

Educational Leadership in Promoting Teacher Professional Development in the Era of Artificial Intelligence

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Abstract: Teaching practice, learning experience and school management are being reshaped anew by artificial intelligence (AI), and the educational environment is rapidly changing along with it. Technology continuously integrates into the daily operation of institutions, and how to lead teachers to complete the digital transformation, and to safeguard educational quality and organisational effectiveness, has become the core subject of educational leadership. A competent leader must both point out the strategic direction, and also stimulate innovation, bring about collaboration, and support teachers in carrying out professional learning over the long term. This paper explores the characteristics of educational leadership in promoting teacher professional development in the era of artificial intelligence, analyses its value in improving school management, and proposes practical strategies for strengthening leadership capacity. By reviewing recent theories of educational leadership and current educational practices, this study argues that effective educational leadership should maintain a balance between technological innovation and human-centred management. School leaders who are able to create a collaborative learning culture, continuously provide professional development opportunities and advocate the use of artificial intelligence technologies in an ethical manner are more likely to enhance teachers' professional competence and the overall effectiveness of schools. The findings help to understand how educational leadership promotes sustainable educational development in an increasingly digital world.

Keywords: Educational Leadership, School Management, Teacher Professional Development, Artificial Intelligence, Digital Transformation.

1. Introduction

Teaching practices, learning experiences, administrative management, and educational decision-making are being transformed one after another by artificial intelligence (AI), and the entire education system is being rapidly reshaped. AI-driven technologies such as intelligent tutoring systems, adaptive learning platforms, automated assessment, and learning analytics are now increasingly appearing in classrooms around the world. New opportunities arise from this, but the challenges are no less significant, particularly with regard to supporting teacher growth and maintaining educational quality and organisational effectiveness [1][2].

Among the key factors influencing school effectiveness and student achievement, educational leadership has long been recognised as the most important. Yet as artificial intelligence advances by leaps and bounds, the role of principals has long ceased to be confined to traditional administrative affairs. Leading digital transformation, encouraging innovation, supporting teachers' professional learning, and establishing rules of ethical governance for the application of artificial intelligence within schools have all become part of the remit of contemporary educational leaders [3][9].

Teacher professional development is all the more important in this era, because professional judgement, teaching expertise, creativity, and even the emotional connection between teachers and students are things that technology cannot replace. A more appropriate positioning is to regard artificial intelligence as an aid to enhancing teaching effectiveness. It is for precisely this reason that school leaders must build up a supportive learning environment, encourage teachers to continually improve their AI literacy and digital

competence, and keep teaching practices fresh with new ideas [10].

Recent research has provided corroboration: a variety of leadership approaches—transformational, instructional, distributed, and digital—all offer clear benefits to teacher competence, organisational learning, and school innovation. If leaders are skilled at fostering a collaborative culture, providing professional development opportunities in a steady stream, and encouraging evidence to do the talking, the implementation of AI within educational institutions tends to go much more smoothly [9][13].

Despite these advances, many schools still struggle to apply artificial intelligence effectively. Teachers often face many challenges, such as insufficient digital competence, limited professional training, a lack of technical resources, and concerns about data privacy, academic integrity and algorithmic bias. These predicaments, in turn, demonstrate how crucial it is for educational leadership to carry out strategic planning, resource allocation, policy guidance, and continuous professional support throughout the entire process of digital transformation [1][2][10].

Following this line of thought, this study examines how educational leadership promotes teacher professional development in the AI era. The paper reviews the characteristics of effective educational leadership, explains its value in strengthening school management, and then offers practical approaches for enhancing leadership capacity. For principals who wish to achieve sustainable educational development in an increasingly technology-driven learning environment, the conclusions of this study may offer some inspiration.

2. Characteristics of Educational Leadership in Promoting Teacher Professional Development

Over the past two decades, educational leadership has undergone a profound transformation. Today's principal is no longer merely the administrative staff who manages the running of the school; the identities of the leader of teaching, the promoter of organisational learning, and the pacesetter of educational innovation equally fall onto their shoulders. Placed against the background of artificial intelligence, educational leadership carries more and more weight for supporting teacher professional development and advancing the continuous improvement of the school [3][9].

2.1. Visionary Leadership

To speak of the most important characteristic of effective leadership in the era of artificial intelligence, visionary leadership counts as one. The principal must set up a clear strategic vision, letting the introduction of artificial intelligence be closely tied to educational goals, rather than only regarding it as a new technological gadget. With a shared vision, teachers can then better understand how artificial intelligence exactly enhances teaching effectiveness, improves student achievement, and raises school performance [3][9].

Highly effective leaders also convey long-term development goals and encourage teachers to regard artificial intelligence as a professional support tool, rather than a substitute for teachers' expertise. Such a leadership approach can reduce the uncertainty brought by technological change and increase teachers' willingness to participate in professional learning and educational innovation [9][18].

2.2. Collaborative Leadership

Collaborative leadership emphasises teamwork, shared decision-making and taking collective responsibility for school improvement. Educational leaders should not rely on hierarchical management structures, but should build a collaborative culture that encourages teachers to exchange experiences, share digital resources and jointly solve the teaching difficulties brought by the application of artificial intelligence [13][16].

Professional Learning Communities (PLCs) have become an effective mechanism for strengthening teacher collaboration. In professional learning communities, teachers discuss classroom practices, evaluate artificial-intelligence-supported teaching strategies, analyse learning data and continuously improve teaching effectiveness. Educational leaders play an indispensable role by providing sufficient time, organisational support and professional development resources for collaborative learning [9][16].

2.3. Continuous Professional Learning

Educational leadership in the digital age also has one bright, distinct brand-mark, and that is continuous professional learning. Artificial intelligence changes new with each day and month, and the knowledge and teaching skill in teachers' hands must also keep being swapped for the new along with it. This requires the leader to build up a sustainable professional development system that holds lifelong learning up, and relying on a few short training sessions to hastily bring things to a close will not do [10][17].

Workshops, online courses, mentoring, coaching,

classroom observation, and action research can all be incorporated into effective professional development. With these opportunities, teachers can enhance their AI literacy and digital teaching capabilities, improve their assessment methods and classroom management, and gain greater confidence in integrating artificial intelligence [10][8].

Recent research indicates that AI-assisted professional development can improve teachers' teaching competence, technological self-efficacy, and capacity for reflective practice. Accordingly, educational leaders ought to systematically provide AI-integrated development opportunities, so that teachers' teaching competence steadily grows and keeps pace with the ever-emerging educational technologies [7].

Encouraging teachers to engage in educational research and innovation projects is also something educational leaders should do. The more research they do, the more their critical thinking and problem-solving abilities grow, providing a foothold for evidence-based school improvement and for advancing organisational learning [9][13].

2.4. Ethical and Human-Centred Leadership

Artificial intelligence brings excellent opportunities for improving educational quality, yet educational leadership must remain, at its core, people-centred. Safeguarding educational equity, student privacy, and professional ethics from being harmed by technological innovation is a responsibility principals cannot shirk. For this reason, responsible leaders must establish clear rules within the school that encompass data protection, algorithmic transparency, academic integrity, and the ethical use of generative artificial intelligence [1][12].

At the same time, teachers' emotional state throughout the course of transformation must also be kept in the leader's mind. The arrival of new tools often means a heavier workload, and teachers may feel adrift over shifts in their professional role. A leader who is willing to give emotional support, to encourage open talking, and to attentively raise up mutual trust, is more likely to breed a positive organisational culture that both benefits teacher growth and boosts student success [5][9].

3. The Application Value of Educational Leadership in School Management

Improving school management, raising teaching quality, and promoting the sustainable development of education — every one of these is inseparable from the core of educational leadership. As we enter the AI era, effective leadership enables emerging technologies to be smoothly embedded into teaching, learning, and administrative processes, while safeguarding educational values and organisational stability. Leaders who are able to master digital transformation are also better equipped to create an innovative learning environment, raise school performance, and support teachers' long-term professional growth [3][9].

3.1. Improving Teachers' Digital Competence

Among the many contributions of educational leadership, enhancing teachers' digital competence can be counted as one of the most important. As AI continually rewrites educational practice, teachers must master, one by one, the new knowledge and skills of digital teaching, intelligent learning

systems, educational data analysis, and AI-assisted assessment. To this end, leaders need to offer systematic professional development opportunities that help teachers genuinely put AI to use in the classroom ^{[10][17]}.

Beyond technical skills, teachers also need to develop critical digital literacy, so that they can evaluate AI-generated content, detect hidden algorithmic bias, and use it responsibly in educational settings. Principals who encourage continuous learning are often able to cultivate a professional culture in which teachers both maintain high standards of teaching quality and keep pace with technological change ^{[1][10]}.

3.2. Enhancing Teaching Quality and Student Learning

By creating a supportive teaching environment and promoting evidence-based practice, educational leadership acts directly on teaching quality in this way. By providing clear instructional guidance, encouraging novel teaching strategies, and introducing AI-supported learning technologies, the effectiveness of classroom teaching can be built up step by step by effective leaders ^{[3][9]}.

Adaptive learning systems, intelligent assessment, and learning analytics allow teachers to gauge students' learning progress more accurately with the help of AI. As for where exactly students' needs lie and how to design personalised teaching strategies, these technologies can provide valuable clues. As for leaders, they underpin the above measures by putting in place the technological infrastructure, arranging professional training, and establishing policies for the use of AI ^{[1][2]}.

Through classroom observation, peer coaching, mentoring, and professional dialogue, leaders also encourage teachers to engage in reflective teaching. In this way, teaching can be continuously improved, and teachers gain greater confidence in weaving artificial intelligence into their everyday teaching ^{[10][16]}.

3.3. Building Learning Organisations

More and more people regard the modern school as a learning organisation, in which teachers, principals, and students all continually learn and collaboratively create knowledge. Whether such an organisational culture can be cultivated depends fundamentally on educational leadership, because it is leaders who establish the mechanisms that encourage innovation, collaboration, and professional reflection ^{[13][16]}.

Professional learning communities (PLCs), interdisciplinary collaboration, and action research are all proven approaches to organisational learning. Immersed in such a collaborative environment, teachers analyse educational data, exchange teaching experiences, evaluate AI-supported teaching practices, and jointly devise new ways to crack classroom challenges. Such collaboration both draws teachers' professional ties closer and strengthens the organisation's capacity for continuous improvement ^{[9][13]}.

By encouraging bold experimentation and tolerating the reasonable risks inherent in educational innovation, educational leaders also strengthen the organisation's resilience. When faced with measures that fail to work, effective leaders treat them as opportunities for professional learning and organisational growth. Teachers' motivation, confidence, and commitment to continuous improvement also grow ever fuller under such leadership ^{[4][9]}.

Recent research shows that, with digital leadership,

principals can manage the digital learning environment more effectively by strengthening collaboration, helping teachers cope with technological change, and driving continuous school improvement. These leadership practices help to build resilient learning organisations that are able to successfully deal with the challenges brought about by digital transformation [14].

3.4. Improving School Performance and Organisational Sustainability

Educational leadership makes an important contribution to the long-term effectiveness of schools by promoting sustainable school development and evidence-based decision-making. Management systems assisted by artificial intelligence enable school leaders to monitor school performance more efficiently by analysing students' academic results, teacher development, attendance records and the state of resource allocation ^{[2][17]}.

Data-driven decision-making enables educational leaders to detect emerging challenges early and to formulate intervention strategies in a timely manner. More importantly, the sustainable improvement of schools depends not only on technological innovation, but also on ethical leadership, a collaborative culture and continuous professional learning. Leaders who are able to maintain a balance between technological progress and human-centred educational values are more likely to build resilient schools, thereby effectively responding to future educational challenges ^{[1][9][12]}.

4. Strategies for Strengthening Educational Leadership in the AI Era

In order to maximise the educational benefits of artificial intelligence, school leaders should adopt comprehensive leadership strategies that promote the sustainable improvement of schools while strengthening teacher professional development. Effective educational leadership requires not only technical ability, but also strategic planning, ethical governance, collaborative learning and continuous organisational development. Based on recent research, this paper proposes four key strategies.

4.1. Establish Professional Learning Communities

When it comes to promoting teacher professional development and collaborative learning, professional learning communities (PLCs) count as one of the most effective avenues. Leaders would do well to encourage teachers to sit down regularly and talk over teaching practice, AI-supported strategies, classroom assessment, and student learning outcomes. Through collaborative reflection, teaching ability climbs steadily, and the confidence to use emerging technologies grows ever fuller ^{[9][13][16]}.

By making room for peer mentoring, knowledge sharing, and collaborative problem-solving, professional learning communities in turn strengthen organisational learning. Rather than pinning their hopes on external training, schools should instead cultivate an internal learning culture in which teachers learn from one another through continuous professional dialogue and reflective practice ^{[13][16]}.

4.2. Strengthen AI-Based Professional Development

In the face of teachers' ever-changing needs in the AI era, leaders should design systematic and long-term professional development programmes in response. Its content cannot be confined to technical training alone; digital pedagogy, AI literacy, educational data analysis, assessment design, and the ethical use of AI should all be included together ^{[8][10][11][17]}.

Workshops, online courses, certification programmes, coaching, mentoring, demonstration lessons, and collaborative action research can all be included on the training menu. When development is done in a personalised way, teachers of differing depths of experience can ascend step by step, and lifelong learning is thereby set in motion ^{[10][17]}.

Beyond this, encouraging teachers to devote themselves to academic research on the educational application of artificial intelligence also falls within the leader's remit. The more research is done, the more teachers' critical thinking, drive for innovation, and capacity for evidence-based decision-making are strengthened, and school improvement together with the raising of educational quality ultimately falls into place as a matter of course ^{[9][18]}.

4.3. Promote Ethical AI Governance

As generative artificial intelligence spreads ever wider across education, leaders are compelled to establish effective governance mechanisms that hold the bottom line of responsible use. Data privacy, information security, academic integrity, transparency, accountability—schools must set out institutional arrangements around these matters. These policies provide clear guidance for teachers and students in the appropriate use of artificial intelligence technologies in teaching, learning and assessment ^{[1][12]}.

Educational leaders should also ensure that artificial intelligence systems are regularly evaluated, in order to minimise algorithmic bias, protect students' personal information, and promote fairness in educational decision-making. The ethical governance of artificial intelligence can not only safeguard the rights of stakeholders, but also enhance public trust in educational institutions ^{[1][12][18]}.

Implementing an AI competency framework is likewise worth educational leaders' support, so that teachers master the knowledge and skills, together with the ethical awareness, needed to use artificial intelligence responsibly in education. ^[15]

4.4. Strengthen External Collaboration

Educational leadership cannot be confined within the school's own small patch; forming partnerships with universities, educational technology companies, government departments, and local communities is the proper path. By reaching out to collaborate, schools can obtain advanced technological resources, research expertise, funding opportunities, and innovative educational practices that may not be available in-house ^{[6][17]}.

Universities joining hands with schools, collaborative research, teacher training and curriculum innovation can all obtain support. What the government departments' side gives is policy guidance and financial support, while what the technology enterprises' end brings out is technical expertise and educational solutions supported by artificial intelligence. When the multiple parties exert effort together, educational

leaders can then set up a sustainable educational ecosystem, continuously and unceasingly supporting teacher professional development and the long-term improvement of the school ^{[2][6][17]}.

5. Conclusion

Artificial intelligence has changed the appearance of the educational environment from the root, and the principal's duties have accordingly been redrawn. Up to today, educational leadership has long since gone beyond the scope of administrative management, and digital transformation, teacher professional development, organisational learning and ethical governance are all classed into it. A competent principal will knead technological innovation and human-centred educational values together into one place, and at the same time raise up a collaborative and inclusive school culture.

Around the characteristics of educational leadership in promoting teacher professional development, this study examines them one by one, dissects its application value in school management, and also brings out practical strategies for strengthening leadership in the era of artificial intelligence. The results show that visionary leadership, collaborative learning, continuous professional development, and responsible artificial intelligence governance are exactly the key point that pries up teachers' digital competence, teaching quality, and organisational effectiveness.

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