

Contribution of E-Leadership to 21st-Century Competencies of Principals in Riau Province

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Abstract. The main objective of this study was to examine the contribution of e-leadership, specifically among principals in Elementary Schools, Junior High Schools, Senior High Schools, and Vocational High Schools. The study population consisted of 384 participants, with a sample size of 196 principals. A quantitative approach was used, employing two variables. Data was collected through a questionnaire and analysed using descriptive and inferential statistical analysis. The results of the study indicated that the mean score for Principals' 21st-century Competencies was 3.76, falling into the highest category. Similarly, the mean score for the Variable E-Leadership among principals was 3.77, also falling into the highest category. The study revealed that e-leadership accounted for 69.80% of the contribution to the principals' 21st-century Competencies, with the remaining 30.20% being attributed to other factors. It is important to note that principals who demonstrate effective leadership utilizing technological advancements in the 21st-century are more likely to possess good 21st-century competencies. The findings also highlight that higher levels of e-leadership correspond to greater competency among principals in the 21st-century. Therefore, it is recommended that principals enhance their e-leadership capabilities to further develop their 21st-century competencies.

1 Introduction

In the 21st-century, education plays a crucial role in equipping learners with the necessary skills for learning, innovation, technology usage, and life skills. This is particularly important due to the rapid advancement of knowledge and the presence of digital media and technology, commonly known as the information superhighway [1]. The introduction of the internet in the commercial world has revolutionized the transfer of information globally. In the knowledge age, jobs require a combination of high-level thinking and complex communication skills [2].

The principal holds a key position in the management system of schools in the 21st-century [3]. They are responsible for fostering a positive school climate, encouraging teacher development, and ensuring a comfortable environment that enables students to achieve great accomplishments. As a formal authority and leader, the principal's role is pivotal [4].

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Given the rapid increase in technology and information in the 21st-century [5], education systems must adapt to these changes and demand competency transformations from principals in order to remain competitive [6]. This presents significant challenges for principals, and it is important to study and analyze their leadership, competencies, roles, and functions in response to these changes in the education system [7].

The competencies of 21st-century principals can be recognized through their abilities [8]. Principals must effectively combine concepts, principles, and procedures to successfully implement changes within schools, whether it be strengthening academic supervision, enhancing the capacity of educational staff, or developing the curriculum [1]. E-leadership has emerged as a critical strategy for principals to succeed in the 21st-century [9].

Education in the 21st-century aims to prepare individuals for a dynamic and unpredictable world, fostering creativity, individual intelligence, and innovation [10,11]. Key competencies for 21st-century education include critical thinking, problem-solving, creativity, collaboration, cross-cultural understanding, communication, computation, and career self-reliance [12].

Therefore, e-leadership is essential for principals to effectively carry out their tasks in the 21st-century [3]. Principals must develop their professionalism and recognize its importance in improving the learning and managerial processes within schools. E-leadership plays a crucial role in achieving effective educational quality [13].

Effective schools in the 21st-century require strong instructional leadership, high expectations for achievement, a positive school climate, and monitoring of continuous teaching and learning progress. E-leadership, combined with an understanding of 21st-century competencies, contributes to the success of schools [14].

As 21st-century competencies are technology-based [15], principals must adapt their leadership to keep up with technological advancements. Technology-based leadership, such as e-leadership, plays a vital role in realizing effective educational quality. E-leadership combines leadership concepts with technological developments [16], incorporating technology and leadership elements [7].

E-leadership is defined by various factors and indicators [17]. It involves utilizing information technology and communication to fulfill visionary, convener, virtual team, virtual manager, innovator, and mentor functions. Technology supports principals in implementing e-leadership and delivering quality public services [18].

While many factors contribute to the level of 21st-century principal competencies, this study focuses on e-leadership as a determining variable [5]. Transforming education in the 21st-century aligns with the demands of human resource development in the global era [19].

Organizations, including schools, must implement information technology and incorporate e-leadership concepts and practices to thrive in the competitive 21st-century landscape [20,21]. E-leadership improves principal competencies [22], and principals' digital technology skills significantly impact their 21st-century competencies. Technological understanding encompasses individual and societal abilities to effectively use digital technology and the internet to fulfill socio-economic and political needs [23].

In conclusion, e-leadership in the 21st-century enables principals to develop effective 21st-century competencies. The better the e-leadership of principals in elementary, middle, high, and vocational schools, the stronger their 21st-century competencies are.

2 Method

This study aimed to examine the contribution of e-leadership to the competencies of 21st-century principals in Riau Province, focusing on Elementary School Principals, Junior High School Principals, Senior High School Principals, and Vocational High School Principals.

The study also assessed the impact of e-leadership on the principal's 21st-century competencies.

The total population for this study was 384 principals, with a research sample of 196 principals selected at a 5% error rate [24]. The population and sample distribution are presented in **Table 1**.

Table 1. Population and Sample of the Study.

School Level	Population	Sample
Elementary School Principal	265	135
Junior High School Principal	72	37
Senior High School Principal	30	15
Vocational High School Principal	17	9
Total	384	196

A quantitative approach was adopted for this study, with two variables: e-leadership (independent) and 21st-century competencies (dependent). Data was collected using 5-choice questions adapted from various sources and analysed using descriptive and inferential statistical analysis.

3 Results

The results of the study revealed that the mean score for principals' 21st-century competencies was 3.76, indicating a high level. The mean scores for each competency indicator are presented in **Table 2**.

Table 2. Principals' 21st-Century Competency Variable Mean Score.

NBR	Indicator	Mean
1	Critical Thinking dan Problem Solving	3.84
2	Creativity and Innovation	3.74
3	Collaboration, Teamwork and Leadership	3.74
4	Cross-Cultural Understanding	3.77
5	Communication and Media Fluency	3.81
6	Computation and ICT Fluency	3.63
7	Career and Self-Reliance	3.78

The highest mean score was observed for Critical Thinking and Problem Solving (3.84), followed by Communication and Media Fluency (3.81), Career and Self-Reliance (3.78), and Cross-Cultural Understanding (3.77). Creativity and innovation, as well as Collaboration, Teamwork, and Leadership, had the same mean score of 3.74, while Computation and ICT Fluency had the lowest mean score of 3.63.

Table 3. Principals’ 21st-Century Competencies Variable Mean Score.

NBR	Indicator	Mean
1	Visionary	3.88
2	Convener	3.74
3	Team Virtual	3.76
4	Manager	3.79
5	Innovator	3.72
6	Mentor	3.75

The highest mean scores were observed for Visionary (3.88) and Manager (3.79). The mean scores for Virtual Team and Mentor were 3.76 and 3.75, respectively. The lowest mean scores were found for Convener (3.74) and Innovator (3.72).

The contribution of E-Leadership to 21st-century competencies and its impact on each of the principals' 21st-Century Competencies indicators are shown in **Fig. 1**.

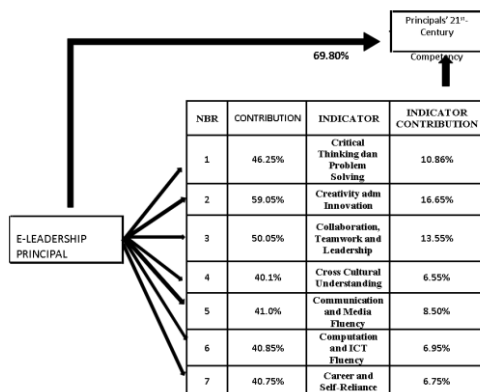


Fig. 1. Contribution of E-Leadership to 21st-Century competencies, and each of the principals’ 21st-Century Competency indicators

An inferential statistical analysis revealed that e-leadership contributed 69.80% to 21st-century competencies, while the remaining 30.20% was influenced by other factors not considered in the study. Additionally, e-leadership made the following contributions to each of the 21st-century competency indicators: Critical Thinking and Problem Solving (46.25%), Creativity and Innovation (59.09%), Collaboration, Teamwork, and Leadership (50.05%), Cross-Cultural Understanding (40.10%), Communication and Media Fluency (41%), Computation and ICT Fluency (40.85%), and Career and Self-Reliance (40.75%).

Each indicator of 21st-century competencies contributed to the overall 21st-century competencies variable as follows: Critical Thinking and Problem Solving (10.85%), Creativity and Innovation (16.65%), Collaboration, Teamwork, and Leadership (13.55%), Cross-Cultural Understanding (6.55%), Communication and Media Fluency (8.50%), Computation and ICT Fluency (6.95%), and Career and Self-Reliance (6.75%).

4 Discussion

Some phenomena that have occurred in the 21st-century include the flow of physical and non-physical resources (data, information, and knowledge), increased collaboration and cooperation between countries to create highly competitive products and services, the pressure of developed countries on developing nations, the influx of foreign products and services in domestic markets, the rapid increase of foreign influence in labor and executive roles, and the merging of private company portfolios between Indonesian entrepreneurs and foreign entities [13].

E-leadership refers to the skill of integrating various roles and implementing them through the use of information and communication technology [8]. In the era of globalization, technology can support leaders in implementing e-leadership to improve public services and achieve good governance [18]. There are various software and hardware products available that support the implementation of information technology for organizational managers [25]. However, managers often struggle to utilize these products effectively because they haven't fully grasped the application concepts and the workings of information technology in supporting leadership functions, known as e-leadership [26].

Researchers have studied e-leadership in various contexts, including school management, school leadership, organizational settings, and laboratories [27]. In a study of virtual teams, it was found that early interactions during team formation can predict trust, satisfaction, and subsequent performance [28]. Teams that spent their initial meetings identifying team members and clarifying expectations demonstrated higher performance later on [29]. For virtual teams to work well together, e-leadership needs to promote interdependence and reliance on each other, as virtual teams can be geographically and culturally dispersed [30]. Therefore, leaders of geographically dispersed teams must encourage various communication-related tasks to maintain relationships [31].

E-leadership has also been investigated in controlled settings [7]. Controlled experiments on e-leadership suggest that participatory leadership may be more effective in solving unstructured or semi-structured problems, while directive leadership may be better suited for structured problems. Some studies also report that the features of groupware systems used for communication can replace leadership [32]. Controlled trials have also shown that anonymity enhances motivation. For example, e-leadership may consider using anonymous chat rooms and polls to achieve an effective level of leadership [14].

E-leadership, team communication, and well-being are interconnected. The results of a study revealed that electronic leadership positively contributes to team communication, and team communication, in turn, contributes to the well-being of schoolteachers [33]. Even in virtual settings with low levels of function and performance, e-leadership behavior still contributes to effective communication within the organization and well-being among teachers [6]. Therefore, school leaders should fully utilize mobile technology to implement their leadership functions, especially in addressing issues that may not be readily apparent in schools due to various external commitments. By using technology, leaders can work anywhere and anytime, providing orders, information and sharing with team members [34]. A study found that visionary leadership had a good rating (77%), convener leadership had a good rating (78%), sponsor team leadership had a good rating (80%), innovator leadership had a good rating (77%), and mentor leadership had a good rating (77%). Descriptive statistical tests showed that e-leadership leaders had an average score of 99.33, indicating that leaders are adept at combining concepts of leadership and technology [18].

Successful electronic leadership involves finding the right balance between traditional and new methods, carefully communicating intentions to followers to avoid misunderstandings, using technology to reach others responsively, and leveraging technology to address workforce diversity [16]. Electronic leaders can utilize tools like email to

effectively communicate a compelling vision, recognize followers' achievements, and generate excitement about new ventures. Finding the right balance between traditional and new methods, effective communication, and leveraging technology is crucial for successful electronic leadership [35].

Competencies required in e-leadership include the ability to integrate various roles and carry them out using information and communication technologies [20]. E-leadership roles include being visionary, translating the big picture to all members of the organization; being a convener, managing differences among members and leading the organization toward clear goals and problem-solving; being a team sponsor, forming and directing real and virtual working groups; being a manager, responsibly striving for and allocating organizational resources, and managing real and virtual organizations; being an innovator, finding new ways to work beyond main tasks and functions; and being a mentor, guiding and directing potential new leaders in the organizational environment. Therefore, e-leadership factors encompassing these various roles are highly significant in determining the success of information technology development. Without e-leadership in an institution, effective implementation of e-government cannot be expected [22].

In the Partnership for 21st-Century, it is explained that 21st-century skills are formed through a solid understanding of content knowledge supported by various skills and literacy necessary for personal and professional success [36]. These skills are essential in today's digital age, where individuals live amidst abundant information, technological advancements, and complex patterns of communication and collaboration. Critical thinking, problem-solving, communication, and collaboration skills are crucial for success in this digital world [6].

Studies have shown that high school, diploma, and college graduates are often lacking competencies in areas such as oral communication, writing, critical thinking, problem-solving, work ethics and professionalism, teamwork, and collaboration, working in diverse groups, technology, and project management and leadership. Jobs in the knowledge age require a new combination of skills involving high-level thinking and complex communication. The 21st-century skills encompass life and career skills, learning and innovation skills, and information and technology skills, which are summarized in a scheme called the rainbow of 21st-century knowledge skills [12].

Principals and educational institutions face challenges in developing 21st-century education, which includes more complex teacher work and tasks [37]. These challenges involve teaching in a multicultural society, promoting the construction of meaning through teaching, facilitating active learning, integrating technology in teaching, adopting a new perspective on abilities, making choices in teaching, and ensuring accountability. In order to address these challenges, teachers require abilities such as critical thinking, social responsibility, networking skills, and time management skills. Additionally, teachers should possess the characteristics and skills necessary to fulfill their roles and responsibilities in the 21st-century [15].

Furthermore, teachers should possess abilities such as critical thinking, social responsibility, networking skills, and time management skills to effectively tackle these challenges. A study concluded that the convergence of globalization, ICT, and the explosion of knowledge has brought about profound changes in modern society, challenging every aspect of the modern lifestyle. Therefore, it is important to be prepared to deal with the various electronic technologies that characterize this digital age [38]. Different teaching delivery approaches are required to prepare citizens with a cosmopolitan outlook, cross-cultural understanding, the ability to work in multicultural settings on group projects, and the capacity to think creatively and critically. Radical changes, especially in developing countries, are needed in the way education is delivered to today's digital natives and tomorrow's citizens. The quality of education is crucial for a country to provide calibrated

education that prepares globally competitive citizens, as education serves as the foundation of a nation's strength [39].

Transforming education in the 21st-century is of utmost importance for human resource development in the global era. It can be concluded that 21st-century competencies are the primary competency that teachers, students, and school leaders must possess to thrive in the 21st-century. The challenge lies in creating an education system that fosters the development of thinkers and innovators who can contribute to building a knowledge-driven social and economic order as

5 Conclusion

In summary, e-leadership refers to the ability of leaders to effectively lead using technological advancements in the 21st-century. The competencies of principals in the 21st-century are directly influenced by their proficiency in e-leadership. The better e-leadership skills principals possess at Elementary Schools, Junior High Schools, Senior High Schools, and Vocational High Schools, the higher their level of 21st-century competencies.

To achieve this, principals must fulfill various roles and functions, such as being a visionary, convener, and manager of virtual teams, virtual manager, innovator, and mentor. Additionally, principals must also possess and utilize the key competencies of the 21st-century to establish an effective and competitive school environment. These competencies include critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, cross-cultural understanding, communication and media fluency, computing and ICT fluency, and career and independence. Meeting these demands is crucial as the challenges of the 21st-century require principals to develop a diverse range of competencies through e-leadership.

It is important to note that the impact of e-leadership on the competencies of principals in the 21st-century is significant. Higher levels of e-leadership correspond to better competencies in the principals. Therefore, it is recommended and encouraged for principals to enhance their e-leadership capabilities, abilities, and skills in order to achieve the best possible 21st-century competencies.

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