA) is a widely used statistical approach in psychometrics to determine the underlying structure of questionnaire items and their alignment with the intended constructs (Costello and Osborne, 2021). The results from Table 5 indicate that after the removal of certain items, the factor loadings of retained items significantly improved, ensuring the strength of the Leadership Quotient (LQ) questionnaire.

The EFA results reveal a three-factor structure, with most items loading strongly on their respective factors. Factor 1 comprises items with high factor loadings (e.g., LQ1 = 0.827, LQ2 = 0.977, LQ6 = 0.999), suggesting a strong underlying latent construct. This factor likely represents "Strategic Leadership and Decision-Making," aligning with recent studies that emphasize the importance of data-driven decision-making in leadership (Northouse, 2022).

Factor 2 captures elements related to adaptability and change management, evidenced by high loadings on items such as LQ34 (0.943) and LQ37 (0.995). These findings align with contemporary leadership literature that underscores the role of adaptive leadership in organizational resilience (Heifetz et al., 2020). Leaders who effectively navigate organizational changes tend to exhibit higher levels of flexibility and responsiveness, critical traits in modern educational leadership (Yukl, 2022).

Factor 3 represents interpersonal leadership qualities, as seen in items such as LQ12 (0.926) and LQ16 (0.901). This aligns with research emphasizing the role of emotional intelligence in leadership effectiveness (Goleman et al., 2021). The ability to foster team collaboration, provide mentorship, and create a positive work environment is a crucial aspect of leadership quotient (Dinh et al., 2022).

Items were removed based on their low factor loadings or high uniqueness values, which could indicate redundancy or weak association with the primary construct. For instance, LQ19

(0.668) and LQ15 (0.694) had relatively lower loadings, suggesting their lesser contribution to the factor structure. This refinement process improves the overall internal consistency and reliability of the instrument, a practice supported by recent methodological literature (DeVellis and Thorpe, 2021).

The use of the 'Principal Axis Factoring' extraction method with an 'oblimin' rotation supports the identification of correlated factors, reinforcing the multidimensional nature of leadership competency. Previous studies have emphasized the necessity of using oblique rotations in factor analysis to accurately reflect real-world leadership dynamics, where different leadership dimensions often interact rather than function independently (Fabrigar et al., 2020).

The refined questionnaire now demonstrates improved construct validity, with clearly defined leadership dimensions that are theoretically and empirically grounded. These findings contribute to the growing body of research advocating for comprehensive leadership assessments that integrate cognitive, strategic, and interpersonal competencies (Antonakis and Day, 2021). Future studies may consider confirmatory factor analysis (CFA) to further validate the stability of the identified factor structure and assess measurement invariance across different leadership contexts.

Internal Consistency of the Final Set of Items Within Each Factor of the LQ

Table 6

Reliability Analysis of Factors of Leadership Quotient

Factor	Cronbach's Alpha	Verbal Interpretation
Strategic Leadership and Decision-Making	0.996	Excellent
Adaptability and Change Management	0.993	Excellent
Interpersonal Leadership	0.991	Excellent

The reliability analysis of the Leadership Quotient (LQ) factors, as presented in Table 7, demonstrates exceptionally high internal consistency, with Cronbach's alpha values ranging from 0.991 to 0.996. These results indicate that the questionnaire items measuring each factor are highly reliable and consistent in assessing leadership competencies.

The first factor, Strategic Leadership and Decision-Making, achieved a Cronbach's alpha of 0.996, indicating an exceptionally high level of reliability. This suggests that the items within this factor consistently measure the ability of educational leaders to set long-term goals, make data-driven decisions, and align leadership strategies with organizational vision. Recent

studies (Du et al., 2021; Wang and Liu, 2023) emphasize the significance of strategic leadership in educational settings, highlighting its role in fostering innovation, driving institutional success, and ensuring sustainability in rapidly evolving academic environments.

The second factor, Adaptability and Change Management also exhibited excellent reliability with Cronbach's alpha of 0.993. This finding aligns with contemporary research (García-Morales et al., 2022; Khan et al., 2023), which underscores the growing importance of adaptability in leadership, particularly in times of crisis, such as the COVID-19 pandemic. Educational leaders must navigate uncertainties by demonstrating flexibility, resilience, and the ability to modify their leadership approach in response to emerging challenges. High reliability in this factor suggests that the questionnaire effectively captures key aspects of adaptability, including responsiveness to organizational shifts, fostering an agile work environment, and managing resistance to change.

The third factor, Interpersonal Leadership, recorded a Cronbach's alpha of 0.991, again reflecting excellent reliability. This result suggests that the items measuring interpersonal leadership are highly consistent in evaluating essential leadership behaviors, such as communication, emotional intelligence, collaboration, and conflict resolution. Recent literature (Mäkikangas et al., 2020; Sun and Wang, 2023) emphasizes the role of interpersonal leadership in promoting positive organizational culture, enhancing teamwork, and increasing employee engagement. Effective interpersonal leadership is particularly critical in educational institutions, where collaboration among teachers, administrators, and stakeholders influences institutional performance and student outcomes.

The reliability analysis confirms that the Leadership Quotient questionnaire is a highly dependable tool for assessing essential leadership competencies. The outstanding reliability scores support its validity in measuring leadership effectiveness across different educational contexts.

Relationship Among the Factors of Leadership Quotient Questionnaire

The correlation matrix highlights significant interrelationships among Strategic Leadership and Decision-Making, Adaptability and Change Management, and Interpersonal Leadership. A moderate positive correlation ($r = 0.588$, $p < .001$) between Strategic Leadership and Adaptability suggests that leaders proficient in strategic thinking also demonstrate adaptability, aligning with studies on institutional resilience (García-Morales et al., 2022; Wang & Liu, 2023). Interpersonal Leadership strongly correlates with both Strategic Leadership ($r = 0.778$, $p < .001$) and Adaptability ($r = 0.767$, $p < .001$), indicating that relational skills enhance strategic decision-making and change management (Du et al., 2021). These results reinforce an integrated leadership framework where interpersonal competencies are essential for navigating educational challenges (Wang & Xu, 2022).

Table 7

Correlation Matrix Among Factors of Leadership Quotient Questionnaire

Correlation Matrix				
		Strategic Leadership and Decision-Making	**Adaptability and Change Management**	**Interpersonal Leadership**
Strategic Leadership and Decision-Making	**Pearson's r**	—		
	df	—		
	p-value	—		
Adaptability and Change Management	**Pearson's r**	0.588	—	
	df	245	—	
	p-value	<.001	—	
Interpersonal Leadership	**Pearson's r**	0.778	0.767	—
	df	245	245	—
	p-value	<.001	<.001	—

These findings support leadership theories emphasizing cognitive, behavioral, and relational competencies as interconnected (Mäkikangas et al., 2020; Sun & Wang, 2023). Educational leaders benefit from strong interpersonal relationships, which facilitate effective strategic initiatives and adaptability (Khan et al., 2023). The results underscore the need for leadership development programs that cultivate strategic, adaptive, and interpersonal skills in a holistic manner (Bui et al., 2023). This integrated approach fosters visionary, people-centered leadership, ultimately enhancing educational leadership effectiveness.

Convergent Validity Test of Leadership Quotient (LQ) to Multifactor Leadership Questionnaire (MLQ)

Table 8

Correlation Matrix Between

Correlation Matrix			
		MLQ	**LQ**
MLQ	**Pearson's r**	—	
	df	—	
	p-value	—	
LQ	**Pearson's r**	0.998	—
	df	418	—
	p-value	<.001	—

Table 8 presents the correlation matrix between the Multifactor Leadership Questionnaire (MLQ) and the Leadership Quotient (LQ), revealing a strong positive correlation ($r = 0.998$, $p < .001$). This exceptionally high correlation suggests that the

Leadership Quotient (LQ) instrument closely aligns with the MLQ, a widely validated measure of leadership behaviors. Given the near-perfect correlation, the findings indicate that LQ effectively captures similar leadership dimensions assessed by MLQ, reinforcing its convergent validity.

Convergent validity refers to the extent to which two theoretically related constructs exhibit a strong correlation (Campbell and Fiske, 1959). The strong correlation between LQ and MLQ supports the construct validity of LQ, suggesting that it measures leadership attributes in a manner consistent with established leadership models. This aligns with recent research by Ghasabeh and Provitera (2021), which emphasized that leadership assessments must align with validated frameworks to ensure reliability and applicability in real-world organizational settings. Additionally, leadership assessments are often shaped by contextual variables such as organizational culture, leadership experience, and stakeholder expectations (Mäkikangas et al., 2020). Given that the study focuses on educational leaders, the exceptionally high correlation may indicate that both MLQ and LQ capture essential leadership attributes necessary for effective school administration, reinforcing the applicability of LQ in educational settings.

Final considerations/ Conclusions (lowercase, bold, Georgia 11 font, left-aligned, unnumbered)

The study identified seven key leadership competencies: Emotional Intelligence and Relationship Management, Follower-Centered and Adaptive Leadership, Collaborative and Team-Oriented Leadership, Innovative and Transformational Leadership, Contextual and Situational Leadership, Authentic and Ethical Leadership, and Strategic and Organizational Leadership. Exploratory Factor Analysis (EFA) revealed a three-factor structure: Strategic Leadership and Decision-Making, Adaptability and Change Management, and Interpersonal Leadership Qualities. High factor loadings were observed for each factor, confirming their significance. Items with low factor loadings, such as LQ19 (0.668) and LQ15 (0.694), were removed to improve construct validity.

Reliability analysis demonstrated high internal consistency, with Cronbach's alpha values ranging from 0.991 to 0.996, ensuring the robustness of the LQ instrument. Correlation analysis showed significant relationships among the three leadership factors, reinforcing their interconnected nature. A moderate positive correlation was found between strategic leadership and adaptability ($r = 0.588$, $p < .001$), while interpersonal leadership exhibited strong correlations with both strategic leadership ($r = 0.778$, $p < .001$) and adaptability ($r = 0.767$, $p < .001$). Additionally, LQ demonstrated strong convergent validity with the Multifactor

Leadership Questionnaire (MLQ) ($r = 0.998$, $p < .001$), confirming its alignment with established leadership assessment models.

Based on these findings, the study concluded that leadership effectiveness in education is driven by emotional intelligence, adaptability, collaboration, innovation, ethical leadership, and strategic decision-making. The identified factor structure highlights the critical roles of strategic leadership, adaptability, and interpersonal skills in fostering effective leadership. Refining the assessment items improved clarity and precision, eliminating redundancies while strengthening the leadership evaluation process. The high reliability scores confirmed the consistency of the LQ instrument in measuring leadership competencies. Furthermore, the significant correlations among leadership factors emphasized their interdependence, while the strong relationship between LQ and MLQ validated LQ as a credible leadership assessment tool.

In light of these conclusions, several recommendations were proposed. Educational leaders should implement leadership development programs that enhance emotional intelligence, adaptability, collaboration, innovation, ethical leadership, and strategic decision-making. Human Resource Officers should design targeted training initiatives to strengthen these competencies, ensuring alignment with the validated leadership model.

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