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The Impact of Leadership Style on Teachers' Use of ICT: A Systematic Review

Manaa Saif Alshidi, Rabiatul-Adawiah Binti Ahmad Rashid

School of Educational Studies, Universiti Sains Malaysia, Pulau Pinang, Malaysia

Email: m.alshidy@student.usm.my, r_adawiah@usm.my

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Abstract

Leadership philosophies play a significant role in the integration of ICT into educational systems, which is essential for improving teaching and learning on a global scale. This systematic review examines the impact of various leadership styles on teachers' incorporation of ICT in educational environments. The findings seek to offer valuable insights to educational leaders in Oman, enabling them to improve educational outcomes in accordance with Oman Vision 2040. This study used the Prisma framework as the theoretical approach, Scopus database was used in this study; 1129 articles were included as the initial search, and after applying the filters, 333 articles were included in this analysis. The most significant result of this research is that different leadership styles have a profound and multifaceted impact on teachers' attitudes towards integrating ICT into their teaching practices. It is important to analyse emerging leadership methods, such as dispersed and digital leadership. Conducting comparative research in various educational settings and cultures, together with emphasising the importance of continuous professional development, will aid in identifying successful approaches to improving teachers' digital skills.

Keywords: Leadership, ICT Use, Teachers, Educational Technology, Digital Integration

Introduction

Globally improving teaching and learning processes depends critically on the integration of Information and Communication Technology (ICT) into educational systems. This integration depends much on leadership styles, which affect teachers' attitudes, competencies, and general ICT efficacy (Baglama et al., 2022; Sederevičiūtė-Pačiauskienė et al., 2021). Globally, educational leaders who adopt transformational, adaptive, and innovative leadership styles tend to create environments that encourage the effective use of ICT among teachers, so improving the educational outcomes and student involvement (Grady et al., 2021; Hurtado-Mazeyra et al., 2022).

Under its larger educational reform projects, the Ministry of Education of Oman has been aggressively advocating ICT integration. Omani educational leaders are realising more and more the need of leadership approaches that promote teachers' professional growth and

digital transformation. Recent research show that teachers' preparedness and competency in including ICT into their lessons in Omani institutions are much improved by supportive and strategic leadership (Al-Adwan et al., 2022). This emphasis aligns with Oman Vision 2040, which emphasises the potential of technology to drive innovation and academic achievement.

With an eye towards the Omani situation, this systematic review seeks to investigate how different leadership styles affect teachers' usage of ICT. This study aims to identify important leadership behaviours that support ICT integration by aggregating current research and offers suggestions for Omani educational leaders. The results will add to the corpus of knowledge on educational leadership and ICT by offering insights that can guide policy and practice to improve the quality of education by efficient use of technologies. Consequently, the project will answer the following research issues:

1. In leadership AND teachers AND technology research area, what are the top countries, educational institutions, authors, and publications?
2. In what ways could various leadership approaches influence teachers' opinions on including ICT into their curricula?
3. Which particular leadership strategies help teachers to use ICT most successfully?
4. How does the presence of supportive leadership impact the frequency and quality of ICT use in teaching?
5. What challenges do leaders face in fostering ICT integration among teachers, and how can these be overcome?

Methods

The purpose of this study was to find how teachers' use of ICT changed with leadership style. This paper applied two analyses beginning with a bibliometric then systematic analysis based on the PRISMA framework (Preferred Reporting Items for Systematic reviews and Meta-Analyses) by (Moher et al., 2009). The study tracked the PRISMA phases as follows.

Identifications

On 19th July, Scopus database was used to achieve the objective of this study. Three main keywords were used “Leadership”, “Teachers”, “Technology” as explained in this query “TITLE-ABS-KEY (leadership AND teachers AND technology)”. The search period included the past nine years from 2015 – 2023, as the following “AND PUBYEAR > 2014 AND PUBYEAR < 2024”.

Screening

A set of exact keywords were used as the following “AND (LIMIT-TO (SUBJAREA, "SOCI”) OR LIMIT-TO (SUBJAREA, "ARTS”)) AND (LIMIT-TO (DOCTYPE, "ar”)).

Inclusion and Exclusion

Multiple subject areas were included in this research, computer science, social science, art and humanities, as following “AND (LIMIT-TO (SUBJAREA, "SOCI”) OR LIMIT-TO (SUBJAREA, "ARTS”))”. Only articles were included “(LIMIT-TO (DOCTYPE, "ar”)”. Only articles writing in English language were included “AND (LIMIT-TO (LANGUAGE, "English”))”.

Table 1
Inclusion and Exclusion Criteria

inclusion criteria	exclusion criteria
Articles in the impact of Leadership style on Teachers' use of ICT	Any other field was excluded
Only articles	Conference papers, book chapters, thesis, blogs were excluded
Only articles written in English	Any other languages were excluded

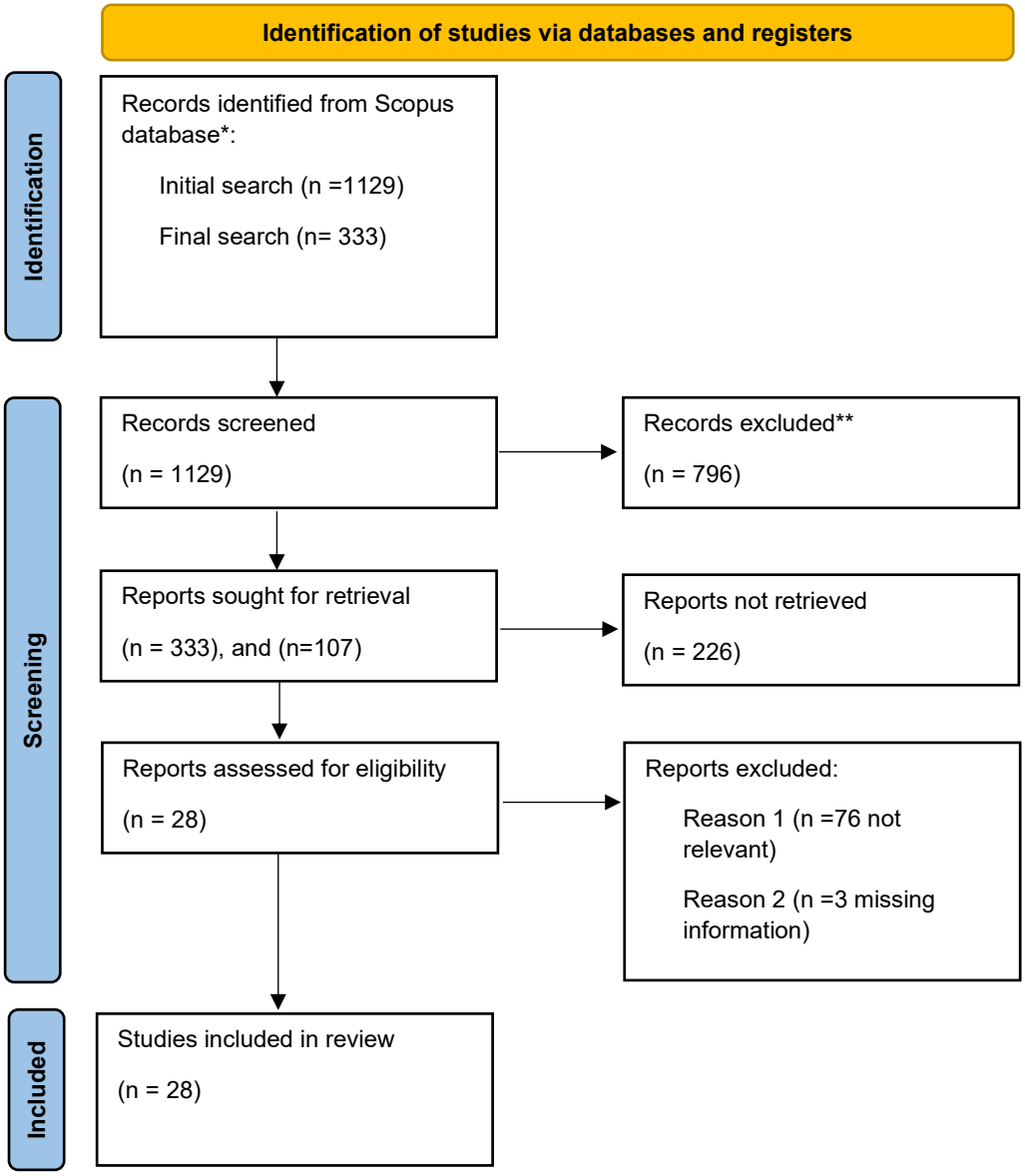

Figure 1: PRISMA FRAMEWORK

Results

Distribution of the Impact of Leadership style on Teachers' Use of ICT Over the Last Nine Years

Figure 1 illustrates the considerable variance in study papers over the last nine years on the influence of leadership style on teachers' ICT usage. The distribution of these publications from 2015 to 2023 shows how interest in this issue has been growing, albeit slowly.

Figure (1) shows that there were relatively few publications in the early years. From 2015 to 2017, a total of 27 papers were published; however, in 2016, there was a significant decrease, with just 14 publications recorded. Since 2018, there has been a consistent increase in the number of publications. In 2018, the quantity of published materials increased to 31, and then further rose to 33 in 2019. In 2020, there was a notable surge with 74 documented publications, which happened at the same time as the worldwide COVID-19 epidemic. Subsequent to 2020, there was a modest decline in publications, however their quantity remained substantial in comparison to the pre-2020 period. A total of 48 publications were released in 2021, which was followed by an increase to 49 publications in 2022. In 2023, the number of publications climbed once more, reaching a total of 57 articles.

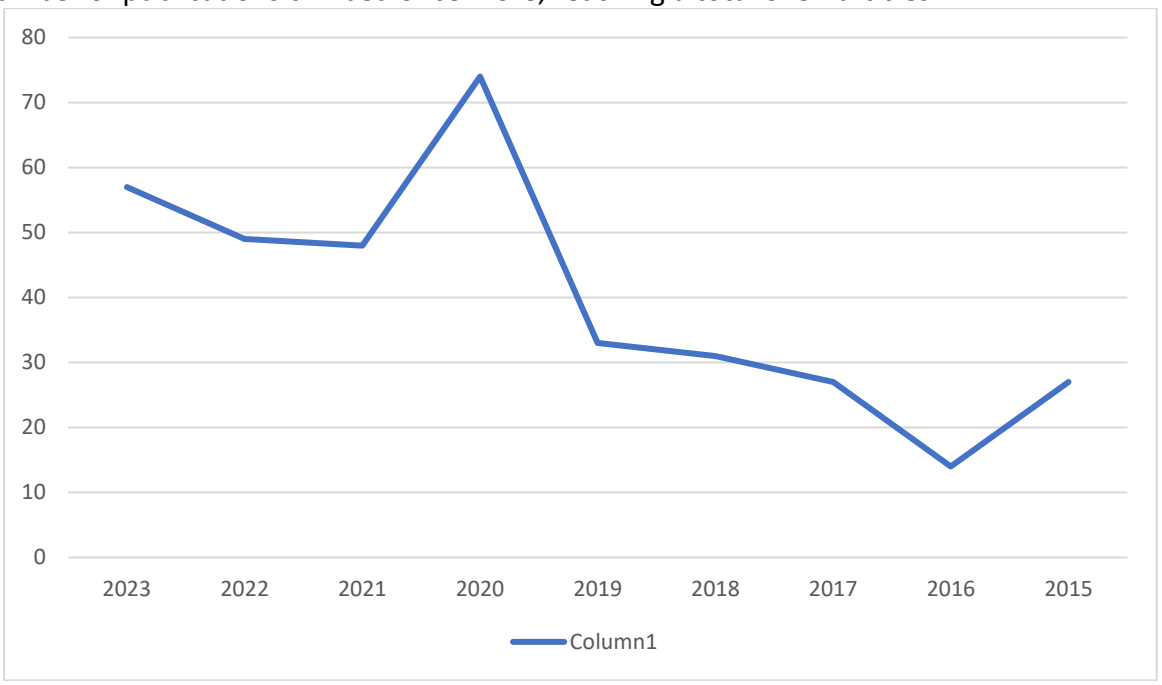

Figure 1: distributions by years the impact of Leadership style on Teachers' use of ICT

Articles distributed during the past nine years show numerous interesting trends. From 2015 to 2017, the need of leadership style in the sphere of education was becoming more and more obvious. This led to a moderate although consistent level of research activity. During the period from 2018 to 2019, there was a notable rise in awareness and interest in the subject, which resulted in a substantial growth in research productivity. The COVID-19 pandemic in 2020 led to a significant rise in publications, emphasising the importance of comprehending and implementing good leadership styles in the context of increased dependence on ICT for education. From 2021 to 2023, interest in the topic continued to grow sustainably, maintaining its relevance with a steady increase in the number of publications, reflecting ongoing research efforts to address evolving challenges and exploit new opportunities in leadership style and ICT.

Top 10 countries in the research field of the impact of Leadership style on Teachers' use of ICT

The analysis of the top research on the influence of leadership style on teachers' ICT use exposes a varied worldwide scene. Emphasising different degrees of involvement and research output, the data shows the top 10 countries contributing to this field during the past nine years.

The United States is much ahead of other countries in the sector, with 91 publications. The dominance observed can be attributed to the substantial investment and emphasis placed by educational and research organisations in the United States on comprehending and improving leadership styles in schools. The significant number of articles suggests a strong academic and practical interest in utilising leadership style to enhance the use of ICT among teachers, maybe motivated by ample money, technological infrastructure, and legislative backing.

Australia is the second most productive country in this scientific field, having published 31 articles. The impressive performance of Australian researchers highlights the country's dedication to incorporating technology into education. Australia's emphasis on leadership style may be shaped by its endeavours to maintain competitiveness in the global educational arena and its acknowledgement of the transformative capacity of ICT in educational settings. Malaysia is third with 19 publications. This shows that Malaysian educational researchers are increasingly studying leadership style. ICT in education is part of the country's efforts to build a technologically savvy and skilled workforce, and leadership style is vital to this.

China and Turkey have an equal number of publications, with each country having 17 publications. This indicates a notable level of involvement with the topic. China's interest in leadership style and ICT usage is in line with its wider educational reforms and technical progress. Turkey may be focussing on this area of study because they want to bring old ways of teaching up to date and use digital tools to help students do better in school. Indonesia comes in second with 15 publications that show how committed it is to improving education through leadership style. Indonesia is focussing on integrating ICT as part of larger educational changes that aim to make it easier for all of its diverse and geographically spread out people to get a good education.

Israel's fourteen publications demonstrate its innovative use of technology and education. Given its robust technological economy and emphasis on educational innovation, Israel is likely interested in conducting study on leadership style and ICT use. Thirteen books from the UK show that people there are still interested in studying the role of leadership style in education. With 13 publications, the United Kingdom shows a consistent curiosity for the function of leadership style in education. The excellent educational infrastructure of the UK and continuous attempts to include digital technology into teaching and learning help to support its involvement with this study topic.

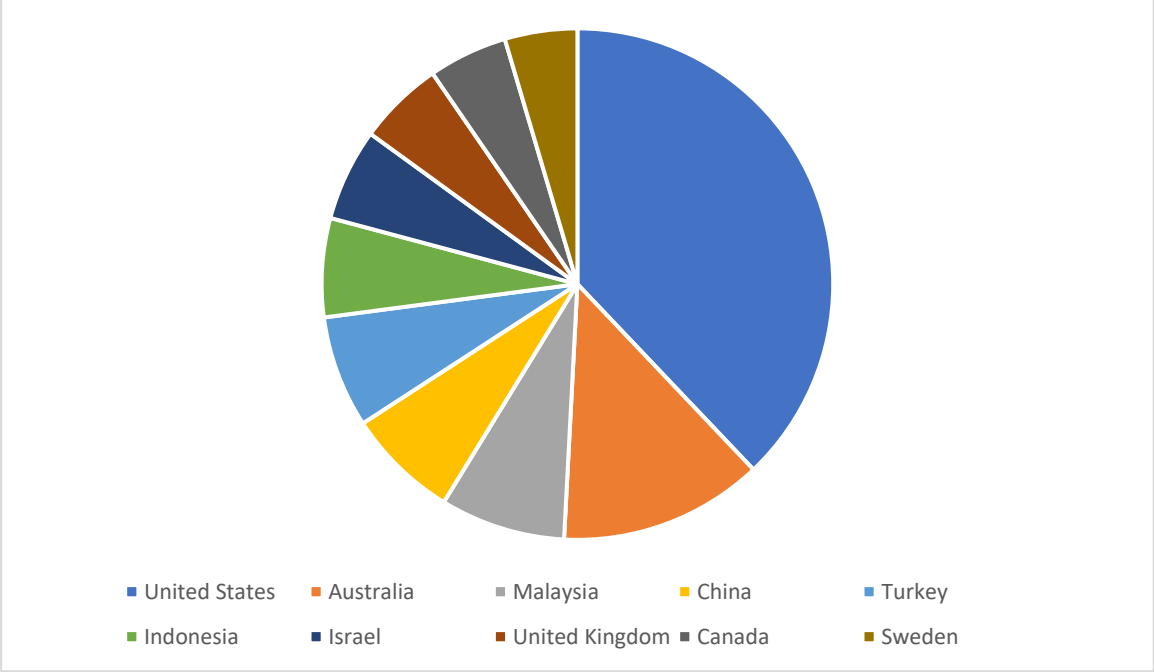

Figure 2: top 10 countries in the research field of the impact of Digital Leadership on Teachers' use of ICT

With twelve publications, Canada shows a constant emphasis on comprehending and enhancing leadership style in education. The emphasis on innovation and technological integration of the Canadian educational system helps to assist its field of research endeavours. Sweden comes in at number ten with eleven publications. Sweden's commitment to digital education and leadership is a key component of its broader strategy to leverage technology in order to maintain its high educational standards and enhance learning outcomes.

Research publications disseminated throughout these top ten countries demonstrate a global commitment to understanding and improving leadership style in education. Following major contributions from nations such Australia, Malaysia, China, and Turkey, the United States takes a leading position that emphasises the general awareness of the need of leadership style in improving teachers' use of ICT. Every nation's participation in this field of research reflects its own educational priorities, technology developments, and policy approach, therefore promoting a greater global knowledge of successful leadership in education.

Top 10 educational institutions the research field of the impact of Leadership style on Teachers' use of ICT

Analysing the top universities supporting research on the impact of leadership style on teacher ICT use reveals a broad spectrum of worldwide institutions. These institutions have been quite helpful in advancing research in this important topic over the last nine years.

At eight publications, Universiti Malaya ranks highest on the list. This well-known Malaysian university has demonstrated a great will to investigate the junction of ICT application in education and leadership approaches. Research initiatives at Universiti Malaya most certainly reflect Malaysia's larger educational objectives of integrating technology and strengthening digital leadership to raise teaching and learning results.

The Education University of Hong Kong is a major participant in this field of research having seven publications. Its emphasis on ICT integration and leadership styles fits Hong Kong's educational policies, which stress creative teaching approaches and the use of technology to satisfy the needs of a contemporary classroom.

The Open University of Israel, with its seven publications, showcases the country's strong focus on remote learning and the integration of technology in education. Israel's dedication to utilising ICT for enhancing education is seen in its research, which frequently investigates how leadership may enable successful technology integration in teaching.

With six papers overall, Universiteit Gent shows the importance of leadership in the context of ICT application in Belgian educational scene. The research of the institution underlines Belgium's dedication to modernise education by means of technology and stresses the vital need of good leadership in this process.

Universiti Utara Malaysia, another esteemed Malaysian university, has produced noteworthy contributions through the publication of five scholarly works. This exemplifies Malaysia's robust emphasis on research in digital leadership and ICT, reaffirming the nation's dedication to cultivating technologically proficient educational institutions.

Both the University of Kentucky and the University of Virginia, each with five publications, represent the United States' robust research activity in this field. These institutions highlight the U.S. educational system's emphasis on leadership and technology integration as critical components for improving educational practices and outcomes.

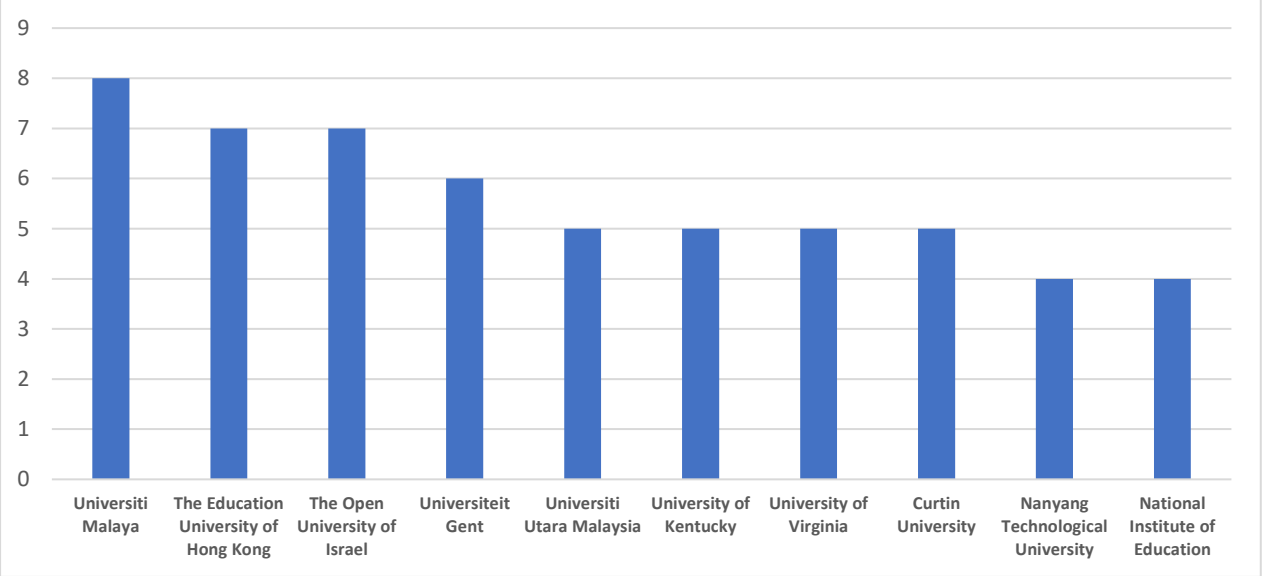

Figure 3: top 10 educational institutions the research field of the impact of Leadership style on Teachers' use of ICT

Curtin University in Australia showcases the country's proactive engagement in researching and adopting digital leadership strategies in educational settings through the publication of five publications. Australia's broader objective of leveraging technology to improve teaching techniques aligns well with this effort.

With four publications apiece, both Nanyang Technological University and the National Institute of Education have made major contributions in Singapore. By including innovative technologies, their work emphasises Singapore's commitment to educational innovation and leadership, therefore preserving its leadership position among countries.

Comprising Universiti Malaya, The Education University of Hong Kong, and The Open University of Israel among others, the top 10 educational institutions show a worldwide dedication to researching and improving the influence of leadership styles on teacher ICT use. Universities all throughout the United States, Europe, Australia, and Singapore have conducted significant studies proving the universal relevance of digital leadership in education. With careful application of technology, this cooperative worldwide endeavour seeks to enhance teaching and learning.

Top 10 authors in the field of the impact of Leadership style on Teachers' use of ICT
Analysing the top leaders in the field of leadership style and how it affects teachers' ICT use exposes a group of very active researchers whose work has greatly advanced the knowledge and growth in this sector. By means of their research publications, citations, and general impact, the top 10 authors have made significant contributions emphasising their great importance.

Leading the field with an outstanding 62 publications and 2,096 overall citations is Ina Blau. Especially the most widely referenced paper "Scaffolding game-based learning: Impact on learning achievements, perceived learning, and game experiences," Blau's study emphasises her enormous importance in investigating how creative pedagogy and leadership style improve teachers' ICT use. Blau's association with The Open University of Israel has been a pillar of her great intellectual production and impact.

Ruben Vanderlinde has the greatest number of publications, with a total of 101, among the top ten writers. Additionally, he has accumulated a total of 2,370 citations. The work titled "The gap between educational research and practice: Views of teachers, school leaders, intermediaries, and researchers," has been referenced 275 times. It demonstrates the author's emphasis on connecting theoretical concepts with practical application in the fields of educational leadership and ICT integration. Vanderlinde's association with Universiteit Gent has enabled him to make significant research contributions.

Sara Dexter has made significant contributions with 32 papers and a total of 1,008 citations. The very significant study titled "School technology leadership: An empirical investigation of prevalence and effect," has been mentioned 199 times. This research extensively examines the prevalence and effects of technology leadership in educational institutions. Dexter's University of Virginia research has been absolutely essential in helping one grasp the subtleties of educational leadership style.

With 38 articles and 612 total citations, Arumugam Raman has made a major contribution to the subject especially with his work "Preservice teachers' acceptance of learning management software: An application of the UTAUT2 model," cited 240 times. Raman studies the adoption and integration of digital tools in teacher education at the School of Education, Universiti Malaysia.

Orit Avidov-Ungar has made a notable impact in the field through the publication of 50 articles and the accumulation of 482 citations. The research paper, titled "Professional identity of teacher teachers in the digital era in light of demands of pedagogical innovation," has been cited 68 times. This study investigates the changing professional identities of teachers in the digital age.

The research undertaken by Avidov-Ungar at The Open University of Israel has significantly influenced knowledge and understanding in this sector.
Jayson W. Richardson has made significant contributions through his research, which includes 49 articles and a total of 462 citations. His most influential piece, titled "What does technology integration research tell us about the leadership of technology?", has been cited 45 times. Richardson's study at the University of Kentucky centres on the points where technology integration and leadership in education interact.

Tamar Shamir-Inbal has authored 24 papers, which have been cited a total of 778 times. One of her major works, titled "Re-designed flipped learning model in an academic course: The role of co-creation and co-regulation," has received 153 citations. Her study at The Open University of Israel focusses on creative teaching models and how they affect leadership style and the usage of ICT.

Table 1
Top 10 authors in the field of the impact of Leadership style on Teachers' use of ICT

#	Author	TP	TC	H-index	Most cited article	Times cited	Affiliation
1	**Richardson, Jayson W.**	49	462	13	What does technology integration research tell us about the leadership of technology?	45	Info University of KentuckyThe institution will open in a new tab, Lexington, United States
2	**Avidov-Ungar, Orit**	50	482	12	Professional identity of teacher teachers in the digital era in light of demands of pedagogical innovation	68	The Open University of IsraelThe institution will open in a new tab, Ra'anana, Israel
3	**Blau, Ina**	62	2,096	24	Scaffolding game-based learning: Impact on learning achievements, perceived learning, and game experiences	253	The Open University of IsraelThe institution will open in a new tab, Ra'anana, Israel

4	**Dexter, Sara**	32	1008	16	School technology leadership: An empirical investigation of prevalence and effect	199	University of VirginiaThe institution will open in a new tab, Charlottesville, United States
5	**Ismail, Siti Noor**	26	234	11	Instructional leadership and teachers' functional competency across the 21st century learning	32	Universiti Utara MalaysiaThe institution will open in a new tab, Sintok, Malaysia
6	**Raman, Arumugam**	38	612	12	Preservice teachers' acceptance of learning management software: An application of the UTAUT2 model	240	School of Education Universiti, Malaysia
7	**Shamir-Inbal, Tamar**	24	778	13	Re-designed flipped learning model in an academic course: The role of co-creation and co-regulation	153	Info The Open University of IsraelThe institution will open in a new tab, Ra'anana, Israel
8	**Vanderlinde, Ruben**	101	2370	28	The gap between educational research and practice: Views of teachers, school leaders, intermediaries and researchers	275	Info Universiteit GentThe institution will open in a new tab, Ghent, Belgium
9	**Borthwick, Arlene C.**	9	181	6	Digital Literacy in Teacher Education: Are Teacher Teachers Competent?	58	National Louis UniversityThe institution will open in a new tab, Chicago, United States

10	**Clausen, Jon M.**	8	116	5	Loving Out Loud: Community Mentors, Teacher Candidates, and Transformational Learning Through a Pedagogy of Care and Connection	49	Info Ball State UniversityThe institution will open in a new tab, Muncie, United States

TP= total publications, TC= Total citations

Siti Noor Ismail has made major contributions with her research titled "Instructional leadership and teachers' functional competency across the 21st century learning." She has published 26 papers and received a total of 234 citations, with her research being cited 32 times. Ismail's research at Universiti Utara Malaysia centres on instructional leadership and its impact on improving ICT competences among teachers.

Arlene C. Borthwick has contributed with 9 publications and 181 total citations. Her work "Digital Literacy in Teacher Education: Are Teacher Teachers Competent?" cited 58 times, explores the competencies of teacher teachers in digital literacy. Borthwick's research at National Louis University addresses critical aspects of leadership style in teacher education.
Jon M. Clausen, with 8 publications and 116 total citations, has made important contributions, especially through his work "Loving Out Loud: Community Mentors, Teacher Candidates, and Transformational Learning Through a Pedagogy of Care and Connection," cited 49 times. Clausen's research at Ball State University focuses on mentorship, transformational learning, and leadership style.

The significant contributions made by the top ten writers highlight their crucial roles in developing research on the influence of leadership style on teachers' use of ICT. This field is characterised by its large publications, considerable citations, and prominent research, which demonstrate its worldwide and interdisciplinary nature. The work of each author, backed by their respective institutions, has offered vital insights and developments, influencing the comprehension and methodologies of leadership style in education.

Impact of Leadership Styles on Teachers' Attitudes Towards Integrating ICT in Teaching Practices

The influence of different leadership styles on teachers' attitudes towards integrating ICT in their teaching practices is significant and multifaceted. Research highlights that leadership styles emphasizing digital transformation, strategic vision, and supportive environments positively impact teachers' willingness to adopt ICT. For instance, Baglama et al. (2022) emphasize that leadership style promotes a culture of digital literacy and support, fostering positive attitudes towards ICT integration among teachers. This is corroborated by Sederevičiūtė-Pačiauskienė et al. (2021), who found that transformational and democratic leadership styles create an inclusive environment that encourages the integration of digital technologies.

Adaptive and innovative leadership styles also play a crucial role, as noted by Grady et al. (2021), by likely enhancing teachers' receptiveness to ICT integration. Moreover, Hurtado-

Mazeyra et al. (2022) point out that integrative leadership, which combines ICT and media competencies, significantly influences teachers' attitudes by fostering a technologically enriched and supportive environment. Leadership that prioritizes professional development and ICT training, as highlighted by A'mar & Eleyan (2022) and Raman et al. (2019), further strengthens teachers' positive attitudes towards ICT by enhancing their competence and confidence.

Additionally, leadership styles that emphasize social justice and equal access to resources, as described by Hassan & Berkovich (2023), ensure that all teachers have the necessary tools and support to integrate ICT, leading to more positive attitudes. During the pandemic, leadership style styles were particularly effective, as noted by Tanucan et al. (2022), by enhancing job satisfaction and supporting the transition to remote learning. Authentic leadership also contributes positively by fostering a more engaged and motivated teaching environment, according to CrawfordB & Butler-HendersonA (2020).

Strategic leadership that aligns ICT goals with the school vision, as described by Özdemir et al. (2020) and Lomos et al. (2023), ensures a cohesive approach to ICT integration, positively influencing teachers' attitudes. Leaders who emphasize collaboration and a shared vision, as noted by Gonzales & Jackson (2020) and Landa et al. (2023), create a supportive environment that encourages teachers to embrace ICT. Moreover, leadership that stays updated with new technologies and promotes their use, as emphasized by Alenezi (2016), sets a positive example and significantly enhances teachers' readiness to integrate ICT.

Overall, different leadership styles, especially those that are proactive, supportive, and visionary, play a critical role in shaping teachers' attitudes towards ICT integration. By fostering a culture of digital literacy, providing adequate training and resources, and aligning ICT with strategic goals, leaders can create an environment that encourages and supports the effective use of ICT in teaching practices.

Effective Leadership Behaviours for Promoting ICT Use among Teachers

Effective leadership behaviors are pivotal in promoting the use of ICT among teachers, significantly enhancing their engagement and integration of technology into their teaching practices. One of the most impactful behaviors is the promotion of continuous professional development. Leaders who provide ongoing training and support, such as targeted ICT training sessions and hands-on workshops, empower teachers to develop their digital competencies and confidence. This approach, highlighted by researchers like Hassan and Berkovich (2023) and Raman and Thannimalai (2019), ensures that teachers are well-equipped to incorporate technology into their classrooms effectively.

Another crucial behavior is fostering a collaborative and supportive environment. Leaders who encourage peer learning, facilitate collaboration among teachers, and create a culture of shared vision and goals for ICT use, as noted by Apsorn et al. (2019) and Agustina et al. (2020), significantly enhance the likelihood of successful ICT integration. This collaborative approach not only builds a sense of community but also allows teachers to share best practices and innovative solutions, further promoting the use of technology in education.

Visionary leadership is also a key behavior that influences ICT adoption. Leaders who articulate a clear vision for technology integration, align ICT goals with the school's strategic objectives, and consistently communicate this vision to all stakeholders create a roadmap for successful ICT use. Studies by Özdemir et al. (2020) and Omar and Ismail (2020) emphasize that visionary leaders inspire and motivate teachers by providing direction and purpose, making the integration of ICT a cohesive and supported endeavor.

Providing access to necessary resources and ensuring a technologically rich environment are also essential leadership behaviors. Leaders who ensure that teachers have access to digital tools, resources, and infrastructure create an enabling environment for ICT use. According to Baglama et al. (2022) and Sosa-Díaz et al. (2022), this support is critical for overcoming barriers to technology integration and ensuring that teachers can effectively utilize ICT in their teaching.

Lastly, modeling the use of technology and demonstrating a commitment to digital transformation are effective behaviors. Leaders who actively engage with technology, showcase its benefits, and integrate it into their own practices set a positive example for teachers. This behavior, highlighted by researchers like Hafiza Hamzah et al. (2021) and Alenezi (2016), not only inspires teachers but also validates the importance of ICT in education, fostering a culture that values innovation and experimentation.

In summary, effective leadership behaviors that promote ICT use among teachers include providing continuous professional development, fostering collaboration, articulating a clear vision for technology integration, ensuring access to resources, and modeling the use of technology. These behaviors collectively create a supportive and forward-thinking environment that encourages teachers to embrace and integrate ICT into their teaching practices.

Impact of Supportive Leadership on the Frequency and Quality of ICT Use in Teaching

Supportive leadership plays a pivotal role in enhancing both the frequency and quality of ICT use in teaching. Leaders who actively facilitate technological integration and foster a collaborative environment significantly impact teachers' engagement with ICT. Baglama et al. (2022) highlight that such leadership ensures that teachers have the resources and support necessary to incorporate technology effectively into their teaching practices, leading to more frequent and higher-quality use of ICT.

Moreover, supportive leadership involves providing essential resources and emotional support, which are crucial for teachers to feel confident and competent in using ICT. Sederevičiūtė-Pačiauskienė et al. (2021) emphasize that when teachers are equipped with the necessary IT skills, devices, and a conducive environment, the frequency and quality of ICT use in teaching naturally increase. This supportive approach is particularly impactful during challenging times, such as the COVID-19 pandemic, where supportive leadership has been critical in managing the transition to remote learning and ensuring consistent and quality ICT use (Ferris et al., 2022).

Additionally, supportive leadership promotes higher levels of digital competence among teachers, contributing to the improvement of teaching practices. Hurtado-Mazeyra et al.

(2022) note that by encouraging experimentation and adaptation, supportive leaders create an environment where teachers are more engaged and consistent in their use of ICT. This not only enhances the frequency of ICT use but also improves its quality, as teachers feel more confident in their digital skills and more willing to integrate technology into their teaching.

Furthermore, supportive leadership is associated with increased job satisfaction and competence among teachers, leading to more frequent and quality use of ICT (Tanucan et al., 2022). By building trust and a positive work culture, supportive leaders ensure that teachers are motivated and prepared to use technology effectively in their classrooms (CrawfordB & Butler-HendersonA, 2020). This positive environment encourages teachers to explore and implement innovative teaching methods using ICT, thereby enhancing the overall quality of education.

Supportive leadership also ensures that teachers have access to continuous professional development and necessary resources, which are crucial for effective ICT integration. Leaders who provide ongoing training, clear guidelines, and a culture of trust and collaboration significantly impact the quality and frequency of ICT use (Gonzales & Jackson, 2020). By fostering a digital learning culture and ensuring that teachers feel valued and supported, leaders create an environment conducive to high-quality ICT integration (ATA & SALTAN, 2023).

In summary, the presence of supportive leadership greatly enhances both the frequency and quality of ICT use in teaching. By providing the necessary resources, emotional support, professional development, and a collaborative environment, supportive leaders empower teachers to confidently and effectively integrate technology into their teaching practices. This not only improves the quality of education but also ensures that teachers are well-equipped to meet the demands of a digital age.

Challenges in Fostering ICT Integration Among Teachers and Strategies to Overcome Them
Leaders encounter numerous obstacles in promoting the integration of ICT among teachers, including opposition to change, insufficient infrastructure, and little digital literacy. To overcome these challenges, a comprehensive approach is necessary, which involves ongoing professional development, strategic planning, and fostering a supportive and collaborative culture.

A major obstacle that arises is the objection to hold change, which often arises from a lack of knowledge, skills and self-assurance in relation to technologies. According to Baglama et al. (2022), creating a supportive atmosphere and offering ongoing professional development can assist reduce this reluctance. Leaders can enhance teachers' confidence and willingness to incorporate ICT into their teaching practices by providing frequent training sessions and promoting a favourable attitude towards technology.

A major obstacle is the insufficient level of digital literacy among teachers. In order to tackle this issue, it is imperative for leaders to allocate resources towards focused professional development programs that strengthen teachers' ICT skills. Sederevičiūtė-Pačiauskienė et al. (2021) underline the need of encouraging a good attitude on technology and providing continual training to guarantee that teachers possess the knowledge and skills related to ICT

utilization in classroom. Grady et al. (2021) suggest the usage of varied training programs to handle various degrees of teacher performance. These initiatives seek to provide teachers the required tools to improve their digital capacity.

The lack of resources and the inadequate infrastructure are significant obstacles to the integration of ICT. A significant obstacle that many leaders have is the task of guaranteeing that their schools possess the requisite technology and digital resources. Ferris et al. (2022) assert that obtaining government backing and allocating resources to infrastructure development are crucial measures for surmounting this obstacle. In addition, implementing a strategic plan for resource allocation, as suggested by Özdemir et al. (2020) and Uygur et al. (2020), can provide equitable access to necessary resources for all teachers.

The presence of the digital gap and inequalities in technology access pose substantial obstacles. Hassan and Berkovich (2023) highlight the importance of a moral dedication to social justice of resources in order to tackle these problems. Leaders should actively promote policies that provide equitable access to ICT tools and offer specific assistance to teachers in disadvantaged regions.

Another obstacle is the inconsistent degrees of self-efficacy and ICT skills among teachers. spreeding a culture characterised by trust and support, as highlighted by Agustina et al. (2020) and Apsorn et al. (2019), which can contribute to the improvement of teachers' self-efficacy and ict skills. Leaders can accomplish this by cultivating a cooperative atmosphere in which teachers are at ease to explore new technology and exchange their methods of teaching.

Leaders face a continuing struggle in keeping up with rapid technical changes and maintaining constant professional development. According to Alenezi (2016), leaders must personally dedicate themselves to continuous learning and professional development in order to effectively manage their teachers through technological advances. Leaders should make sure their institutions remain current with the evolving digital world by being knowledgeable and providing tools meant for this.

In essence, there are several different and complicated challenges to encourage the integration of ICT among instructors. These comprise reluctance to welcome change, inadequate knowledge and skills in ICT use, limited resources, and unequal chances to make use of technology. Consistent improvement of professional skills, wise infrastructure investment, encouragement of a culture of support and teamwork, and advocacy of equitable resource distribution help to solve these problems. Leaders that give these strategies top importance can create an environment that supports and makes successful ICT application in education possible.

Dissection

Research on the effect of leadership style on teachers' ICT use over the last nine years has revealed a great deal of diversity. The first few years (2015-2017) saw a low number of publications, with a decline in 2016 that may have been due to the topic's early acknowledgement of significance. Starting in 2018, an increasing trend is seen; the COVID-19 epidemic causes a sharp peak in 2020, therefore highlighting the requirement of good leadership in remote learning. Publication figures stayed significant post-2020, suggesting

continuous interest and continuous research on ICT integration in education and leadership. These patterns show how increasingly important leadership is becoming in the use of educational ICT.

Research on the influence of leadership style on teachers' usage of ICT shows a varied worldwide scene when one examines top countries. With 91 publications, the United States leads greatly in both academics and practical interest supported by large financing and policy support. Following with 31 publications, Australia's commitment to integrating technology into the classroom is demonstrated by 31 publications. With 19 publications, Malaysia ranks third showing its national focus on generating a workforce with superior technologies. China and Turkey, with 17 pieces apiece, demonstrate notable engagement driven by improvements in their educational system. Indonesia, Israel, the UK, Canada, and Sweden are among other prominent contributors, thereby stressing a worldwide dedication to improve leadership in education by means of ICT integration.

Research on top educational institutions in relation to leadership style impact on teachers' ICT usage exposes a wide range of institutions. Leading with eight books, Universiti Malaya shows Malaysia's aspirations of including technology into the classroom. Both The Open University of Israel and The Education University of Hong Kong, with seven books apiece, emphasis technological integration and creative teaching techniques. Notable donors include Universiteit Gent, Universiti Utara Malaysia, US and Australian universities as these universities have a strong dedication to global digital leadership and use ICT to improve instruction.

Experts in this domain have greatly improved our understanding of leadership style and its impact on teachers' use of ICT. Ina Blau ranks first on the list, having authored 62 books and amassed 2,096 references, showcasing her significant impact on pioneering instructional approaches. Ruben Vanderlinde uses 2,370 references and 101 books to bridge the gap between theory and practice in educational leadership. Orit Avidov-Ungar, Sara Dexter, and Arumugam Raman all provide incisive commentary on leadership and technological integration in education. These highly productive academics emphasis the global, interdisciplinary nature of this significant field.

The impact of leadership styles on teachers' perspectives regarding the use of ICT in their pedagogical approaches is complex. Teachers' desire to adopt ICT is positively impacted by leadership styles that emphasise digital transformation, strategic vision, and supporting settings. For example, Baglama et al. (2022) stress that a supportive and culture of using ICT is fostered by a leader's style, which in turn encourages teachers to have positive attitudes towards ICT integration. Sederevičiūtė-Pačiauskienė et al. (2021) have confirmed that the integration of ICT is encouraged in an inclusive atmosphere created by transformational and democratic leadership styles.

According to Grady et al. (2021), adaptive and innovative leadership styles are also important since they increase teachers' acceptance to integrating ICT. Furthermore, Hurtado-Mazeyra et al. (2022) note that integrative leadership significantly affects teachers' attitudes by creating a technologically encouraging atmosphere. A'mar & Eleyan (2022) and Raman et al. (2019) state that leadership places a high priority on professional development and ICT

training reinforces teachers' favourable attitudes towards ICT by boosting their competence and confidence.

According to Hassan & Berkowicz (2023), leadership style that give social justice and fair distribution of resources the priority could guarantees that teachers have the necessary tools and abilities to use ICT in their teaching practice. By raising job satisfaction and enabling the change to digitalise learning. Tanucan et al. (2022) noted that particular leadership styles were clearly beneficial in the epidemic. Crawford and Butler-Henderson (2020) argue that authentic leadership has a good impact on creating a teaching environment that is more engaged and driven.

Strategic leadership, as defined by Özdemir et al. (2020) and Lomos et al. (2023), involves aligning ICT goals with the school vision. This strategy promotes a seamless integration of ICT and has a good impact on teachers' attitudes. According to Gonzales & Jackson (2020) and Landa et al. (2023), leaders that prioritise teamwork and a common vision foster a supportive climate that motivates teachers to adopt ICT. Furthermore, Alenezi (2016) highlights that leadership that remains informed about emerging technologies and actively encourages their use serves as a positive role model and greatly improves teachers' preparedness to incorporate ICT.

Effective leadership behaviours have a crucial role in encouraging teachers to embrace ICT and improving their involvement and incorporation of technology into their teaching methods. Leaders who offer continuous training and support, such as focused ICT training sessions and practical workshops, enable teachers to enhance their digital skills and self-assurance. Scholars such as Hassan and Berkovich (2023) and Raman and Thannimalai (2019), state that teachers are adequately prepared to integrate technology into their classrooms with proficiency.

Another essential behaviour is cultivating a cooperative and encouraging atmosphere. According to Apsorn et al. (2019) and Agustina et al. (2020), leaders that promote peer learning, foster collaboration among instructors, and establish a culture of shared vision and goals for using ICT greatly increase the chances of effective ICT integration. This cooperative methodology not only fosters a feeling of unity but also enables teachers to exchange exemplary methods and ground-breaking solutions, so further encouraging the integration of technology in the field of education.

Visionary leadership is a crucial behaviour that has a significant impact on the adoption of ICT. Leaders who effectively communicate a distinct vision for integrating technology, integrate ICT objectives with the school's strategic goals, and regularly convey this vision to all individuals involved, establish a plan for achieving successful ICT utilisation. Özdemir et al. (2020) and Omar and Ismail (2020) emphasise the significance of visionary leaders in inspiring and motivating teachers. Leaders who provide a clear sense of purpose encourage the smooth and well-supported incorporation of ICT in education.

Leaders who ensure that instructors have access to digital tools promote the utilisation of ICT. According to Baglama et al. (2022) and Sosa-Díaz et al. (2022), providing this support is crucial

for overcoming barriers to technology integration and ensuring that teachers can effectively utilise ICT in their instruction.

Finally, two good habits are imitating technological use and proving a dedication to digital change. Leaders that actively interact with technology, highlight its advantages, and include it into their own methods inspire teachers. Researchers such as Hafiza Hamzah et al. (2021) and Alenezi (2016) underline this tendency, which motivates teachers and justifies the use of ICT in education which could promote a culture of innovation and experimentation.

Improving the quality of ICT use in the classroom depends much on supportive leadership. Teachers' interaction with ICT is highly influenced by leaders who aggressively support technological integration and a cooperative environment. Such leadership guarantees that teachers have the tools and support required to properly include technology into their instructional activities (Baglama et al, 2022).

Moreover, good leadership means providing teachers with necessary tools and emotional support, which will help them to feel confident and competent in using ICT. According to Sederevičiūtė-Pačiauskienė et al. (2021), giving teachers the necessary IT tools, devices, and a conducive environment naturally increases the frequency and quality of ICT use in the classroom. Supportive leadership is especially effective in difficult times, like the COVID-19 pandemic, where it plays a crucial role in successfully managing the shift to distant learning and maintaining consistent and high-quality use of ICT (Ferris et al., 2022).

Moreover, encouraging leadership helps teachers become more digitally competent, hence improving instructional strategies. Encouragement of experimentation and adaptation by supportive leaders helps to establish an environment whereby instructors are more involved and consistent in their usage of ICT, notes Hurtado-Mazeyra et al. (2022). Teachers feel more competent in their digital skills and readier to include technology into their instruction, therefore enhancing not only the frequency of ICT use but also its quality.

Moreover, supportive leadership is linked to higher job satisfaction and teacher competency, which drives more regular and quality ICT use (Tanucan et al., 2022). Supporting leaders make sure that teachers are driven and ready to use technology in their classrooms by establishing trust and a good work culture (Crawford & Butler-Henderson, 2020). These favourable surroundings motivate teachers to investigate and apply creative teaching strategies with ICT, so improving the general calibre of education.

The successful integration of ICT relies on teachers having continuous access to professional development and necessary resources, which is also ensured by supporting leadership. Leaders who provide ongoing education, well defined policies, and foster a culture of trust and collaboration have a significant impact on the frequency and quality of ICT use (Gonzales & Jackson, 2020). Leaders create an environment conducive to effective integration of ICT by promoting a culture of digital learning and ensuring instructors feel valued and assisted.

Conclusion

The systematic research conducted over the past nine years on leadership styles and teachers' utilisation of ICT reveals a conspicuous pattern: there is a noticeable increase in interest about

this subject. Between 2015 and 2023, there has been a notable surge in research, with a significant spike occurring during the COVID-19 pandemic in 2020. This increase underscores the importance of leadership in supervising the shift to remote learning and highlights the need for competent leadership to promote the incorporation of ICT in education. Many countries and organisations throughout the world are committed to understanding the impact of leadership on the use of ICT in educational institutions. The United States holds the top position worldwide in terms of publication count. These publications are mostly attributed to substantial investments in educational research and technology. Australia, Malaysia, China, Turkey, and other European countries are notable contributors. Each of them highlights their distinct educational goals and technical achievements. Leading universities with great contributions through their targeted research activities are Universiti Malaya, the Education University of Hong Kong, and the Open University of Israel.

In this field of study, academics such Sara Dexter, Ruben Vanderlinde, and Ina Blau have made important progress. Their research emphasises the influence of various leadership styles on teachers' attitudes and practices in relation to the use of information and communication technology (ICT). Leadership behaviours that are supportive, visionary, and adaptive have a particularly strong impact on creating a favourable climate for integrating ICT (Information and Communication Technology) and enhancing both the frequency and quality of instruction. In this particular environment, effective leadership entails the promotion of ongoing professional growth, the cultivation of collaboration, the clear articulation of a goal, the provision of essential resources, and the demonstration of technological proficiency as a role model. Effective leadership is essential in instilling confidence and competence in teachers when it comes to utilising ICT. Plans must be developed in order to overcome challenges like resistance to change, poor infrastructure, and varying levels of digital knowledge. By addressing these issues, we can create an environment that is favourable to the growth of ICT integration and support academic success in the digital age.

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Appendix

Author	How do different leadership styles affect teachers' attitudes towards integrating ICT in their teaching practices?	What specific leadership behaviors are most effective in promoting the use of ICT among teachers?	How does the presence of supportive leadership impact the frequency and quality of ICT use in teaching?	What challenges do leaders face in fostering ICT integration among teachers, and how can these be overcome?
A3	Digital leadership emphasizes the integration of digital platforms within management mechanisms, which positively affects teachers' attitudes towards ICT integration by promoting a culture of digital literacy and support.	Effective leadership behaviors include ensuring technological development, adapting the institution to the digital age, being innovative and entrepreneurial, and fostering collaboration.	Supportive leadership, characterized by facilitating technological integration and fostering a collaborative environment, significantly enhances both the frequency and quality of ICT use in teaching.	Challenges include resistance to change, lack of digital literacy among teachers, and inadequate infrastructure. These can be overcome through continuous professional development, investment in technology, and creating a supportive culture.
A4	Different leadership styles, such as transformational and democratic, positively affect teachers' attitudes by fostering a supportive and inclusive environment that encourages ICT integration. Leadership styles that focus on digital transformation and strategic vision significantly improve teachers' willingness to integrate ICT by aligning it with institutional goals.	Effective leadership behaviours include using digital platforms, combining competencies from different disciplines, and promoting innovation and entrepreneurship. Promoting the use of ICT involves behaviours such as crisis management, continuous communication, and adaptability during unexpected changes like the COVID-19 pandemic.	Supportive leadership ensures the necessary resources and emotional support, leading to increased frequency and quality of ICT use in teaching. Supportive leadership impacts ICT use by providing the necessary IT skills, devices, and a conducive environment for online teaching and learning.	Leaders face challenges such as resistance to change and lack of resources, which can be overcome by continuous training and promoting a positive attitude towards technology. Leaders encounter technical issues and the need for continuous professional development, which can be addressed through proper planning and stakeholder collaboration.
A5	Adaptive and innovative leadership likely positively influences teachers' attitudes towards ICT integration.	Providing targeted professional development, supporting social-emotional well-being, facilitating collaboration.	Supportive leadership lowers turnover rates, increases satisfaction, correlates with better ICT integration.	Challenges: varying proficiency, lack of resources, stress. Solutions: differentiated PD, online platforms, ongoing support.
A6	The study indicates that teachers' digital competence is influenced by the reflective use of technologies promoted by integrative leadership. Leadership that fosters a supportive and technologically enriched environment positively influences teachers' attitudes towards ICT integration. Leadership styles that emphasize the	Effective leadership behaviours include providing targeted training and recognizing teachers' innovative practices. Leaders promoting continuous professional development and creating collaborative environments are most effective. Encouraging peer learning and providing hands-on ICT training sessions are effective leadership behaviours.	Supportive leadership promotes higher levels of digital competence, contributing to the improvement of teaching practices. Supportive leadership enhances both the frequency and quality of ICT use by encouraging experimentation and adaptation. Supportive leadership leads to greater engagement and consistent use of ICT in classrooms.	Challenges include limited ICT resources and the digital divide; overcoming these requires targeted training and investment in ICT infrastructure. Leaders face challenges such as resistance to change and lack of ICT skills; solutions include ongoing professional development and building a culture of innovation. Key challenges include varying levels of ICT

	importance of ICT training significantly affect teachers' attitudes towards ICT integration. Integrative leadership that combines ICT and media competencies positively impacts teachers' attitudes towards ICT. Leadership styles that prioritize ICT training and accessibility influence teachers' willingness to integrate ICT.	Leadership behaviours that integrate ICT into everyday teaching practices and encourage media literacy are most effective. Providing accessibility to ICT resources and promoting inclusivity are effective leadership behaviours.	The presence of supportive leadership results in a higher self-perception of ICT competencies among teachers, leading to frequent and high-quality ICT use. Supportive leadership ensures that teachers feel competent and confident in using ICT, enhancing both frequency and quality of use.	proficiency among teachers; these can be overcome by differentiated training programs. Leaders must address the low self-perception of ICT skills among teachers; this can be mitigated by building confidence through training and support. Challenges include ensuring equal access to ICT tools; this can be addressed by advocating for equitable resource distribution.
A7	Different leadership styles, particularly digital instructional leadership, have a significant impact on teachers' attitudes towards ICT integration. Younger and male teachers tend to have more positive attitudes towards integrating ICT due to higher digital competencies. Leadership styles that promote social justice and equal access to resources positively influence teachers' attitudes towards ICT integration.	Effective leadership behaviours include defining school goals, managing instructional programs, and developing a supportive school climate. Leadership behaviours that involve providing ongoing training and adapting practices to meet teachers' real needs are effective. Providing incentives, managing time effectively, and encouraging professional development are key leadership behaviours.	Supportive leadership significantly enhances both the frequency and quality of ICT use in teaching, especially during challenging circumstances like the pandemic. Supportive leadership ensures teachers are better prepared and motivated to use ICT, leading to improved teaching practices. In low SES schools, supportive leadership improves learning conditions at home and school, impacting ICT use positively.	Leaders face challenges such as lack of equipment, inadequate knowledge, and value disagreements, which can be overcome through professional development and moral commitment to social justice. Challenges include disparities in digital competencies and lack of training, which can be addressed through targeted training programs and policy recognition of good practices. Leaders in low SES schools face unique challenges such as inadequate home conditions and lack of support, which require a moral commitment and proactive engagement.
A8	Digital leadership styles during the pandemic positively influenced teachers' attitudes towards integrating ICT, enhancing job satisfaction.	Effective behaviours include providing digital tools, training, and fostering a supportive digital environment.	Supportive digital leadership increases teachers' job satisfaction and competence, leading to more frequent and quality use of ICT.	Challenges include inadequate digital infrastructure, insufficient training, and resistance to change; these can be overcome through targeted professional development and investment in technology.
A9	Authentic leadership positively affects teachers' attitudes by fostering a more engaged and motivated teaching environment.	Authentic leadership behaviours such as transparency, ethical conduct, and genuine interactions are most effective.	Supportive leadership enhances the frequency and quality of ICT use by building trust and a positive work culture among teachers.	Leaders face challenges such as ensuring digital literacy and managing diverse technological skills among staff; these can be overcome by implementing

				structured training programs and fostering a culture of continuous learning.
A10	Different leadership styles had to adapt quickly to manage remote learning, impacting teachers' attitudes towards ICT integration significantly.	Effective leadership behaviours include providing support, facilitating professional development, and ensuring access to digital resources.	Supportive leadership has been critical in managing the transition to remote learning, ensuring consistent and quality ICT use in teaching.	Challenges include digital poverty, lack of resources, and insufficient training. These can be overcome through government support, investment in infrastructure, and continuous professional development.
A11	Leadership styles that promote strategic planning and collaboration positively impact teachers' attitudes towards ICT integration.	Effective leadership behaviours include fostering a shared vision, providing professional development, and ensuring access to resources.	Supportive leadership enhances the frequency and quality of ICT use by creating an environment conducive to innovation and experimentation.	Challenges include lack of resources, resistance to change, and insufficient training, which can be overcome through strategic planning, professional development, and fostering a collaborative culture.
A12	Principals' technology leadership positively influences teachers' attitudes towards integrating ICT, especially through professional development and resource provision.	Effective leadership behaviours include visionary leadership, promoting a digital age learning culture, and fostering excellence in professional practice.	Supportive leadership enhances the frequency and quality of ICT use by providing a conducive environment and continuous support.	Challenges include lack of training, limited access to ICT resources, and varying levels of ICT competence. These can be overcome through targeted professional development and investment in ICT infrastructure.
A13	Positive impact through strategic leadership that enhances teachers' attitudes by aligning ICT goals with school vision.	Strategic behaviours include providing professional development, fostering collaboration, and ensuring access to ICT resources.	Supportive leadership increases ICT use frequency and quality by creating a conducive environment for innovation.	Challenges include insufficient training, lack of resources, and resistance to change; these can be overcome by continuous professional development and strategic planning.
A14	Different leadership styles, particularly digital leadership, positively impact teachers' attitudes towards integrating ICT by providing necessary support and resources.	Effective leadership behaviours include supporting digital transformation, providing technology-based professional development, and creating a digital learning culture.	Supportive leadership significantly increases the frequency and quality of ICT use by ensuring adequate digital technology use, professional development, and a digital learning culture.	Challenges include insufficient technological knowledge, lack of resources, and resistance to change, which can be overcome by continuous training, infrastructure development, and strategic planning.
A15	Leadership that emphasizes collaboration and a shared vision positively impacts teachers' attitudes towards ICT integration.	Effective leadership behaviours include creating a shared vision for online instruction, providing professional development, and implementing supplemental frameworks for	Supportive leadership enhances the quality and frequency of ICT use by providing clear guidelines and fostering a culture of trust and collaboration.	Challenges include lack of clear instructional expectations for technology use, insufficient training, and misunderstandings between teachers and administrators. These can be overcome by co-

		evaluating teaching and learning online.		developing evaluation tools and frameworks that align with technology standards.
A16	Leadership styles that emphasize collaboration, support, and continuous professional development positively affect teachers' attitudes towards integrating ICT.	Effective leadership behaviours include providing ongoing professional development, fostering a collaborative culture, and offering practical support for ICT use.	Supportive leadership enhances the quality and frequency of ICT use by creating a supportive environment and providing necessary resources and training.	Challenges include resistance to change, lack of resources, and insufficient training. These can be overcome by providing continuous professional development, creating a supportive culture, and ensuring adequate resources.
A17	Leadership styles that prioritize ICT in teaching significantly influence teachers' positive attitudes towards ICT integration. Teachers in schools with a clear ICT vision report higher use of ICT.	Leadership behaviors that involve setting clear ICT goals, providing ongoing professional development, and fostering collaboration among teachers are most effective.	Supportive leadership that emphasizes ICT as a teaching priority increases both the frequency and quality of ICT use among teachers.	Leaders face challenges such as teachers' self-efficacy, attitudes towards ICT, and availability of digital materials. These can be overcome by professional development, clear ICT policies, and collaborative culture.
A18	Leadership styles that support and encourage technology integration positively influence teachers' attitudes towards using ICT in their teaching practices.	Effective behaviours include providing professional development, creating a shared vision for technology use, and fostering a collaborative culture among teachers.	Supportive leadership significantly enhances both the frequency and quality of ICT use by creating a conducive environment and providing necessary resources and training.	Challenges include lack of ICT training, insufficient resources, and teachers' ICT competency. These can be overcome by offering continuous professional development, improving access to ICT resources, and enhancing teachers' ICT skills through targeted training.
A19	Digital leadership positively influences teachers' reflective practices and attitudes towards integrating ICT.	Effective leadership behaviours include providing digital resources, fostering trust, enhancing self-efficacy, and engaging teachers in continuous professional development.	Supportive leadership enhances the frequency and quality of ICT use by building trust and self-efficacy among teachers.	Challenges include lack of trust, low self-efficacy, and insufficient work engagement. Overcoming these requires building a culture of trust, enhancing self-efficacy through training, and increasing work engagement by providing support and motivation.
A20	Different leadership styles, particularly ICT leadership, positively impact teachers' attitudes by fostering a supportive and resource-rich environment.	Effective behaviours include developing a vision for ICT use, providing strategic plans, offering continuous professional development, and acting as role models in daily ICT use.	Supportive leadership enhances the frequency and quality of ICT use by creating an atmosphere conducive to ICT integration, ensuring access to resources, and offering consistent support.	Leaders face challenges such as lack of ICT readiness, insufficient training, and limited resources. These can be overcome by providing targeted training, fostering an ICT culture, and ensuring the availability of necessary resources.

A21	Leadership styles that emphasize support and professional development positively affect teachers' attitudes towards ICT integration, making them more willing to adopt new technologies.	Effective behaviours include establishing a vision for ICT use, providing professional development, and creating a supportive environment for technology integration.	Supportive leadership increases the frequency and quality of ICT use by providing necessary resources and encouraging continuous improvement and collaboration.	Leaders face challenges such as lack of training, resistance to change, and inadequate resources. These can be overcome by providing ongoing professional development and fostering a culture of innovation and support.
A22	Leadership styles that encourage collaboration and provide a shared vision positively influence teachers' attitudes towards ICT integration.	Effective leadership behaviours include establishing a vision for technology, providing support, and facilitating professional development.	Supportive leadership increases the frequency and quality of ICT use by fostering a positive environment and providing necessary resources.	Leaders face challenges such as lack of ICT training and resources, which can be overcome by providing professional development and securing necessary resources.
A23	Different leadership styles, such as visionary and systemic improvement, positively influence teachers' attitudes by creating a conducive environment for ICT integration. Leadership styles that emphasize IT implementation, such as transformational leadership, lead to higher ICT integration among teachers. Leadership that aligns with modern educational technology needs positively impacts teachers' willingness to integrate ICT.	Visionary leadership, systemic improvement, and digital citizenship are key behaviours for promoting ICT usage among teachers. Transformational leadership behaviours, including providing support and establishing a vision for ICT use, are effective. Effective leadership behaviours include the development of clear guidelines and support systems for ICT integration.	Supportive leadership increases the frequency and quality of ICT use by providing necessary resources and encouragement. Transformational leaders positively impact ICT use by fostering an environment that encourages experimentation and usage. Supportive leadership provides a nurturing environment, increasing both the frequency and quality of ICT use.	Insufficient professional development and lack of confidence among leaders; these can be overcome by targeted training and support. Limited access to ICT resources and inadequate training; addressing these through better resource allocation and training programs is crucial. Overcoming the digital divide and ensuring equitable access to ICT; leaders must focus on inclusive policies and practices.
A24	Leadership styles that emphasize professional development and continuous support positively impact teachers' attitudes towards ICT integration.	Effective behaviours include providing ongoing professional development, facilitating access to resources, and fostering a collaborative culture.	Supportive leadership leads to higher frequency and better quality of ICT use by creating an environment that encourages experimentation and use of technology.	Leaders face challenges such as lack of training, insufficient resources, and resistance to change, which can be overcome through targeted professional development and resource allocation.
A25	Leadership styles that foster a supportive and visionary approach positively impact teachers' attitudes towards integrating ICT in their teaching practices. Inadequate training and incompetency in ICT among school leaders negatively affect teachers' attitudes towards ICT integration.	Visionary leadership, digital age learning culture, excellence in professional practice, systemic improvement, and digital citizenship are effective in promoting ICT use among teachers. Encouraging and supporting teachers to integrate technology and keeping abreast with new technologies	Supportive leadership creates a shared vision and facilitates the use of technology, enhancing both the frequency and quality of ICT use in teaching. Presence of supportive leadership is imperative for integrating technology, as it fosters a conducive environment for ICT use in teaching.	Challenges include inadequate training, ICT incompetency, and limited access to ICT resources. These can be overcome by prioritizing professional development and ensuring teachers have access to necessary ICT resources. The main challenges include inadequate training, incompetency

	Leaders who are not necessarily ICT experts but support and manage ICT integration effectively foster positive attitudes among teachers towards using ICT in their teaching. Leadership support positively influences teachers' attitudes towards integrating ICT, fostering a positive environment for technological innovation.	are effective leadership behaviours. Effective planning and implementation of ICT, supporting teachers and staff, and establishing a culture of ICT in schools are critical leadership behaviours. Providing consistent support, creating a nurturing work environment, and offering opportunities for collaboration and risk-taking are effective behaviours.	School directors who effectively plan and implement ICT for teachers and supporting staff significantly impact the frequency and quality of ICT use in teaching. Leaders' support fosters positive attitudes towards ICT and facilitates innovative uses of ICT in education, leading to increased frequency and quality of ICT use.	in ICT, and limited access to ICT resources. Leaders need to undergo training and gain competency in ICT to overcome these challenges. Lack of expertise in ICT among school leaders. This can be overcome by leveraging the knowledge of ICT staff and establishing a culture of continuous learning and support within the school. Overcoming low uptake of ICT can be challenging; however, providing support and resources to teachers can significantly improve the integration process. Continuous professional development and prioritizing ICT goals are essential.
A26	Leadership styles that are visionary and promote a digital-age learning culture positively impact teachers' attitudes towards integrating ICT.	Effective behaviours include providing professional development, fostering a digital-age learning culture, and ensuring systemic improvement.	Supportive leadership increases both the frequency and quality of ICT use by creating an encouraging and well-resourced environment.	Challenges include lack of professional development, inadequate ICT infrastructure, and resistance to change. These can be overcome by providing continuous training, improving infrastructure, and encouraging a culture of innovation.
A27	Different leadership styles, especially technology leadership, significantly influence teachers' attitudes towards integrating ICT. Leaders who actively support and encourage the use of technology can foster a positive attitude among teachers towards ICT integration. School leaders' encouragement significantly influences teachers' integration of technology.	Effective leadership behaviours include providing support for personal and professional use of technology, integrating technology into current instructional practices, and encouraging continuous professional development. support for teachers' personal and professional use of technology and integrating it into current instructional practices.	Supportive leadership leads to higher frequency and better quality of ICT use as it ensures teachers feel encouraged and equipped to utilize technology effectively in their teaching. Supportive leadership from school technology leaders is essential for successful technology integration.	Challenges include insufficient professional development, lack of relevant training, and limited access to ICT resources. Overcoming these challenges requires continuous professional development and a supportive environment for experimenting with new technologies. The main challenges include ensuring continuous support and addressing the specific needs of teachers; this can be managed by ongoing professional development and responsive leadership.
A28	Leadership styles that emphasize support and encouragement for	Leadership behaviours such as providing continuous support,	Supportive leadership plays a crucial role in the effective and frequent	Leaders face challenges such as lack of sufficient training and professional

	technology use positively affect teachers' attitudes. Leaders who are proactive in promoting technology integration can significantly enhance teachers' willingness to integrate ICT into their teaching practices. attitudes towards ICT integration are positively influenced by leaders who provide adequate training and support. Leadership that is engaged and proactive can significantly enhance teachers' readiness to integrate technology. that stays updated with new technologies and promotes their use can positively impact teachers' attitudes towards ICT integration. Leaders who actively engage with technology set a positive example for teachers. styles that are visionary and supportive foster positive attitudes towards ICT integration among teachers. Leaders who communicate a clear vision for technology use can significantly impact teachers' willingness to integrate ICT.	offering professional development opportunities, and creating a positive environment for technology use are effective in promoting ICT integration among teachers. Leadership behaviours such as facilitating professional development, ensuring access to necessary ICT resources, and creating a collaborative environment are most effective in promoting ICT use. Effective behaviours include staying informed about new technologies, providing continuous support, and promoting the use of innovative teaching methods. Visionary leadership, providing clear guidelines and support, and fostering a collaborative environment are effective behaviours in promoting ICT use.	use of ICT by ensuring that teachers have the necessary resources and support to integrate technology into their teaching. Supportive leadership impacts the frequency and quality of ICT use by providing a nurturing environment that encourages teachers to experiment and adopt new technologies. Supportive leadership ensures that teachers are continuously motivated and supported to use ICT, which enhances the quality and frequency of technology use in teaching. Supportive leadership significantly impacts the quality and frequency of ICT use by creating an environment where teachers feel valued and supported in their efforts to integrate technology.	development, and limited access to technology. These can be overcome by providing continuous training and improving access to necessary resources. Leaders must address challenges such as insufficient training, limited access to technology, and resistance to change. Solutions include providing ongoing training, improving access to technology, and fostering a culture of acceptance towards new technologies. Challenges include staying updated with rapid technological advancements and ensuring continuous professional development. Overcoming these requires a commitment to ongoing learning and providing resources for professional growth. Leaders face challenges such as resistance to change and the need for continuous professional development. These can be overcome by fostering a supportive environment, providing continuous training, and promoting a positive attitude towards technology use.
A29	Different leadership styles can influence teachers' self-efficacy and willingness to integrate ICT in their teaching practices. Technology leadership by principals plays a crucial role in enhancing teachers' confidence and competence in using ICT.	Effective leadership behaviours include encouraging and supporting the use of ICT, being role models, and providing necessary resources and training. Principals who exhibit excellence in professional practice and digital citizenship are seen as effective in promoting ICT use among teachers.	Supportive leadership positively impacts the frequency and quality of ICT use by creating an environment where teachers feel confident and supported in their efforts to integrate technology into their teaching. Principals who actively support ICT initiatives can significantly enhance the adoption and effective use of technology in classrooms.	Leaders face challenges such as inadequate training, limited access to ICT resources, and resistance from teachers. These can be overcome by providing ongoing professional development, improving infrastructure, and fostering a positive attitude towards technology integration through continuous encouragement and support.

A30	Leadership styles that emphasize digital leadership positively affect teachers' attitudes towards integrating ICT by fostering a supportive environment and promoting the use of digital technology. Leadership styles have a significant impact on teachers' attitudes towards ICT integration. Leaders who are proactive and supportive can positively influence teachers' willingness to adopt new technologies in their teaching practices.	Effective leadership behaviours include visionary leadership, promoting a digital era learning culture, ensuring professional practice excellence, driving systemic improvement, and fostering digital citizenship. leadership behaviours include providing ongoing support and training, being actively involved in technology initiatives, and creating a culture that values innovation and experimentation. Leaders who model the use of technology themselves can inspire their teachers to do the same.	Supportive leadership enhances both the frequency and quality of ICT use by creating an encouraging environment and providing necessary resources and training. Supportive leadership results in higher levels of ICT use and better quality of integration in teaching. Teachers are more likely to embrace and effectively use technology in their classrooms when they know they have the support and encouragement of their leaders.	Challenges include lack of digital competency among teachers, limited resources, and resistance to change. These can be overcome by continuous professional development, strategic planning, and creating a culture that embraces digital technology. Challenges include resistance to change, lack of adequate training, and limited resources. These can be overcome by fostering a culture of collaboration and continuous learning, providing necessary resources and training, and addressing any concerns or barriers teachers may face through open and supportive communication.