Teacher's Adaptive Leadership in the Digital Age

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Abstract— *The study examined the adaptive leadership of educators in the context of rapid technological advancements and educational transformation. It focused on their visionary, interpersonal, and decision-making adaptability. The research involved 30 elementary teachers, 30 high school teachers, and 30 college professors. The study revealed that educators generally have a positive view of technology's role in education, with college professors showing greater visionary adaptability. However, elementary teachers exhibited lower confidence in developing visionary approaches and openness to long-term educational goals, while college professors were more comfortable with technology's transformative power. The study found no significant gender differences in adaptive leadership perceptions but found significant differences among different teaching levels, suggesting that teaching level plays a significant influence in shaping these perceptions*

Keywords— *Decision-making adaptability, Digital age, interpersonal adaptability, Teacher's Adaptive Leadership, visionary adaptability.*

I. INTRODUCTION

In today's educational landscape, the digital age has ushered in a transformative era marked by rapid technological innovations and dynamic educational transitions. Traditionally known for their stability and time-honored practices, educational institutions are now grappling with the challenges posed by the integration of technology into the learning environment. As these institutions navigate this complicated terrain, leadership becomes critical in ensuring a smooth transition and reaping the benefits of technological advancements.

Furthermore, the necessity for adaptive leadership in the digital era is emphasized by the continuous advancement of technology and its influence on educational frameworks. In light of the transition from traditional teaching methods to e-learning platforms and digital resources, educational leaders must demonstrate the capacity to adjust their instructional approaches in response to this evolving educational environment. According to The Economic Times (2023), Adaptive leadership is a mindset and skill set that empowers leaders to navigate complexities and uncertainties, enabling them to thrive. Hence, in the rapidly evolving landscape of digital education, teachers play a pivotal role in navigating transitions and embracing technological innovations. Teachers must cultivate a forward-thinking mindset in this dynamic environment, anticipating the needs of both teachers and students as they engage with emerging technologies.

This research addressed the multifaceted nature of adaptive leadership, specifically focusing on visionary adaptability, interpersonal adaptability, and decision-making adaptability as key dimensions shaping teachers' responses to the challenges posed by the digital era. It sought to uncover nuanced insights into how educators from different levels of the educational system perceive and engage with adaptive leadership in the digital age. Such distinctions are imperative for tailoring educational interventions that address the specific needs and challenges faced by educators at different stages of their careers.

Moreover, one fundamental aspect under investigation is the teachers' perspectives on technology integration practices, with a particular emphasis on their openness to new technologies and engagement in professional development. Akram et.al (2022) revealed that teachers have positive attitudes toward technology integration in teaching-learning practices. They believe that incorporating technology into teaching helps them improve their instructional practices, make learning more exciting and interactive, and keep learners motivated. On the other hand, in their study, Mag-atas et.al (2023) found that the availability of internet access and proficiency in ICT skills posed significant challenges in the teaching and learning process. These challenges hindered effective communication among teachers, students, and parents during the COVID-19 pandemic. The current study delves into the nuanced dimensions of technology integration, acknowledging the importance of teachers' openness to embracing new tools and their active participation in professional development initiatives to enhance their digital literacy and pedagogical skills.

II. LITERATURE REVIEW

The current study on adaptive leadership among teachers in the digital age sheds light on the critical role of visionary adaptability in educational institutions, particularly in integrating and optimizing technology. Johnson et al. (2016) emphasize the importance of visionary leaders in guiding technology implementation by having a clear vision of the future of education, fostering innovation, and cultivating a collaborative culture. Their emphasis on collaboration extends to teachers, students, parents, and the community, with a focus on holistic student development. Visionary leaders, according to Varthana (2023), are adaptable, embrace change, and recognize the importance of technology in 21st-century education to empower staff and maintain institutional relevance. Candrasari et al. (2023) make a valuable contribution by emphasizing how visionary leadership actively engages all stakeholders, encouraging initiative, experimentation, and inclusive decision-making. Furthermore, Pribudhiana et al. (2020) emphasize the importance of visionary leadership in preparing teachers to implement

educational policies. According to Herdayati et al. (2020), while visionary leadership may not directly affect student achievement, it has a significant impact on teacher performance, which in turn affects student outcomes. This thorough investigation highlights the multifaceted impact of visionary adaptability on various aspects of educational leadership and its implications in the digital age.

Likewise, prior research on interpersonal adaptability as it relates to teacher leadership in the digital age has yielded significant contributions that are of great value to the current investigation. Archana and Archana (2020) assert that effective relationship management is a critical interpersonal competency that educators must possess. Sustaining positive and healthy relationships becomes imperative in the digital age, where interactions are varied and frequently mediated via technology. Effective interpersonal relationships contribute to the development of interpersonal communication skills among digital natives, with teachers serving as facilitators of learning in this regard, according to the study. Furthermore, Loreto (2019) proposes a pragmatic strategy for confronting the difficulty of accommodating the educational requirements of digital native learners. By incorporating social media into the academic curriculum, instructors can capitalize on the extensive usage of these platforms by students, thereby encouraging active participation and enriching the educational journey. This is consistent with Li's (2021) assertion that education is a collaborative endeavor, which emphasizes the significance of teacher-student interactions. By integrating social media, educational institutions not only tackle the issue of adaptation but also correspond with the collaborative spirit of the digital age; this underscores the criticality of interpersonal adaptability in cultivating productive teaching and learning associations.

Moreover, the study by Archana & Archana (2020) contributes significantly to the current research by emphasizing the interpersonal aspect of decision-making. Their insights into considering another person's perspective align with the collaborative nature of decision-making within educational settings. This perspective is crucial for understanding the communication dynamics among teachers, school leaders, and other stakeholders. Integrating this focus on interpersonal decision-making into the current study could provide a nuanced understanding of how adaptive decision-making plays a role in the new normal leadership context. Furthermore, Austria et al.'s (2021) research highlights the pivotal role of school leaders' decision-making in the context of new normal leadership. Their findings underscore the importance of decision-making adaptability, particularly in the face of evolving challenges such as those posed by the changing educational landscape. Incorporating this emphasis on the centrality of school leaders' decision-making into the current study could enhance its relevance to contemporary educational practices and shed light on the specific challenges and opportunities faced by educational leaders in the current environment. By building upon these prior studies, the current research can offer a more comprehensive exploration of decision-making adaptability in educational contexts, taking into account both interpersonal dynamics and the leadership role in navigating the challenges of the new normal.

Research Statements

This study explored the concept of teacher adaptive leadership within the context of the digital age, examining how educators effectively navigate educational transitions and technological advancements. Specifically, it sought to answer the following questions:
1. What is the demographic profile of the respondents?
2. What is teachers' perception of adaptive leadership in the digital age in terms of:
   2.1.1   visionary adaptability
   2.1.2   interpersonal adaptability
   2.1.3   decision-making adaptability
3. Is there a significant difference between teachers' perceptions of adaptive leadership in the digital age when grouped according to position and gender?

Hypothesis

1. There is no significant difference between teachers' perceptions of adaptive leadership in the digital age when grouped according to gender.
2. Teacher's perceptions of adaptive leadership in the digital age have no significant difference when grouped according to position.
3. Teacher's perceptions of adaptive leadership in the digital age have no significant difference when grouped according to gender and position.

Conceptual Framework

The provided conceptual framework illustrates the independent variables, namely gender and level of teaching, employed in the study. The dependent variable is teacher adaptive leadership, which encompasses three sub-categories: visionary adaptability, interpersonal adaptability, and decision-making adaptability.
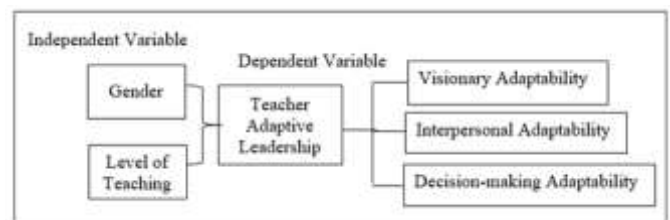

Figure 1. Conceptual Framework

III. METHODS

Research design. The study employed descriptive research design to systematically obtain information to describe a phenomenon, situation, or population, and facilitate predictions. This approach aimed to scrutinize significant differences and draw generalizations concerning teachers' adaptive leadership in the digital age. The study also focused on understanding how educators navigate educational transitions and embrace technological innovations.

Participants. The participants consisted of 30 elementary teachers, 30 high school teachers, and 30 college professors.

The selection process utilized a non-probability sampling method, specifically opting for convenience sampling. This method allowed for a pragmatic and accessible selection of participants.

Instrument. For data collection, a meticulously crafted self-made questionnaire was employed, addressing the core issues outlined in the study. The questionnaire underwent a rigorous validation process by three research experts, ensuring its reliability and relevance to the research objectives. The survey questionnaire delved into teachers' adaptive leadership in the digital age. To assess the teachers' perceptions of adaptive leadership, a Four-Point Likert Scale was employed.

Data Gathering Procedure. The researcher initiated the data-gathering procedure by preparing a formal letter of request, which was then distributed to the participants via email. Google Forms and printed survey questionnaires served as tools for collecting responses, offering a flexible and accessible means for participants to express their perspectives.

Data Analysis Tools. To discern any significant differences among the perceptions and agreement levels, an Analysis of Variance (ANOVA) was conducted. The hypotheses were rigorously tested at a significance level of 0.05, ensuring a robust statistical evaluation of the study's findings.

Ethical Considerations. The study rigorously adhered to the Data Privacy Act of the Philippines to ensure ethical standards and protect the confidentiality and privacy of the participants. Furthermore, the study adhered to the ethical principles delineated in the APA 7th edition style, ensuring the integrity and ethical conduct of the research endeavor.

IV. RESULTS

TABLE I. Teacher's Perspectives on Adaptive Leadership in the Digital Age Focusing on Visionary Adaptability.

Visionary Adaptability	Levels of Teaching	M	SD	VI
Technology has the potential to significantly shape the future of education	College Professor	3.93	0.254	SA
	High School Teacher	3.45	0.993	SA
	Elementary Teacher	3.47	0.937	SA
Envision innovative ways in which technology can enhance the educational experience	College Professor	3.9	0.305	SA
	High School Teacher	3.5	0.917	SA
	Elementary Teacher	3.77	0.43	SA
Open to adapting long-term educational goals based on the transformative power of technology	College Professor	3.8	0.407	SA
	High School Teacher	3.36	0.906	SA
	Elementary Teacher	3.17	0.379	A
Confident in the ability to develop a visionary approach that incorporates technology in educational leadership	College Professor	3.53	0.507	SA
	High School Teacher	3.26	0.912	SA
	Elementary Teacher	2.97	0.414	A
Embrace technological advancements that are crucial to staying ahead in the field of education	College Professor	3.73	0.45	SA
	High School Teacher	3.24	0.932	A
	Elementary Teacher	3.57	0.504	SA

Note. 1.00-1.75 (SD); 1.76-2.50 (D); 2.51-3.25 (A); 3.26-4.00 (SA)

Table 1 shows the results highlighted a generally positive attitude among educators towards the role of technology in education, with college professors consistently demonstrating higher levels of agreement across dimensions of visionary adaptability. However, elementary teachers displayed a lower level of agreement, falling into the Agreement (A) category, particularly in their confidence to develop visionary approaches with the (M = 2.97, SD = 0.414) and their openness to adapting long-term educational goals with the (M = 3.17, SD = 0.379) displayed a slightly lower level of agreement, falling into the Agreement (A) category.

TABLE II. Teacher's Perspectives on Adaptive Leadership in the Digital Age Focusing on Interpersonal Adaptability.

Interpersonal Adaptability	Levels of Teaching	M	SD	VI
Comfortable in collaborating with others to integrate technology seamlessly into the educational environment	College Professor	3.33	0.547	SA
	High School Teacher	3.31	0.924	SA
	Elementary Teacher	2.97	0.809	SA
Consider the transformative power of technology has positive implications for building effective communication within the educational community	College Professor	3.87	0.346	SA
	High School Teacher	3.38	0.936	SA
	Elementary Teacher	3.53	0.681	SA
Open to feedback and suggestions from peers regarding the integration of technology into education	College Professor	3.8	0.407	SA
	High School Teacher	3.43	0.941	SA
	Elementary Teacher	3.5	0.682	SA
Build relationships with stakeholders is a priority when implementing technology-driven educational initiatives	College Professor	3.87	0.346	SA
	High School Teacher	3.29	0.918	SA
	Elementary Teacher	3.23	0.626	A
Believe that fostering interpersonal skills is essential for successful leadership in the ever-changing landscape of educational technology	College Professor	3.9	0.305	SA
	High School Teacher	3.26	1.037	SA
	Elementary Teacher	3.37	0.928	SA

Note. 1.00-1.75 (SD); 1.76-2.50 (D); 2.51-3.25 (A); 3.26-4.00 (SA)

Table 2 presents that while there were similarities in teachers' perspectives across different levels, college professors generally showed a higher level of comfort, belief in the transformative power of technology, openness to feedback, and emphasis on relationship-building and interpersonal skills. However, elementary teachers displayed a lower level of agreement, falling into the Agreement (A) category, specifically in building relationships with stakeholders is a priority when implementing technology-driven educational initiatives with the (M=3.23, SD=0.626) falling into the Agreement (A) category.

Table 3 shows that teachers were eager to adapt their decision-making processes to incorporate technological advancements in education, with college professors and high school teachers strongly agreeing and elementary teachers agreeing less. Teachers at all levels recognize technology's transformative power in educational leadership decision-making, with college professors and elementary teachers agreeing that it is critical, while high school teachers disagree.

The data also shows that college professors were actively seeking information about emerging technologies, while high school and elementary teachers were also positive about active information seeking. Teachers at all levels were confident in their ability to make decisions that take advantage of technology's transformative potential, with college professors scoring higher on the "Strongly Agree" scale. The data show that decision-making flexibility is critical for responding to rapid changes in educational technology, with college professors strongly agreeing and high school and elementary teachers agreeing less.

TABLE III. Teacher's Perspectives on Adaptive Leadership in the Digital Age Focusing on Decision-making Adaptability.

Decision-making Adaptability	Levels of Teaching	M	SD	VI
Willing to adjust decision-making processes to incorporate the benefits of technological advancements in education	College Professor	3.7	0.466	SA
	High School Teacher	3.33	0.954	SA
	Elementary Teacher	3.1	0.712	A
Consider the transformative power of technology as a key factor in educational leadership decision-making	College Professor	3.77	0.43	SA
	High School Teacher	3.12	0.968	A
	Elementary Teacher	3.53	0.571	SA
Actively seek information about emerging technologies to inform my decision-making in education	College Professor	3.77	0.43	SA
	High School Teacher	3.12	0.968	A
	Elementary Teacher	3.03	0.183	A
Confident in the ability to make decisions that align with the transformative potential of technology in education	College Professor	3.69	0.471	SA
	High School Teacher	3.12	0.861	A
	Elementary Teacher	3	0.455	A
Flexibility in decision-making is necessary to effectively respond to the rapid changes brought about by educational technology	College Professor	3.7	0.466	SA
	High School Teacher	3.24	0.932	A
	Elementary Teacher	3.2	0.61	A

Note. 1.00-1.75 (SD); 1.76-2.50 (D); 2.51-3.25 (A); 3.26-4.00 (SA)

TABLE IV. Summary of Teacher's Adaptive Leadership in the Digital Age.

Adaptive Leadership	Levels of Teaching	M	SD	VI
Visionary Adaptability	College Professor	3.78	0.259	SA
	High School Teacher	3.36	0.843	SA
	Elementary Teacher	3.39	0.252	SA
Interpersonal Adaptability	College Professor	3.75	0.286	SA
	High School Teacher	3.33	0.903	SA
	Elementary Teacher	3.32	0.632	SA
Decision-Making Adaptability	College Professor	3.73	0.313	SA
	High School Teacher	3.19	0.856	A
	Elementary Teacher	3.17	0.385	A

Table 4 presents the responses from teachers surveyed indicating that, in terms of visionary adaptability, interpersonal adaptability, and decision-making adaptability, the majority held optimistic views regarding adaptive leadership. In all three categories, college professors consistently achieved higher scores in comparison to elementary and secondary school instructors. The results indicated that there was substantial consensus among educators, specifically regarding interpersonal and visionary adaptability. However, concerning decision-making adaptability, additional research and targeted interventions at the elementary and high school levels might have been more beneficial.

TABLE V. Significant Difference in Adaptive Leadership Among Three Groups of Respondents.

	Sum of Squares	F	p	Decision
Gender	0.441	1.218	0.272	Retain H_0
Levels of Teaching	4.43	6.113	0.003	Reject H_0
Gender ✳ Levels of Teaching	0.128	0.177	0.838	Retain H_0

It can be seen in Table 5 that the sum of squares for gender was 0.441, with an F-value of 1.218 and a p-value of 0.272. The non-significant p-value suggests that there were no significant differences in adaptive leadership perceptions between genders. On the other hand, the sum of squares for levels of teaching was 4.43, with an F-value of 6.113 and a significant p-value of 0.003. This indicates that there were significant differences in adaptive leadership perceptions among different levels of teaching. As for the interaction between gender and levels of teaching, the sum of squares for the interaction between gender and levels of teaching was 0.128, with an F-value of 0.177 and a non-significant p-value of 0.838. The lack of significance suggests that there were no significant interactions between gender and levels of teaching regarding adaptive leadership perceptions.

The findings indicate that while there were no significant differences in adaptive leadership perceptions based on gender, there were notable variations among different levels of teaching. This suggests that the level of teaching plays a more influential role in shaping perceptions of adaptive leadership than gender. The lack of interaction between gender and levels of teaching further supports this conclusion.

TABLE VI. Post Hoc Comparison - Gender.

Comparison Gender		Mean Difference	t	p
Female	Male	0.138	1.1	0.272

Table 6 demonstrates the post hoc comparison of gender, exploring the mean difference between females and males. The mean difference was found to be 0.138, with a *t*-value of 1.1 and a *p*-value of 0.272. Given that the p-value was higher than the 0.05 significance level, the statistical analysis did not find a significant difference between the genders in the measured variable. Based on these findings, the decision was made not to reject the null hypothesis. This means that any observed differences in means between male and female groups can be attributed to random variation rather than a meaningful distinction in the variable under study.

TABLE VII. Post Hoc Comparison – Levels of Teaching.

Comparison		Mean Difference	*t*	*p*
Levels of Teaching				
College Professor	- Elementary Teacher	0.451	2.845	0.015
	- High School Teacher	0.4935	3.247	0.005
Elementary Teacher	- High School Teacher	0.0425	0.285	0.956

It can be gleaned from Table 7 that the comparison revealed a statistically significant difference between College Professors and Elementary Teachers (t(DF) = 2.845, p = 0.015). The positive mean difference of 0.451 suggests that, on average, College Professors reported higher levels in the assessed variable compared to Elementary Teachers. A significant difference was also found between College Professors and High School Teachers (t(DF) = 3.247, p = 0.005). With a mean difference of 0.4935, College Professors demonstrated higher levels in the variable compared to High School Teachers. In contrast, no significant difference was observed between Elementary Teachers and High School Teachers (t(DF) = 0.285, p = 0.956). The mean difference of 0.0425 suggests that, on average, there was minimal distinction in the levels of the assessed variable between these two groups.

TABLE VIII. Post Hoc Comparison – Gender*Levels of Teaching.

Comparison		Mean Difference	*t*	*p*
Gender	Levels of Teaching			
Female	Elementary Teacher	0.4526	2.216	0.24
	High School Teacher	0.4181	2.354	0.183
Male	College Professor	0.089	0.39	0.999
Male	Elementary Teacher	0.5383	2.539	0.123
Male	High School Teacher	0.6578	3.036	0.035
Female	High School Teacher	-0.0345	-0.184	1
Male	College Professor	-0.3636	-1.542	0.638
Male	Elementary Teacher	0.0857	0.389	0.999
Male	High School Teacher	0.2051	0.913	0.942
Male	College Professor	-0.3292	-1.544	0.637
Male	Elementary Teacher	0.1202	0.614	0.99
Male	High School Teacher	0.2396	1.193	0.839
Male	Elementary Teacher	0.4494	1.853	0.438
Male	High School Teacher	0.5688	2.306	0.202
Male	High School Teacher	0.1194	0.515	0.995

The findings indicate that College Professors differ significantly from both Elementary and High School Teachers, with higher reported levels in the assessed variable, and no significant difference was identified between Elementary and High School Teachers.

It can be perceived from Table 8 that for female teachers, the mean difference in scores between Elementary and High School teaching levels was 0.4526, with a t-value of 2.216 and a p-value of 0.24, indicating a non-significant difference. Similarly, for female teachers between High School and College Professor levels, the mean difference was -0.0345, with a *t*-value of -0.184 and a *p*-value of 1, suggesting no significant distinction.

In the case of male teachers, significant differences were observed in several comparisons. For Elementary teachers, the mean difference between Elementary and High School teaching levels was 0.5383, with a *t*-value of 2.539 and a *p*-value of 0.123, indicating a non-significant difference. However, the mean difference between High School and College Professor levels for male teachers was 0.6578, with a *t*-value of 3.036 and a *p*-value of 0.035, suggesting a significant distinction.

In the comparison of male and female teachers at the High School level, the mean difference for males was 0.1194, with a *t*-value of 0.515 and a *p*-value of 0.995, indicating no significant difference. Additionally, for male teachers at the College Professor level, the mean difference between Elementary and High School teaching levels was -0.3292, with a *t*-value of -1.544 and a *p*-value of 0.637, indicating a non-significant difference.

Overall, these post hoc comparisons provide insights into the gender-based variations in mean scores across different levels of teaching. While some differences were found to be statistically significant, others were not, suggesting the need for further exploration and consideration of additional factors that may influence these teaching-level variations.

V. DISCUSSIONS

The study found that educators generally have a positive attitude towards the role of technology in education, with college professors showing higher levels of agreement in visionary adaptability. However, elementary teachers showed a lower level of agreement, particularly in their confidence to develop visionary approaches and openness to adapting long-term educational goals. College professors showed a higher level of comfort, belief in the transformative power of technology, openness to feedback, and emphasis on relationship-building and interpersonal skills. They were also more willing to adapt their decision-making processes to incorporate technological advancements in education. Both college professors and elementary teachers agreed that technology's transformative power is critical in educational leadership decision-making. They were also more confident in their ability to make decisions that take advantage of technology's potential. Decision-making flexibility is critical for responding to rapid changes in educational technology.

Teachers surveyed expressed optimistic views on visionary, interpersonal, and decision-making adaptability. College professors consistently scored higher than elementary and secondary school teachers. There was consensus on interpersonal and visionary adaptability, but additional

research and targeted interventions at elementary and high school levels might have been more beneficial.

The study found no significant differences in adaptive leadership perceptions based on gender, but notable variations among different levels of teaching. This suggests that the level of teaching plays a more influential role in shaping perceptions of adaptive leadership than gender. The post hoc comparison of gender revealed a mean difference of 0.138 between females and males, indicating that any observed differences can be attributed to random variation. However, a statistically significant difference was found between College Professors and Elementary Teachers, with College Professors reporting higher levels in the assessed variable compared to Elementary Teachers. No significant difference was observed between Elementary Teachers and High School Teachers, suggesting minimal distinction in the levels of the assessed variable.

VI. RECOMMENDATIONS

The study highlights the importance of tailoring professional development programs to the specific needs of elementary and secondary school teachers, focusing on visionary approaches and decision-making adaptability. It also highlights the need for targeted interventions and training programs that emphasize collaboration and relationship-building in technology integration. Hence, the study suggests that interventions at lower teaching levels could improve decision-making adaptability, such as mentorship programs or collaborative learning communities. Teachers are actively seeking information about emerging technologies, but the level of agreement varies depending on the teaching level. Addressing barriers to information access, particularly at elementary and secondary school levels, could promote a more equitable and widespread integration of technology in education. Policymakers should consider the specific needs of elementary, secondary, and college-level educators in educational policies. Further research is needed to explore factors influencing teaching-level variations, such as institutional support, access to resources, and teaching methodologies.

VII. CONCLUSION

The study examine educators' attitudes towards technology in education, revealing a generally positive outlook. College professors showed higher visionary adaptability, confidence in technological integration, and openness to feedback compared to elementary teachers. Both groups acknowledged the transformative power of technology in educational leadership decision-making. However, the study suggests targeted interventions at elementary and high school levels, as these educators exhibited lower levels of agreement. Gender did not significantly influence adaptive leadership perceptions, but the level of teaching had a more pronounced impact. College professors consistently outperformed elementary and high school teachers, highlighting the importance of tailored strategies for different teaching levels.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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