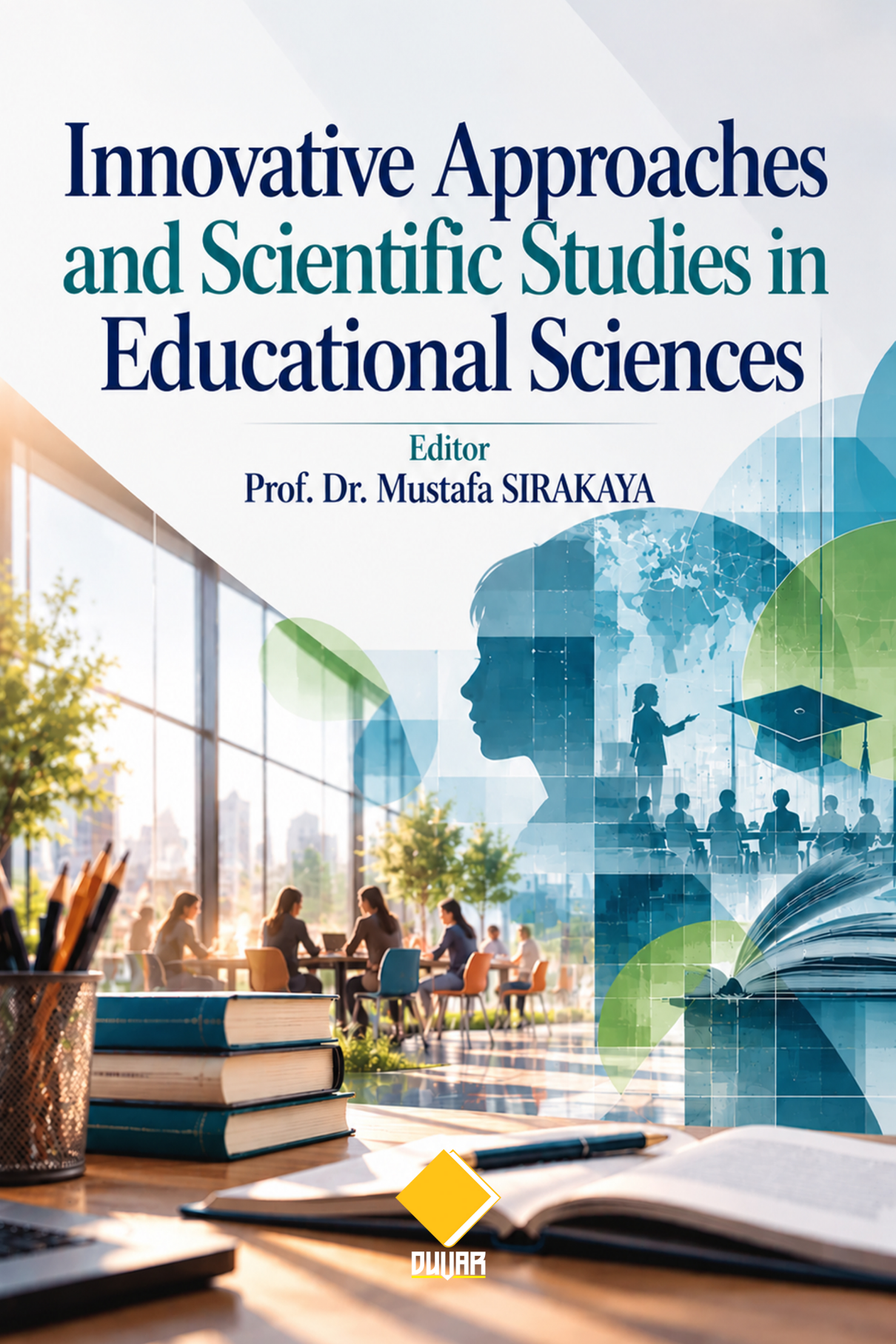
Innovative Approaches and Scientific Studies in Educational Sciences

Editor
Prof. Dr. Mustafa SIRAKAYA



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INNOVATIVE APPROACHES AND SCIENTIFIC STUDIES IN EDUCATIONAL SCIENCES

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Chapter 1

Education in the Age of Artificial Intelligence: From Knowledge Transmission to Thinking Skills

Ali KELEŞ[1], Aytürk KELEŞ[2]

Abstract

The growing use of artificial intelligence in education is expanding access to information and diversifying instructional support, while bringing renewed attention to how learning should be assessed. This chapter examines developments from intelligent tutoring systems to generative artificial intelligence through the lenses of personalized learning, feedback, critical thinking, metacognition, the teacher's role, and academic integrity. It emphasizes that artificial intelligence should be used not as a decision-maker replacing teachers, but as a support tool guided by pedagogical aims. The chapter also presents principles for process-oriented assessment, examples of classroom activities, and recommendations for institutional implementation. These proposals are not presented as empirically verified findings of effectiveness; rather, they are approaches open to evaluation through research and practice.

Keywords: artificial intelligence in education, generative artificial intelligence, critical thinking, teacher competencies, process-oriented assessment

1. Introduction

Advances in artificial intelligence (AI) are reopening debates about how information is presented, processed, and assessed in education. Learning management systems, intelligent tutoring software, and platforms that adapt learning content to students' needs have long been used in educational settings. However, the widespread adoption of AI systems capable of producing text, answering questions, and explaining a range of topics has broadened the scope of this technological transformation. These tools can respond to questions in everyday language, prepare explanations and examples, and interact with users across various learning tasks. As a result, students have more ways to access

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information, while teachers have new options for instructional design, feedback, and assessment.

Yet the role of AI in education cannot be understood solely in terms of its technical capabilities. In addition to transmitting knowledge, education aims to help students make sense of concepts, assess evidence, compare different perspectives, solve problems, and regulate their own learning. A system's ability to provide a persuasive answer does not establish either that the information is necessarily correct or that the student has understood the subject. When information becomes so readily accessible, defining educational success only by the production of correct answers or the rapid completion of tasks risks overlooking the deeper dimensions of learning.

Research on AI and education indicates that these technologies can be used for personalized learning, automated feedback, learning analytics, and instructional support. In their systematic review of AI applications in higher education, Zawacki-Richter et al. (2019) found that research was concentrated in areas such as student profiling and performance prediction, assessment, adaptive systems, and intelligent tutoring systems. They also argued that educators' pedagogical perspectives should be more visible in this research. Their observation suggests that effective educational uses of AI need to be considered in relation not only to engineering solutions but also to instructional goals and theories of learning.

The spread of generative AI has further broadened this discussion. Kasneci et al. (2023) explored the potential of large language models to create learning materials, support student interaction, and personalize learning experiences, while also drawing attention to risks involving misinformation, bias, privacy, misuse, and the need for verification. UNESCO's guidance (Miao & Holmes, 2023) recommends a human-centred, safe, inclusive, and age-appropriate approach to generative AI in education, and highlights the need to reconsider learning objectives and assessment methods in light of these technologies.

This chapter examines where AI tools may be useful in teaching and learning, what limitations they entail, and how education might move from an emphasis on knowledge transmission towards an approach centred on thinking skills. It first outlines the conceptual foundations and principal applications of AI in education, then discusses critical thinking and higher-order cognitive skills, the changing role of teachers, assessment, and academic integrity.

The final sections offer examples of classroom strategies and recommendations for future practice. The chapter is a literature-based discussion drawing on selected academic publications and institutional guidance.

Methodologically, it is neither a systematic review nor a meta-analysis. It is a structured narrative examination of selected theoretical studies, research reviews, and guidance issued by international organizations on AI in education. Accordingly, its assessments are intended to inform conceptual debate and the development of practical recommendations.

2. The Development and Applications of Artificial Intelligence in Education

2.1. From Intelligent Tutoring Systems to Generative Artificial Intelligence

AI in education does not refer to a single type of software; it encompasses a range of computational approaches intended to support teaching and learning. Intelligent tutoring systems, machine-learning-based applications, and automated assessment tools are examples (Holmes et al., 2019; McArthur et al., 2005). Learning analytics is a related field that seeks to understand and improve learning processes through the measurement, collection, and analysis of data about learners and their learning environments; not every learning analytics application is AI-based (Siemens & Long, 2011).

Developed by Keleş et al. (2009), ZOSMAT is an example of a web-based intelligent tutoring system that combines individual learning with classroom teaching guided by a teacher. By tracking students' progress and providing guidance on subsequent activities, it illustrates an earlier approach that brings adaptive instruction together with human guidance. This example also shows that the use of AI for educational support was being investigated well before the emergence of generative AI tools.

The review by Zawacki-Richter et al. (2019) demonstrates that AI in higher education is not a recent phenomenon but rests on a longer history of research. Unlike earlier systems, however, generative AI tools can engage students in open-ended, multipurpose interactions through natural language. Students can ask for a simpler explanation of a concept, request examples, obtain feedback on a text, or compare alternative ways of solving a problem. This flexibility expands instructional possibilities, but also increases the need to check the accuracy and pedagogical appropriateness of the outputs.

Generative AI systems can produce text and responses by drawing on patterns in language. Fluent language generation, however, should not be equated with verified knowledge or conceptual understanding. Rather than experimentally measuring the effects of large language models in education, Bender et al. (2021) critically examined their language generation, biases associated with training data, and wider societal risks. Issues of misinformation,

verification, and critical use in educational contexts are addressed more directly by Kasneci et al. (2023). AI-generated information should therefore be checked against reliable sources.

2.2. Personalized and Adaptive Learning

Personalized learning is a broad pedagogical approach in which goals, learning pathways, and support are adjusted to students' characteristics and needs. Adaptive learning focuses more specifically on systems making such adjustments dynamically in response to students' answers or progress data. Although related, these concepts are not synonymous; the quality of technical adaptation matters, but so do teachers' pedagogical decisions.

AI-supported tools can be designed to offer explanations, exercises, hints, and feedback at different levels. Luckin et al. (2016) discuss these possibilities as part of AI's potential in education; their publication is not an experimental impact study demonstrating improved learning outcomes for every student group. The pedagogical value of adaptive features therefore needs to be assessed in relation to specific learning objectives and conditions of use.

Adapting instruction to the individual does not, in itself, demonstrate better learning. If a system continually offers easy answers, students may have fewer opportunities to engage in the thinking and effort needed to learn. A system may also produce unsuitable recommendations based on incomplete or inaccurate student information. It is therefore important to consider what student data are collected, how they are used, and how teachers evaluate the system's recommendations. UNESCO recommends particular attention to personal data protection, age-appropriateness, and human oversight when generative AI is used in education (Miao & Holmes, 2023).

These systems should consequently not be positioned as decision-makers in place of teachers. Instead, they should assist teachers in monitoring student development. Student data alone are insufficient: teachers must also consider their classroom observations, the circumstances in which students learn, and students' own accounts of their experiences.

2.3. Feedback, Learning Analytics, and Instructional Support

AI can provide students with rapid feedback and make it easier for teachers to prepare instructional materials. In a writing assignment, for instance, a tool may ask questions about text organization, identify a point that lacks sufficient justification, or indicate passages that require further attention. Teachers may likewise use these tools to develop lesson plans, exercises for different ability levels, case studies, and questions that help check understanding.

Useful feedback cannot be limited to identifying the correct answer; it should also help students develop their reasoning. Merely saying “Incorrect” may do little to show students where their thinking went wrong. Questions such as “What evidence led you to this conclusion?”, “Could there be another explanation?”, or “How can you check whether the source supports this claim?” instead encourage reflection. The educational value of AI thus depends not only on how quickly it responds, but also on whether it helps students think more deeply.

3. From Knowledge Transmission to Thinking Skills

3.1. Distinguishing Access to Information from Learning

Knowledge transmission remains necessary for learning the basic concepts of a subject. Yet easy access to information does not remove the need for students to understand and apply it. In a world characterized by abundant sources of varying reliability, students must be increasingly able to distinguish accurate information from misleading content, examine sources, and understand the contexts in which claims are made.

Receiving an answer within seconds does not mean that learning has taken place. Rather than accepting ready-made responses without question, students can use them as material for explanation and comparison. The National Research Council (2000) provides a general learning-sciences framework concerning prior knowledge, conceptual understanding, and metacognition; it does not investigate the effects of generative AI applications. Drawing on this framework, the ability to explain ideas independently and apply knowledge to new situations is proposed here as an important consideration in the design of AI-supported instruction.

UNESCO’s guidance on generative AI notes that these technologies may influence how people access information and engage in thinking. Learning objectives and assessment methods therefore warrant reconsideration (Miao & Holmes, 2023). The aim is not to abandon the acquisition of knowledge, but to combine it with questioning, interpretation, application, and reflection on one’s own learning.

3.2. Critical Thinking and Evaluation of Evidence

Critical thinking means examining the reasons, evidence, assumptions, and alternative explanations behind a claim rather than immediately accepting it as true. In the age of AI, students need to question both claims encountered in their studies and answers generated by AI. An explanation may sound fluent and convincing without being supported by reliable evidence (Paul & Elder, 2006).

Kasneci et al. (2023) emphasize the importance of verifying AI responses and adopting approaches that develop critical thinking in education. After receiving an AI-generated answer, students should ask: What evidence supports this claim? Do other reliable sources say the same thing? Under what circumstances might the response be incomplete or incorrect? These questions encourage students to use AI not simply to obtain answers, but also to evaluate information.

Critical-thinking activities might ask students to identify verifiable claims in an AI-generated response, examine sources, develop counterarguments, and reach a reasoned conclusion. This instructional proposal can be related to the ICAP framework of Chi and Wylie (2014), which distinguishes passive, active, constructive, and interactive levels of cognitive engagement. The meta-analysis by Freeman et al. (2014) on the benefits of active learning in STEM higher education also provides a general pedagogical rationale; neither study directly tested the effectiveness of activities designed to verify AI-generated responses.

3.3. Problem-Solving, Creativity, and Metacognition

Problem-solving involves identifying a problem, selecting relevant information, choosing an approach, testing a solution, and evaluating the outcome. AI may suggest different solutions to a problem. Nevertheless, deciding which solution suits the situation, setting criteria, and considering possible consequences require students' active involvement. Learning tasks should therefore go beyond asking for the correct answer and invite students to explain and compare their methods.

AI can be useful when generating ideas, exploring alternative perspectives, or considering options for an initial draft. Producing numerous suggestions, however, is not in itself creativity. Students need to select among ideas, modify them, adapt them to their own circumstances, and explain their choices. AI-generated content should therefore be treated not as a finished product, but as a starting point for reflection and development.

Metacognition concerns individuals' knowledge of, and monitoring of, their own cognitive processes (Flavell, 1979). Self-regulated learning encompasses broader processes, including goal-setting, strategy use, motivation, and behavioural management (Panadero, 2017; Zimmerman, 2002). Asking AI for hints rather than direct answers, or explaining one's own solution, may be consistent with these theories. However, none of these three sources measures the effects of such AI-based interventions.

Whereas metacognition concerns awareness and monitoring of one's thinking, self-regulated learning also involves setting goals, sustaining

motivation, managing effort, and adapting learning behaviour alongside metacognitive strategies. A student's explanation of a solution with AI support may therefore encourage metacognitive monitoring; for self-regulated learning, it is also important that the student determine when and how much assistance to seek (Flavell, 1979; Panadero, 2017; Zimmerman, 2002).

4. The Changing Role of Teachers: From Sources of Knowledge to Guides for Learning

The changing role of teachers is less about abandoning knowledge transmission than about offering more deliberate support for students' thinking. This does not mean that subject expertise or direct instruction has lost its importance. Clear explanations, worked examples, practice, and feedback may still be needed when students encounter new material. The central change concerns how teachers integrate these methods with the possibilities offered by AI and create opportunities for students to think independently (Rosenshine, 2012; Selwyn, 2019).

Teachers retain responsibility for setting learning objectives, selecting appropriate activities, providing support suited to students' levels, checking AI-generated responses, and establishing rules for ethical use. UNESCO's AI competency framework for teachers covers five areas: a human-centred mindset, ethics of AI, foundational technical knowledge, pedagogical use of AI, and professional learning (Miao & Cukurova, 2024). It makes clear that teachers must develop not only the ability to operate tools but also the capacity to make pedagogical and ethical decisions.

Interaction among teachers, students, and AI can be understood as a working relationship in which responsibilities are clearly defined. AI may assist with preparing content and giving feedback, while teachers continue to make decisions in light of learning objectives, classroom conditions, and students' development. Students, in turn, should not simply accept responses as given. They should ask questions, verify evidence, discuss alternatives, and take responsibility for their own learning.

Teachers' AI literacy includes understanding the tasks for which tools may be useful, the circumstances in which they may make mistakes, and how student information should be protected. Teachers also need to adapt instructional materials and assessment tasks to the presence of AI. For these changes to become sustainable, individual effort must be complemented by institutional guidance, professional learning opportunities, and shared rules.

Aspects	Acquire	Deepen	Create
Human-centred mindset	Human agency	Human accountability	Social responsibility
Ethics of AI	Ethical principles	Safe and responsible use	Co-creating ethical rules
AI foundations and applications	Basic AI techniques and applications	Application skills	Creating with AI
AI pedagogy	AI-assisted teaching	AI–pedagogy integration	AI-enhanced pedagogical transformation
AI for professional development	AI enabling lifelong professional learning	AI to enhance organizational learning	AI to support professional transformation

Figure 1. Dimensions and progression levels of UNESCO's AI competency framework for teachers.

Source: Miao, F., & Cukurova, M. (2024). AI competency framework for teachers. UNESCO, p. 22, Table 1. https://doi.org/10.54675/ZJTE2084. Framework reproduced in English in the source table structure (CC BY-SA 3.0 IGO).

5. Assessment and Evaluation: From Products to Processes

Access to generative AI has made the limitations of grading only the submitted product more apparent. It is not always possible to determine from a final essay, presentation, or solution how much was produced by the student and how much was prepared with AI assistance. The answer, however, is not necessarily to prohibit AI altogether or to rely on automated detection tools. Instead, assessment should be designed to provide better evidence of what students have learned and how they have worked.

In a review of AI-assisted assessment in higher education, Zhao (2024) found that these tools are used for automated feedback, individualized learning support, and assessment. At the same time, concerns about personal data protection, bias, the reliability of feedback, and academic integrity persist. Assessment technologies should therefore not displace teachers' professional judgement.

Process-oriented assessment considers not only the product submitted but also the steps through which the student arrived at it. Planning, drafting, selecting sources, incorporating feedback, and revising are all relevant. Portfolios, project presentations, oral explanations, short in-class writing assignments, and students' justifications of their decisions may serve this purpose. Students might, for example, be asked to critique an AI-generated answer, identify the sources used, and explain the reasons for their final judgement (Sadler, 1989).

Assessment criteria need to be communicated in advance and applied fairly to all students. If AI use is expected, the permitted forms of use, the stages at which students must disclose that use, and the criteria by which their work will be assessed should be specified beforehand. This makes expectations clearer and promotes consistency in assessment.

6. Academic Integrity, Ethics, and Equity

6.1. Academic Integrity and Transparency

The use of AI in education calls for renewed consideration of how academic integrity rules should be applied. Treating any use of AI as a breach of the rules may unnecessarily restrict uses that support learning and are openly disclosed. At the same time, presenting a piece of work produced by AI as entirely one's own is not acceptable. Rules should therefore take account of the purpose for which AI was used and the extent of the student's contribution.

Transparent use requires students to explain why they relied on AI and how they verified its responses. Using AI to develop ideas or correct spelling and grammar, for instance, differs from asking it to produce the entire argument and text of an assignment. When students are required to disclose AI use, the disclosure should be straightforward and understandable.

6.2. Misinformation, Bias, and Privacy

Generative AI may present incorrect or misleading information in a confident tone. If students have limited experience in checking sources, this may adversely affect their learning. Generated answers may also reproduce stereotypes about certain groups or privilege some perspectives over others. Important information should therefore be compared with reliable sources, and outputs should be carefully examined rather than assumed to be neutral or correct.

Protecting personal data is another essential consideration. Students' identities, specific learning needs, and assessment results, as well as teachers' confidential materials, should not be uploaded to external systems without understanding the terms of use. Schools and teachers need to establish what information may be shared and prevent the unnecessary collection of personal data (European Commission, 2022).

6.3. Digital Inequality and Inclusion

Although wider access to AI has the potential to reduce digital inequalities, it may also deepen existing disparities. Students do not all have the same internet connectivity, suitable devices, access to paid tools, language support, or digital

skills. Unless such differences are considered, some students may benefit more from these technologies while others fall further behind. AI-supported activities should therefore be designed with the access conditions of all learners in mind.

UNESCO's AI competency framework for students encompasses a human-centred mindset, ethics of AI, foundational technical knowledge, and AI system design. It emphasizes that students should learn not only to operate AI tools, but also to understand, question, and use them responsibly (Miao et al., 2024).

Competency aspects	Understand	Apply	Create
Human-centred mindset	Human agency	Human accountability	Citizenship in the era of AI
Ethics of AI	Embodied ethics	Safe and responsible use	Ethics by design
AI techniques and applications	AI foundations	Application skills	Creating AI tools
AI system design	Problem scoping	Architecture design	Iteration and feedback loops

Figure 2. Dimensions and progression levels of UNESCO's AI competency framework for students.

Source: Miao, F., Shiohira, K., & Lao, N. (2024). AI competency framework for students. UNESCO, p. 19, Table 1. https://doi.org/10.54675/JKJB9835. Framework reproduced in English in the source table structure (CC BY-SA 3.0 IGO).

7. Classroom Applications and Instructional Strategies

These principles become more concrete when translated into classroom activities. The following examples can be adapted to different subjects and age groups. In selecting an activity, teachers should consider students' levels, the learning objective, and whether AI use is appropriate to the task.

7.1. Verifying an AI-Generated Response

The teacher shares an AI-generated response to a question addressed in class. Students identify the verifiable claims in the response, check them against at least two reliable sources, and flag statements that lack sufficient evidence. They then explain which parts of the response need to be corrected.

7.2. Comparing Alternative Solutions

AI may be asked to generate different solutions to a problem or case study. Students compare the suggestions using criteria such as cost, feasibility, ethical implications, and evidential support. They then explain which solution they would choose and why.

7.3. Hint-Based Learning Dialogue

The activity begins with students attempting a problem independently. They then ask AI to provide step-by-step hints rather than the answer, question their reasoning, and encourage them to explain their solution. In this way, the tool supports students in reaching their own solutions instead of solving the task for them.

7.4. Drafting, Feedback, and Revision

Students first prepare a short text or project outline independently. Rather than asking AI to rewrite it from the beginning, they ask it to identify unclear sections, suggest counterarguments, and raise questions requiring clarification. Students then consider the feedback and explain what they changed and why.

7.5. Shared Principles for Implementation

For these activities to support learning, the objective must be clear, AI use must align with the purpose of the task, and students' own reasoning must remain visible. Teachers should specify the stages at which AI may be used and ask students to verify sources, justify their views, and evaluate their learning. Personal information should also be protected, and differences in access to technology should not be allowed to make assessment unfair.

Potential use	Possible contribution	Human oversight	Main risks
Curriculum / lesson co-design	Drafts for lesson plans, activities and assessments	Teacher verifies objectives, content and factual accuracy	Dominant pedagogical norms; exclusionary outcomes
Teaching assistant	Explanations, answers to questions and directions to resources	Monitor accuracy and help students verify answers	Misinformation; diminished human guidance

Figure 3. Selected uses, human oversight requirements, and risks in generative-AI-supported instructional design.

Source: Adapted and abridged from Miao, F., & Holmes, W. (2023). Guidance for generative AI in education and research. UNESCO, p. 31, Table 4. https://doi.org/10.54675/EWZM9535 (CC BY-SA 3.0 IGO). Two illustrative uses are retained in an abridged four-column adaptation; the complete UNESCO table contains additional information.

7.6. A Staged Model for Designing Learning Activities

The first question when planning an AI-supported activity should not be "Which tool should we use?" but "What should the student learn?" Teachers need to specify which concept students should be able to explain, what evidence they should assess, or which decision they should justify by the end of the activity. They should then clarify where AI can provide assistance, what students should accomplish

independently, and how learning will be assessed. Technology is thus used because it serves a learning purpose, not simply because it is new.

To this end, an activity can be organized into five stages: (1) define the learning objective and success criteria; (2) ask students to articulate their initial thinking or attempt a solution without AI; (3) use AI in a limited way for explanations, counterarguments, hints, or feedback; (4) check the suggestions against sources and reasons; and (5) ask students to explain their own decisions and evaluate the process. These stages need not be implemented identically in every subject. The essential point is that students' own contributions remain visible.

In task instructions, teachers should state clearly for what purposes AI may or may not be used. Idea generation and proofreading, for example, might be permitted while obtaining direct answers during an examination is prohibited. Students may also be asked to disclose at which stages they used AI. The purpose of this disclosure is not punishment but to make the learning process transparent and fair.

8. Institutional Implementation and Research Agenda

8.1. Institutional Implementation: Shared Principles and Responsibilities

For AI to become a safe and established practice in education, decisions cannot be left solely to individual teachers. Educational institutions should set clear rules concerning acceptable use, data security, age-appropriateness, accessibility, academic integrity, and human oversight. These rules should be reviewed as technologies change and updated in consultation with teachers, students, parents, and technical staff. Institutional policies should not merely list prohibitions; they should also provide examples of appropriate use and avenues for support (Miao & Holmes, 2023; U.S. Department of Education, 2023; Miao et al., 2021).

Beginning with low-risk classroom activities may make it easier to identify the limits of implementation. Professional learning groups should be established so that teachers can share experiences, and outcomes should be monitored regularly. A tool's success should not be judged solely by how often it is used. Students' conceptual understanding, independent working skills, ability to evaluate sources, teachers' workload, and equity of access should be considered together. If a tool speeds up homework but weakens students' ability to solve problems independently, for example, its use should be reconsidered (OECD, 2023).

Responsibilities for decisions should also be made explicit. Teachers set learning objectives and assessment criteria. Students are responsible for the accuracy of their work and for disclosing AI use appropriately. Institutions provide the conditions necessary to select safe tools, protect data, and ensure fair access for all learners. Technology providers, in turn, should communicate the limitations of

their systems, data-use practices, and security conditions. High-stakes decisions affecting students' futures should not rely exclusively on the outputs of automated systems.

8.2. Research Agenda and Evaluation Criteria

When evaluating AI applications in education, researchers should look beyond task completion time and user satisfaction to examine whether students can solve similar problems without the tool and transfer what they have learned to a new context. Perkins and Salomon (1992) offer a theoretical account of transfer of learning across contexts; they do not measure the effectiveness of an AI-based intervention. The use of pretest–posttest comparisons, delayed assessments, and student work as sources of evidence is therefore a methodological recommendation advanced in this chapter.

Future studies should compare different school subjects, age groups, languages, and cultural conditions. The National Academies of Sciences, Engineering, and Medicine (2018) comprehensively examine how learning relates to context and culture; they do not establish that one AI-supported teaching method is superior to another in language or history education. Developing task designs suited to specific subjects and comparing long-term outcomes should therefore be understood as research directions inferred from existing evidence.

An application's technical reliability does not necessarily indicate its educational success. It should contribute to learning objectives, support student autonomy, promote fairness, protect personal data, and strengthen teachers' educational responsibilities. These criteria help distinguish technological novelty from genuine educational value.

The classroom activities proposed in this chapter are not presented as interventions whose effects on learning have been validated through field research. Before implementation, they should be adapted to the age group, subject matter, accessibility requirements, and learner characteristics, and evaluated through expert review and pilot studies. Assessment of learning outcomes should prioritize students' independent performance, retention of learning, and transfer to new situations rather than the frequency of technology use.

9. Conclusion

The sources reviewed in this chapter identify potential uses of AI for feedback, instructional support, and assessment, together with the risks that may arise. Many of these sources, however, are commentaries, theoretical studies, or policy guidance rather than experimental evidence demonstrating improved achievement across all age groups. The effects of AI applications should therefore be tested in

comparative, context-sensitive research, while independent thinking, verification of information, and meaningful understanding remain central pedagogical objectives.

Knowledge still needs to be taught in the age of AI, but educational aims cannot be limited to the transmission and memorization of information. Students should be able to apply what they learn to new situations, assess evidence, compare different viewpoints, and justify their decisions. Critical thinking, problem-solving, creativity, and the ability to manage one's own learning should consequently be articulated as explicit learning objectives.

This transformation does not diminish the importance of teachers; it reshapes their role. Teachers assess AI-generated content against instructional goals, support students' reasoning, design learning activities, and establish rules for ethical use. UNESCO's competency frameworks for teachers and students emphasize that AI literacy extends beyond technical skills to encompass human-centred perspectives, ethical responsibility, and critical evaluation (Miao & Cukurova, 2024; Miao et al., 2024).

Assessment practices likewise need to reflect these aims. Rather than considering only the final work submitted, educators should examine how students reasoned, which sources they used, how they responded to feedback, and how they justified their solutions. Process-oriented assessment and explicit rules for AI use support academic integrity and help students learn to engage responsibly with emerging technologies.

Future research should employ longitudinal and comparative designs to investigate how AI-supported teaching affects learning among different age groups, subjects, and socioeconomic contexts. Critical thinking, independent problem-solving, and the capacity to manage one's own learning should be assessed using sound measurement instruments. Researchers should also investigate the conditions under which AI supports learning and those under which it may unduly reduce students' own cognitive effort.

Ultimately, education should do more than teach students to operate new technologies. It should prepare them to encounter those technologies as independent thinkers who make evidence-based decisions, act with ethical responsibility, and manage their own learning. AI should not be an authority that thinks in place of students; when appropriately designed, it should be a support tool that develops their capacity to think. Moving from knowledge transmission towards thinking skills requires technology to serve human development rather than determine the purposes of education.

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Chapter 2

Identifying Factors Affecting the Process in Educational Planning

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1. INTRODUCTION

Along with health and the economy, education is a key sector that influences a nation's development. In fact, education serves as one of the fundamental indicators within the Human Development Index. Experts have provided numerous definitions of education, and it is interpreted in various ways across theoretical studies—depending on the perspective from which it is approached. At its core, however, education is an endeavor to improve human well-being. This implies that education is a conscious and planned effort—a process that must be addressed deliberately and mapped out with care. Consequently, every level of education—from national, regional, and institutional or school-based frameworks down to the operational stage of actual learning—requires robust and comprehensive planning.

Educational planning is the application of a rational, scientific approach to the field of education—the very same approach that educators strive to instill in their students. Such an approach entails defining goals and identifying available resources; examining the implications of alternative courses of action to make informed choices; establishing specific objectives to be achieved within set timeframes; and, ultimately, developing the most effective methods for systematically implementing these chosen strategies. In this sense, educational planning is far more than merely drafting a plan; it is an ongoing, continuous process. This process necessitates a sequence of interconnected actions.

Broadly speaking, planning is one of the core functions of management. Planning is the initial step in any endeavor we undertake; in the realm of education, planning is essential for achieving predetermined educational goals. Both the "2023 Education Vision" and the "Century of Türkiye Education Model" emphasize that a primary objective of the national education system is to foster the potential of students to become individuals who are faithful, value national heritage, possess noble character, are healthy, knowledgeable, talented, and

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creative, and grow into independent, democratic, and responsible citizens. Educational planning—a vital component of educational administration—requires robust management. Educational goals can only be attained when supported by effective educational administration, which encompasses the coordination of resources, teaching staff, planning, collaboration, leadership, curriculum, student affairs, and various other elements. By managing these components effectively, it is possible to create a teaching and learning process that successfully meets educational objectives. Without sound educational administration and strong leadership, achieving desired goals is not possible.

It can be concluded that educational administration involves the coordination and implementation of collaborative processes designed to achieve educational goals by fostering relationships among the various components of the education system; in doing so, it optimizes the system through the strategic use of facilities and infrastructure that support learning activities. Furthermore, educational administration serves as a field of study within academic curricula. Although this field remains relatively new in many countries, it is perhaps not surprising that some educators have yet to fully grasp or appreciate the necessity and significance of educational administration in the implementation and development of education (Husaeni, 2016).

2. OBJECTIVES OF EDUCATIONAL MANAGEMENT

The term "educational management" generally encompasses all activities that contribute to the attainment of educational goals. The measure of success in educational management is primarily reflected in the productivity of the educational process—that is, its effectiveness and efficiency. Achieving this effectiveness requires a fundamental process that incorporates human organizational behavior. Such behavior can be defined in terms of the planning, implementation, and supervision—or direction—of administrative tasks (Mahidin, 2017). In the context of reaching educational goals—which constitute the broader objectives of educational management—it can be said that the management applied within education seeks to attain specific, fundamental targets. While this may sound simple, it carries a profound meaning; education involves numerous individuals, each of whom must carry out their own specific tasks while simultaneously engaging in collective efforts to achieve shared educational goals.

For initiatives aimed at enhancing productivity through innovation and efficiency to become an integral part of the way educational systems function, the primary impetus must come from those who manage these systems. Yet, many such managers are already so overwhelmed—struggling merely to keep the

existing, legacy system operational—that they lack the training in the techniques required for innovation. Furthermore, the inherited management systems they serve—with their established rules, procedures, organizational structures, personnel, ingrained attitudes, and self-perceptions regarding roles—are often ill-suited to address the management tasks and challenges that educational systems currently face. Consequently, it is clear that any effort to increase educational productivity must go hand in hand with the modernization of educational management.

The starting point should be a redefinition of the role of educational administration, as well as the types of specialized personnel and teams required for it to function effectively. In earlier, simpler times, the primary concern of educational administration in most countries was the establishment of rules and standards and the monitoring of compliance with them—a role that was essentially regulatory and protective. Today, however, the core purpose of educational administration should be the advancement of education, which entails unleashing and mobilizing the human energy, creativity, spirit, and physical resources—both within and outside the educational system—necessary for this goal. In a sense, this stands in direct opposition to rigid, uniform rules and procedures that, rather than fostering initiative and imagination, often serve to stifle them (UNESCO, 1970).

Educational development is nurtured not by the regularity of uniformity, but by the creative interaction of diversity. While such educational diversity naturally carries certain risks and must remain within reasonable bounds, the greater danger at this juncture lies in the continued maintenance of restrictive, outdated forms of uniformity.

Ultimately, the purpose of educational administration is to serve as a means for achieving the most appropriate educational objectives. As schools function as subsystems within the national education system, the objectives of educational management in schools encompass three areas (Annisa, 2020):

1. Short-Term Objectives: Essentially, the short-term objective of educational management in schools is to establish and implement a management system for the instrumental components of the educational process—including students, staff, teachers, infrastructure, facilities, organization, finance, curriculum, governance, and community relations—and to ensure the effective and efficient execution of the educational process within the school.

2. Medium-Term Objectives: To ensure the proper implementation of short-term objectives, the focus must shift toward medium-term objectives—that is, the institutional goals of the educational programs offered at any given type or level within the school. Consequently, short-term objectives must be aligned with these

institutional goals. For every type and level of school, institutional educational goals are standardized by higher-level administrative authorities.

3. Long-Term Objectives: All medium-term objectives should contribute to the attainment of broader, overarching educational goals—namely, national objectives. Therefore, long-term educational management activities within schools must support the realization of national educational goals.

Achieving long-term objectives requires an educational planning process—regardless of a nation's level of development—guided by a clear strategy. This strategy serves to inspire the entire scope of educational development while tailoring it to the specific conditions of the country in question. There is no pre-packaged, standardized strategy applicable to all nations; each country must develop its own unique strategy. A country's stage of development and its rate of growth will have a significant influence on what its strategy should be. For instance, a nation—or a region within a nation—at an early stage of development with limited resources might find it necessary to adopt a strategy that prioritizes job-oriented adult education over general cultural education; secondary education over primary education; and, specifically, the teaching of sciences at the secondary level and engineering at the university level to foster scientific and technological advancement. For a more developed country, the appropriate emphasis in these areas might be the exact opposite. However, a well-designed strategy serves as a more comprehensive guide, incorporating new approaches to achieve long-term goals. Regardless of how their strategies may differ in other respects, there is one objective that the educational strategies of all nations must emphasize in the coming years: they must all place great importance on enhancing the efficiency and productivity of their educational systems. These concepts are closely interconnected. When viewed from within, the performance of an educational system is directly linked to its internal efficiency—that is, the relationship between the resources employed and the educational outcomes achieved. For example, a system can improve its efficiency by adopting new methods that allow it to produce greater and better educational outcomes without a proportional increase in resources.

In the context of the definition of educational management, the objectives of educational management refer to all collaborative efforts aimed at utilizing various human and non-human resources in an orderly, effective, efficient, and productive manner to achieve educational goals. The general purpose of management is to ensure that all activities support the achievement of educational goals. In other words, management as applied in education aims to facilitate the attainment of educational objectives.

Educational management has four goals: 1. Productive effectiveness; 2. Efficiency; 3. Adaptability; 4. Job satisfaction. These four goals serve as criteria for determining success in school administration.

The curriculum, which is the most vital component of any educational institution, is significantly influenced by educational management. It ensures that children receive an education that covers all the fundamentals and prepares them for real life. It also involves making preparations aligned with the institution's goals and working toward those objectives. This guarantees that the institution is moving in the right direction and utilizing its resources effectively.

The role of a school administrator largely entails establishing a vision for the institution and taking a series of measures to bring that vision to life. In this way, the institution can ensure that its resources are being used effectively. Setting measurable goals and objectives enables educational administrators to track progress and evaluate outcomes.

2.1. Functions of Educational Management

The functions of educational management are as follows: the Planning function, the Organizing function, the Implementation function, and the Controlling (supervisory) function.

a. The planning function consists of a set of predetermined activities to be carried out within a specific timeframe in order to achieve established goals (Sheathelm, 1991).

b. The organizing function is the process of identifying the work that needs to be done, grouping tasks, and distributing responsibilities among the staff.

c. The implementation function involves motivating group members to develop the desire and effort to achieve organizational goals.

d. The controlling function is the process of monitoring, evaluating, and reporting on the plans aimed at achieving established goals. In the context of management, this refers to the process of organizing and mobilizing resources to reach specific objectives. Indeed, according to various experts, there are several other functions of educational management beyond the four mentioned above. These are: 1. Planning, 2. Organizing, 3. Executing actions/tasks, 4. Supervising, 5. Directing, 6. Coordinating, 7. Reporting, 8. Budgeting.

3. EDUCATIONAL PLANNING

Planning is a general management function; it is the initial step in managing any organizational activity. It involves the establishment of a vision, mission, goals, objectives, and strategies, as well as the allocation of resources—all of which are typically defined within a foundational program structure. For any

organization, the core challenge lies in developing and creating a plan that ensures its objectives and operational activities are truly aligned with the vision, mission, goals, objectives, and strategies it has set for itself.

In the realm of education, educational planning serves as a component of educational management. As explained by Saihu and Taufik (2019)—drawing on various sources—educational management encompasses the planning, implementation, monitoring, and supervision of human resources, learning resources, curriculum, finances, and facilities, all with the aim of achieving educational goals effectively and efficiently.

Educational planning is an endeavor concerning the future of a system. What the educational system will look like in the future depends on the changes that will occur in its environment. In societies—and particularly in economies—undergoing rapid change, it is quite difficult to predict when, in what direction, and at what pace the environment surrounding the educational system might evolve. A sound prediction requires the scientific collection of data regarding both the environment and the educational system itself. When this is achieved, the goals set within educational planning efforts become realistic and valid. To this end, it is essential to establish a robust information system within the educational framework.

A significant challenge within an educational system is determining how to allocate scarce resources among various initiatives aimed at addressing specific problems or fostering innovation. Choosing between alternative uses for scarce resources inevitably means sacrificing the options that were not selected. This phenomenon—known as "opportunity cost"—underscores the importance of making choices when utilizing limited resources and highlights the fact that every decision carries a cost (Üstünel, 1988). For instance, if decision-makers within an educational system opt to invest in higher education to increase student capacity, the opportunity cost of this decision might be the potential improvement of existing higher education institutions—such as by providing books, equipment, and materials, or by supporting research projects—or, alternatively, it could represent the foregone investment in primary or secondary education.

To achieve success in educational planning, certain principles must be adopted:

- Educational planning is a continuous process that requires a specific organization or unit.
- Educational planning is an interdisciplinary process that necessitates ongoing collaboration among experts, administrators, and advisory bodies; it requires teamwork.
- Educational planning is an integral part of economic and social planning.

- During the educational planning process, scientific methods are employed to examine the country's educational, economic, social, and cultural realities (Yıldırım, 2024).
- When developing solutions in educational planning, the necessary human resources and financial capital must be assessed realistically—in short, a balance between goals and means must be established.
- An educational plan must possess sufficient flexibility to adapt to unforeseen circumstances.

According to many experts, educational planning can be defined as follows:

1. Educational planning is the process of preparing a set of alternative decisions for future activities, aimed at achieving goals with the greatest possible effort, while taking into account a country's economic, socio-cultural, and general realities.

2. Educational planning is a continuous intellectual process that involves analysis, formulation, evaluation, and decision-making. Decisions made must possess internal consistency (adherence to principles) and be systematically linked both to the field itself and to decisions made in other areas of development. There are no fixed time limits for any type of activity, nor is there a requirement for one activity to necessarily precede or follow another.

3. Educational planning is a process of reflection, analysis, formulation, evaluation, and decision-making regarding the means to achieve predetermined goals. It can also be described as a future-oriented activity designed to attain specific objectives within the educational sphere.

From these definitions, it can be concluded that educational planning is the process of formulating a set of educational policies to shape the future of the education sector in alignment with established goals.

3.1 Key Issues and Elements in Educational Planning

Four fundamental issues are addressed in educational planning (Steller, 1980):

1. Educational goals: These define what is to be achieved through educational planning activities.

2. The state of the educational system: This refers to whether the existing educational system is successfully meeting its goals.

3. Alternative solutions: This refers to the various options available for achieving the stated goals.

4. Strategy for achieving goals: This refers to the optimal approach for reaching these objectives.

There are several key elements in educational planning:

1. The application of rational and systematic analysis within the planning methodology.

2. The process of educational development and progress—that is, the implementation of educational planning within the framework of educational reform.

3. The principle of effectiveness and efficiency—that is, the application of economic reasoning to educational planning—manifests in areas such as the exploration of educational funding sources, cost distribution, the relationship between education and the labor force, and the connection between educational development and economic growth.

4. The local, regional, national, and international needs and goals of students and society. This implies that educational planning encompasses both the internal and external aspects of the organization of the education system.

5. A country's national development goals inform decisions within the framework of national educational policies.

6. Strategic issues involve the management of operational policies that may influence the implementation process of educational planning.

3.2 The Function of Educational Planning

In educational management, educational planning aims to assist with the following:

1. Meeting workforce requirements: Addressing the need for a qualified and skilled workforce is a top priority; without such a workforce, development across various sectors becomes difficult, and unemployment rates may continue to rise.

2. Expanding educational opportunities: Equalizing educational opportunities serves as a measure for political and social emancipation.

3. Enhancing the quality of education: Quality in education is a fundamental factor in the development of all sectors—from healthcare and agriculture to production and finance.

4. Increasing the effectiveness and efficiency of educational delivery: Improving the effectiveness and efficiency of how education is provided is a prerequisite for meeting workforce needs and expanding access to educational opportunities.

3.3 Approaches to Educational Planning

There are at least four alternative approaches to educational planning: the Social Demand Approach, the Manpower Requirements Approach, and the Cost-Efficiency Approach, Social Demand Approach

1. Social Needs Approach: The "social needs approach" is a highly successful and humane method, particularly for planning compulsory education stages and increasing schooling rates. However, when applied in isolation to fields requiring specialized expertise—such as higher education—it can lead to employment issues and the waste of resources; therefore, it is typically balanced with the "manpower requirements approach."

2. Employment Needs Approach: This approach emphasizes the importance of educational programs in meeting the employment requirements of various development sectors. Projected labor force needs can be expressed in terms of education and training requirements, which can then be compared against the supply provided by the education and training system.

3. Cost-Efficiency Approach: In this approach, based on cost-benefit analysis, the individual and societal returns on investments made in various levels and fields of education are calculated, and resources are directed toward the areas that yield the highest returns. In a review compiling studies from around the world, Psacharopoulos and Patrinos (2018) demonstrated that the private return on investment in education averages approximately nine percent for each additional year of schooling, with returns tending to be higher in developing countries. A limitation of this approach is the difficulty in measuring the non-monetary benefits of education—such as those related to health, civic engagement, and social cohesion—as well as its reliance on historical data.

This approach focuses on alternatives that yield benefits exceeding their costs. It is based on the assumption that an individual's contribution to the national income is proportional to their level of education, and that income disparities within a society stem not from differences in innate ability or background, but from disparities in the capacity to finance one's education.

4. Social Demand Approach: This is an educational planning method that determines the scope of educational opportunities based on the demand for education from individuals and families. The planner estimates how many people will wish to enter a particular educational level or program in the future and anticipates the necessary resources—such as schools, enrollment capacities, teachers, and budgets—to meet this demand. Hough (1993) defines the "social demand" approach as one that focuses on projections of students' future preferences to determine the level of educational supply, noting that it centers on the choices made by students and their families—particularly within higher education. The term "demand" here differs from the price-sensitive concept of demand used in economics. What is measured is the number of individuals who meet specific entry requirements and wish to pursue an education; how these

individuals might respond to the cost of that education or the likelihood of securing employment after graduation is frequently not taken into account.

4. THE EDUCATIONAL PLANNING PROCESS IN TURKIYE

Regardless of the level or scope at which it is conducted, planning serves as a roadmap for the future. It acts as a guide, enabling teachers to manage the processes of learning and teaching in a secure and efficient manner. Instructional plans—essentially the planning of a curriculum—indicate how that curriculum will be put into practice. Consequently, plans developed by teachers reflect their own personal philosophies and approaches to the learning-teaching process, as they reveal how the teacher intends to facilitate that process. An effective plan is one that ensures students achieve meaningful learning within a specific timeframe. Furthermore, it should be noted that such plans often emphasize student-centeredness, deep learning, and the application of knowledge to real-life situations; they also incorporate students into the assessment process through methods such as performance-based assessment, peer assessment, and the use of portfolios (student development files).

Educational planning has long been viewed not only as a tool for resolving educational problems but also as an instrument for broader economic and social change. Many educational scientists and administrators, approaching educational planning as a purely technical process, have framed and evaluated it within the context of the role assigned to education in development plans. However, there has been insufficient critical engagement with the underlying objectives—the "aims"—of the educational principles and policies established through this planning framework. It is fair to say that such an inquiry is now a pressing necessity; on one hand, the internal and external challenges facing education are becoming increasingly severe as they persist into the future, while on the other, there are signs of a fundamental shift in the prevailing approach to educational planning.

In Turkey, the history of planning—which emerged concurrently with global developments—is relatively brief. The "planning" model, first implemented in 1929 within the Union of Soviet Socialist Republics (established following the October Revolution), subsequently spread to both "developed" and "underdeveloped" capitalist nations after the Second World War, partly in response to the economic crises that had gripped capitalist countries during the 1930s.

Following these initial experiments with planning, the period between 1950 and 1960 was characterized by a lack of formal planning. In the wake of the May 27 coup—which occurred partly as a reaction to this period—a policy of "planned

development" was adopted (Erder, Karaosmanoğlu, Çilingiroğlu, and Sönmez, 2003). With the 1961 Constitution, the preparation of development plans became a legal requirement in Turkey. Since the First Development Plan, development plans in Turkey have been formulated through a "macro," "centralized," and "phased" approach, characterized by a "holistic" planning perspective that encompasses economic, social, and cultural spheres (Hesapçıoğlu, 2001).

Within the framework of planned development policy, education has also been incorporated into these development plans as a "sector" that addresses the economy's human resource requirements and contributes to social change by raising the educational level of the population. Educational planning efforts within these development plans have focused, on one hand, on securing the resources necessary to fulfill the tasks demanded by economic and social progress, and, on the other, on the allocation of these resources across the various types and levels of the education system.

Development plans stand out as the most strategic policy-setting instruments in the context of educational planning. Turkey implemented its first development plan in 1963. Between 1963 and 1980, the State Planning Organization (SPO) utilized these development plans to revise and implement a "human resources" approach. Theoretically, at least, this approach is also applicable to areas of education beyond the primary level. Since the inception of the first plan, Türkiye's development plans have been prepared within a "holistic" framework—encompassing economic, social, and cultural spheres—and have been characterized as "macro," "centralized," and "phased" in nature. Meanwhile, the National Councils of Education (Millî Eğitim Şûraları) also serve as significant policy-setting bodies. Indeed, the 11th Development Plan (2019)—the first development plan under the Presidential Government System—confirms this, stating that for the 2019–2023 period, the objective is "to enhance human capital through an educational initiative, and to bolster technological and innovative capabilities through a national technology initiative (Tezci, 2023).

Developments within Türkiye's economic and social structure, as well as in its approach to planning—such as the adoption of mixed economic policies, neoliberal economic perspectives, international agreements, and the European Union accession process—have exerted a developmental influence on both educational planning and the education system. Given that education is also viewed as a vehicle for economic and social development, this influence has directly shaped models of educational planning. To achieve the goals set for the education system within these development plans, various policy instruments have been employed. These can be categorized as policies concerning student

flow and guidance, administrative and legal frameworks, personnel management, finance, and social affairs.

4. CONCLUSION

No planner can perfectly foresee the future; the only certainty is that there will be many surprises—both positive and negative. While errors in judgment regarding future trends and possibilities are forgivable, failing to correct such errors once they come to light is not. Therefore, an educational plan must be subject to continuous adjustment and refinement. To ensure that such adjustments are made in a timely manner, there must be adequate mechanisms in place to monitor performance, progress, and shortcomings throughout the process. Although the various stages of the educational planning process—as outlined here—follow a logical progression, in practice, they may also occur simultaneously. While an existing plan is being implemented, it is continuously adjusted to ensure it does not conflict with the development of a new plan. Clearly, establishing an effective planning process is no simple task. Such a process takes years to evolve and mature, though the returns on the effort invested may begin to appear much sooner.

At its core, planning is a process that directs efforts toward the achievement of a specific goal. National development planning is a process that guides all efforts, encompassing both the capacity and the utilization of resources. National educational planning should be oriented toward the goals and normative vision of national development, while also accounting for the internal forces and global trends that shape the direction of that development.

The process of national education and training planning is not merely about reaching quantitative targets; it also concerns making the system more effective and efficient, enhancing the quality of the teaching and learning process, and ensuring that the content delivered aligns with national development objectives. As a mechanism for developing the human resources that will both drive and benefit from national development, education and training must remain in harmony with the broader process of achieving national development goals.

From an external perspective—as viewed by society—the performance of an education system is directly proportional to its "external productivity": the relationship between the resources invested in education and the long-term benefits subsequently realized by students and society as a whole in relation to their overarching goals. The challenge in measuring the external productivity of an education system lies in identifying criteria for these benefits that correspond to the multifaceted nature of educational objectives. Moreover, this difficulty is often significantly compounded by the discrepancies between stated economic

goals and societal expectations. However, if an education system teaches many things that are irrelevant or of little value—whether in terms of the students' future lives or the overall development and enrichment of society—and fails to respond to social and technological change, then that system's productivity is low. In such a case, the way to increase productivity is to change what is being taught. Consequently, educational planners—who in the past were more concerned with expanding the size of the education system rather than improving its internal operations and content—must now urgently turn their attention to matters of structure, content, and methodology. This is because nations are compelled to use their scarce resources efficiently and productively. Educational planning must refine its concepts and analytical tools to examine efficiency and productivity across every aspect of the education system, as well as ways to enhance both. In this context, planners may find techniques such as unit-cost analysis, operations research, systems analysis, and programmed budgeting to be valuable.

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Chapter 3

The Use of Technology in Education and Technological Pedagogical Content Knowledge (TPACK): A Theoretical Framework

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Technology has established itself as an indispensable component of twenty-first-century existence, finding pervasive application across virtually all spheres of daily life, including communication, healthcare, industry, and formal education (Öztürk, 2013). This expanding footprint of technology has generated profound transformations within pedagogical processes, creating novel pathways to refine teaching practices and enrich learning environments. Specifically, the integration of digital tools into educational frameworks facilitates the establishment of learning ecosystems carefully tailored to accommodate students' individual differences and diverse requirements. Because learners vary substantially in their processing speeds, preferred learning modalities, personal interests, and developmental needs, the strategic deployment of technology helps deliver educational experiences closely aligned with these unique characteristics. Consequently, educational technologies present vital opportunities to foster personalized learning by empowering students to interact with course materials in alignment with their specific capacities. Therefore, the proficient application of technological instruments in academic settings directly contributes to flexible, student-centered learning environments that recognize and respect individual variances (Uşun, 2006).

Digital learning instruments furnish students with access to an extensive array of informational repositories, permitting them to investigate topics from multiple vantage points and expand their conceptual horizons. Furthermore, the delivery of prompt feedback streamlines the evaluation of student progress and supports continuous monitoring of learning trajectories. These technological mechanisms also foster the refinement of problem-solving proficiencies by encouraging individuals to diagnose and tackle obstacles encountered in authentic scenarios. Within this framework, problem-based learning models grant students valuable

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opportunities to explore intricate subjects in greater depth, thereby promoting a holistic understanding of the curriculum (Döner & Kesicioğlu, 2023).

The continuous evolution of technology exerts a direct influence on instructional methodologies, particularly within formal classrooms. Consequently, educators must remain cognizant of technological breakthroughs to ensure they equip learners with contemporary knowledge and utilize up-to-date pedagogical strategies (Alkan, 2011). Nevertheless, successfully leveraging educational technologies demands considerably more than mere device accessibility; it requires the thoughtful integration of these instruments into classroom routines, backed by appropriate pedagogical frameworks. When technology is implemented in harmony with curriculum goals, it heightens instructional efficacy and accelerates student comprehension through visual and interactive formats. For example, virtual reality applications empower learners to examine historical milestones and scientific phenomena via immersive simulations, generating enduring and meaningful educational encounters (Aydın & Dedeoğlu, 2017).

Alongside deep content-area mastery, educators require targeted professional development focused on how to smoothly incorporate emerging digital utilities into instructional routines. Embedding technology into academic frameworks markedly amplifies both classroom interactivity and the overall richness of curriculum content. Hence, it is imperative that both current teachers and educator candidates stay informed regarding ongoing technological shifts and pedagogical applications, constantly calibrating their competencies to match these progressions (Hew & Brush, 2007).Technology in education boosts engagement, simplifies complex concepts, and enhances problem-solving skills for real-world challenges (Avcı Ünal, 2010).

Aligning technology with strong pedagogical principles is crucial for both face-to-face and remote instruction. The global health crisis accelerated this digital shift, highlighting the urgent need for teachers and students to adapt to digital infrastructure and cementing distance education as a vital pillar of formal schooling (Kaya, 2002, p. 18).

Digital channels have profoundly reshaped educational practice, with distance education evolving from early correspondence courses into a contemporary discipline anchored by advanced technology and internet connectivity (Karaman & Karabey, 2020, p. 12). By eliminating physical and geographical barriers, distance learning creates novel instructional opportunities, tailored pathways, and expanded horizons for both teachers and learners (Karaman & Karabey, 2020, p. 12).

Digital learning platforms grant students the autonomy to navigate academic content at their individual tempo and within comfortable study environments. Furthermore, these technologies aid learners in identifying their distinct cognitive learning styles. Nevertheless, distance education paradigms introduce distinct challenges. Notably, student attitudes toward digital materials play a decisive role in determining overall instructional quality. Consequently, discerning these attitudes can inform and direct the design and evolution of future digital content. Crafting intuitive, user-friendly tools and strategies that elevate learner participation and interaction remains a primary determinant of success within distance education frameworks. The expansion of distance learning has likewise transformed teachers' professional duties, obligating them to assume novel responsibilities. The disruptions experienced during the pandemic suggest that certain classes may periodically need to pivot toward remote delivery even after resuming in-person education. Accordingly, distance education is projected to maintain a more influential role in post-pandemic teaching processes; thus, evaluating teachers' adaptation levels and proficiencies in this domain is vital for sustaining and improving educational quality.

Use of Technology in Education

The influence of technology on output and productivity has grown increasingly prominent throughout the twenty-first century (Sümer, 2020). Nevertheless, the application of technological instruments within educational settings is not merely a recent phenomenon; rather, its historical trajectory dates back to the introduction of the chalkboard in physical classrooms (Kolburan-Geçer & Bakar-Çörez, 2020). Milestone developments in educational technologies have consistently driven fundamental shifts across distinct eras. Key historical benchmarks in this evolutionary process include the initial adoption of technological devices in instruction during the 1920s (Hannafin & Savenye, 1993), the proliferation of overhead projectors in the 1930s, and the widespread implementation of audio headphones, video recording tapes, and photocopying equipment by the 1950s (Ömrüuzun, 2019). Furthermore, the integration of radio and television broadcasting for instructional delivery in Türkiye during the 1970s illustrates the global reach of this ongoing technological evolution (Aksoy, 2003). In contemporary education, cutting-edge innovations—such as artificial intelligence, virtual reality, big data analytics, and the Internet of Things (IoT)—are assuming a central role. While virtual reality grants learners immersive experiences that transcend traditional physical boundaries, artificial intelligence can tailor instructional content to match unique individual learning styles. Simultaneously, big data enables the granular assessment of student performance

and learning bottlenecks, whereas the Internet of Things enhances interactive classroom dynamics and bridges academic concepts with real-world applications (Kaya, 2019).

Harnessing technology in education requires a systemic shift in pedagogical frameworks rather than just modern hardware, transforming the entire learning paradigm to cultivate twenty-first-century competencies (Türker, 2019). This holistic shift empowers students to critically analyze information, apply knowledge, and solve complex problems rather than merely acquiring facts (Çakır & Yıldırım, 2009).

The swift pace of technological advancement necessitates that nations continuously update their overarching technology strategies to align with emerging innovations (Türel et al., 2020). Consequently, this imperative has rendered the digital transformation of educational systems virtually unavoidable. Both developed and developing nations are actively restructuring their policy frameworks to ensure their educational infrastructures remain compatible with evolving technological trends.

Prominent instances of digital transformation within Türkiye's educational landscape include the Movement to Increase Opportunities and Improve Technology (FATİH) project and the Education Information Network (EBA) platform (Kolburan-Geçer & Bakar-Çörez, 2020; Kaya, 2019). Furthermore, formal curricula have placed growing emphasis on the acquisition of digital competence. Digital literacy encompasses far more than the simple operation of hardware and software; it requires learners to critically evaluate digital content, analyze information accurately, and cultivate robust media literacy proficiencies. The integration of digital competence into the revised core curricula issued by the Ministry of National Education in 2018 demonstrates a clear shift toward reflecting these priorities in nationwide educational governance (Kaya, 2019).

Fostering digital competence is vital not only for individual growth but also for driving broader economic and social advancement. Equipping individuals with these advanced skills enhances their preparedness and competitive edge within an evolving labor market. Nevertheless, to ensure that technology is deployed purposefully and ethically, technical proficiencies must be underpinned by strong moral values and a well-defined sense of social responsibility.

Ongoing technological advancements necessitate the continuous renewal and adaptation of formal education systems. Institutions such as the Organisation for Economic Co-operation and Development (OECD) and the International Association for the Evaluation of Educational Achievement (IEA) serve a pivotal role in assessing and benchmarking educational frameworks internationally. Large-scale international assessments conducted under the auspices of these

organizations—including PISA, TIMSS, and PIRLS—provide nations with valuable comparative datasets to critically analyze their respective educational performance (Türel et al., 2020).

The OECD's 2019 report highlights that while Turkish primary students benefit from computer simulations, teachers face significant integration challenges (Kurtoğlu Erden & Uslupehlivan, 2019).

Consequently, building pre-service teachers' technical skills must be a core pillar of preparation (Powers & Blubaugh, 2005), and practicing educators need continuous professional development to boost their technological confidence. Because the success of digital initiatives depends directly on teachers' integration methodologies (Comi et al., 2017), educational policies must continuously evolve to cultivate these competencies for both active and prospective educators (Kocaman-Karoğlu, Bal-Çetinkaya & Çimşir, 2020).The national expansion of educational technologies in Türkiye gained significant momentum following the launch of the FATİH Project by the Ministry of National Education. The primary objective of this initiative is to modernize the technological infrastructure of schools, thereby enabling teachers and students to utilize information technologies more effectively. The core structural components of the project comprise the following:

- **Infrastructure Enhancement:** Comprehensive upgrading and maintenance of technological infrastructure across schools.
- **Digital Content Management:** Systematic development, curation, and governance of electronic educational resources.
- **Curricular Integration:** Active support for embedding information technologies into course curricula.
- **Professional Development:** Provision of targeted in-service training programs for educators.
- **Safe & Measurable Practice:** Frameworks to ensure that information technology is utilized in a conscious, secure, and evaluable manner.

Following the rollout of this project, the technological competencies of teachers have assumed heightened critical importance. Alongside empirical evidence from Western literature, numerous studies conducted within Türkiye similarly underscore that an educator's mastery of technological tools is fundamental to overall educational success (Seferoğlu, 2004).

Today, learning environments need to be restructured with technology in accordance with individual and social needs. It is important to provide students with environments supported by contemporary technologies and to ensure that teachers have the competencies needed to use these tools effectively (Seferoğlu,

2004). The documents on General Competencies for the Teaching Profession published by the Ministry of National Education also identify technological knowledge as one of the basic competencies teachers should possess (MONE, 2017; MoNE, 2020). In this context, teachers are expected not only to develop their subject-matter knowledge and pedagogical skills but also to continually update their technological competencies.

The increasing need for technology integration in education has also led to an increase in research in this field. Incorporating technology into lesson content requires teachers and pre-service teachers to develop their technological knowledge and skills (Erdemir et al., 2009).

In Ceylan's (2015) study examining the effect of learning objects on pre-service teachers' TPACK competencies, the need to support technology integration and improve teacher training was emphasized.

Türker (2019) investigated teachers' self-efficacy beliefs regarding the use of technology in the classroom. The study found that teachers' beliefs in this regard were high, but their practical use of technology could be limited by technical problems, insufficient educational materials, and time constraints.

In the digital age, the effective use of technology by teachers and pre-service teachers has become an important requirement. Research shows that educators need continuous learning and professional development in order to improve their technological competencies (Kolburan-Geçer & Bakar-Çörez, 2020). Therefore, educational institutions should support training and professional-development programs that increase teachers' competencies in technology.

Findings obtained in the Technology Use in Education course conducted with second-year university students revealed the importance of integrating technology appropriately into the teaching process. Although the students stated that technology has an important place in contemporary education, they indicated that the impact of technological tools depends on using them for the right purposes and with appropriate strategies. It was concluded that technology does not have to be used in every situation, but when used appropriately, it can deepen learning, increase interaction, and support motivation (Kurtoğlu Erden & Uslupehlivan, 2019).

Faculties of education must train pre-service teachers to integrate technology effectively for pedagogical purposes rather than viewing it merely as an auxiliary tool (Demirer & Dikmen, 2018).

Technology transforms teaching and learning by offering interactive experiences, enhancing instructional methods, and helping teachers with material preparation, assessment, and feedback (Komis, Ergazakia & Zogzaa, 2007).

However, providing equipment is not enough; teachers must acquire the necessary pedagogical competencies to use these tools successfully (Hızal, 2019).

The real importance of technology integration becomes apparent through its contribution to students' learning processes. Digital transformation in education aims not merely to use technological tools but to make them an effective component of teaching and learning processes (Atasoy et al., 2020). In addition to access to information, technology expands opportunities to produce, analyze, critically evaluate, and share information. Experiential learning activities carried out with technological tools can support students' cognitive development (Usta & Boğa, 2021).

The technological transformation taking place in education requires teachers to develop their competencies in this area. Gündüz and Odabaşı (2004) emphasize the importance of increasing pre-service teachers' knowledge of information technologies. Technological literacy is not limited to being able to use information technology tools; it also includes using these tools effectively and efficiently for educational purposes.

As technology becomes part of teaching processes, teachers' roles also change. In addition to being transmitters of information, teachers guide students in making sense of and applying information. Materials prepared with technological tools can make learning more interactive and lasting. Visual and audio content presented through interactive whiteboards, tablets, and computers helps students understand topics better. These tools also make it possible to assess student performance quickly and intervene in learning difficulties in a timely manner (Akıska, 2022).

Teachers' attitudes toward technology and their pedagogical approaches affect the success of the integration process. It is stated that teachers who have a positive attitude toward technology are more willing to use these tools in their lessons. Teachers who understand the contributions technology can make to learning can use the tools more effectively in the classroom (Başarıcı & Ural, 2009). Therefore, in addition to providing technological infrastructure, educational institutions should support teachers through professional development, workshops, and mentoring activities.

Technology enables learning processes to be carried out more flexibly and in a more individualized manner. Digital platforms allow students to learn at their own pace and in environments they prefer, while methods such as gamification can make learning more engaging (Özgür et al., 2018). However, the effective use of technology in education requires teachers to continue their professional development and follow innovations. Technology offers advantages such as monitoring student achievement, increasing motivation, making abstract

concepts concrete, and providing rapid feedback (Özdemir & Özdemir, 2019). Taking advantage of these benefits depends on teachers' skills in using technology effectively and their positive attitudes.

Although the use of technology is important at all levels of education, the primary-school years are particularly significant in this respect. Today, children encounter technology at an early age and see digital tools as part of their daily lives. Therefore, primary education needs to be organized in a way that enables children to use technology effectively. The section titled Use of Technology in Primary Schools focuses on explanations, strategies, and examples of practice related to this subject.

Technology integration in education supports the acquisition of skills needed in the information age. These skills include creativity, critical thinking, intercultural communication, collaboration, and problem-solving through technology. Using technological tools for pedagogical purposes contributes to the development of teaching methods, more efficient work by teachers, and the enrichment of students' learning experiences (Paily, 2013).

The dynamic interplay between education and technology has driven transformative shifts in twenty-first-century instructional practices. Whereas technological utilities were historically viewed merely as supplementary aids, they are increasingly recognized today as a holistic framework that underpins and enhances both teaching and learning environments. In educational contexts, technology integration extends far beyond the routine use of computers during lessons; rather, it demands the continuous, systematic, and meaningful embedding of digital utilities directly into pedagogical processes (Uğur & Arkün Kocadere, 2016). Prominent international bodies, such as the International Society for Technology in Education (ISTE), similarly conceptualize technology integration as a foundational structure designed to elevate the quality of instructional delivery and student learning (Friedman, Bolick, Berson & Porfeli, 2009, p. 15). Through this integrated approach, learners develop critical competencies that go beyond mere information retrieval, empowering them to systematically analyze, synthesize, and apply knowledge in diverse contexts.

Furthermore, formal definitions established by professional bodies such as the Association for Educational Communications and Technology (AECT) demonstrate that educational technology cannot be reduced to the simple operation of technical instruments. Instead, technology ought to be understood as a multifaceted, multidimensional process that influences various stages of the cognitive learning cycle (Şimşek, 2016, p. 16). Embracing this comprehensive perspective enables students to engage in richer, more profound educational experiences. Consequently, it is imperative for educators, institutional leaders,

and policymakers to strategically leverage this transformative potential to cultivate the essential competencies required of learners in the modern era.

Information and Communication Technologies (ICT) support more flexible learning approaches by reducing time and space limitations in education. These developments enable students to determine their own learning pace and paths, while allowing teachers to offer learning experiences suited to individual needs (Loveless, 2003; Watson, 2001).

The strategic integration of Information and Communication Technologies (ICT) within educational frameworks serves as a key catalyst in cultivating critical cognitive proficiencies among learners, including complex problem-solving abilities, rigorous analytical thinking, and creative capacity (Allegra, Chiforive & Ottaviano, 2001). Acquiring these higher-order cognitive competencies is essential for individuals navigating and thriving within a contemporary, knowledge-driven economy.

The meaningful deployment of ICT in classrooms depends on teachers possessing strong technical expertise and targeted pedagogical training, which empowers them to deliver high-quality learning experiences (Ayaz, Oral & Söylemez, 2015).

Use of Technology in Primary School

Technological developments have transformed social life in the 21st century and led to the emergence of new approaches in education. The use of educational technologies offers important opportunities to reorganize teaching and learning processes (Altın & Kalelioğlu, 2015). Countries' efforts to make their education systems suitable for the requirements of the age have increased investments in information technologies (Chen et al., 2009). Türkiye also aims to incorporate technology more effectively into educational processes through initiatives such as the FATİH project and the Education Information Network (EBA).

However, technology integration cannot be achieved merely by placing technological tools in classrooms. Effective integration requires teacher training, the use of appropriate pedagogical methods, sustainable funding, and stronger institutional infrastructure. Instructional materials, students, teachers, and school administration are interrelated components of this process (Mazman & Koçak-Usluel, 2011). Yalın, Karadeniz, and Şahin (2007) also emphasize that a comprehensive approach is required for technology to be used efficiently at every stage of teaching and learning.

Digitalization requires the development of new skills and teaching approaches in education. Technological changes affect not only individuals' work and social lives but also their learning processes. Therefore, it is important for individuals

to acquire 21st-century skills so that they can adapt to current and future developments. Technology and digital literacy include the skills of understanding and using digital tools and producing and sharing information through them (Komis, Ergazakia & Zogzaa, 2007). While Industry 4.0 refers to the incorporation of technologies such as artificial intelligence, big data, and the Internet of Things into production processes, digital literacy is an important element of this transformation. Education 4.0, which has developed in relation to Industry 4.0, involves the use of technologies such as artificial intelligence, virtual reality, and augmented reality in educational processes. This approach aims to support student-centered and personalized learning, increase the accessibility of education, and prepare individuals for the professional requirements of the future (Öztemel, 2018).

The introduction of new skills into education systems has led to the development of various policies and practices at national and international levels. The inclusion of digital competence in the primary-school curricula updated in Türkiye in 2018 is one example of this change. Digital competence refers to the effective, safe, and ethical use of digital tools. Organizing curricula in this direction aims to help students acquire the skills required by contemporary life (Özgür et al., 2018).

Practices aimed at integrating technology into primary-school curricula vary by subject and grade level. In Turkish and Mathematics, some grade levels include learning outcomes directly related to technology, while others may not. However, the use of materials such as stories, videos, and music indicates an indirect need for technological tools. Although the importance of technology integration is emphasized in Science courses, practices are sometimes not described in sufficient detail. In English lessons, technology may be useful in certain learning contexts; however, detailed plans and examples are needed to implement this approach (Kaya, 2019).

The Information Technologies and Software course is vital for helping students develop digital skills and avoid haphazard technology use, a need emphasized by INETD (2012) (Çakır & Tazıcı, 2016). Making such courses compulsory and covering ethics, safety, and effective use can support students' digital competencies and help Türkiye achieve its IT goals, though current shortcomings in addressing these topics remain (Çakır & Tazıcı, 2016). Furthermore, effectively integrating technology into primary school teaching requires robust models and approaches to enhance educational quality and support deeper learning.

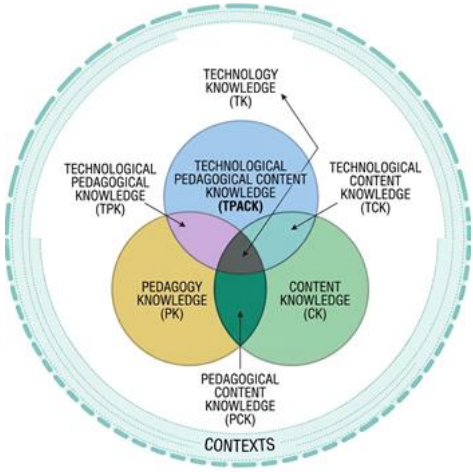
Technological Pedagogical Content Knowledge (TPACK) Model

Technological Knowledge (TK)

Technological Pedagogical Content Knowledge (TPACK) is an integrated knowledge structure that enables teachers to incorporate technology effectively into teaching processes. This approach was developed by adding a technological dimension to Shulman's (1986) understanding of pedagogical content knowledge (PCK). The model, addressed by Pierson (1999) in a doctoral dissertation, examines the importance of the relationships among technology, pedagogy, and content knowledge in teaching processes. The model focuses on the interaction among teachers' Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK).

Pierson's model demonstrates the importance of teachers using these three knowledge areas together in order to prepare effective lessons and support student learning. How teachers integrate their technological, pedagogical, and content knowledge is important for the quality of the teaching process and student achievement.

Figure 1. Components of the TPACK Model.



Retrieved from http://www.tpack.org/. Source: Mishra and Koehler, 2006.

Mishra and Koehler (2006) state that TPACK should be considered not as the simple sum of three independent types of knowledge but as an integrated structure formed through the interaction of these components. When planning lessons, teachers need to consider students' needs, the classroom environment, and the available technological opportunities. Using technology, pedagogical approach, and content knowledge together helps determine appropriate teaching strategies. Therefore, teachers need to understand the relationship among these areas of

knowledge and establish a balance between them (Zhao, Pugh, Sheldon & Byers, 2002).

The concept of TPACK, developed by Mishra and Koehler (2006), provides a comprehensive framework highlighting the interaction of Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Knowledge (TK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK). Through the integration of these interrelated components, TPACK equips teachers to use technology effectively for instructional purposes, serving as a foundational model in teacher education and technology integration research (Mishra & Koehler, 2006).

Content Knowledge (CK)

Effective teaching requires more than theoretical content knowledge; teachers must also know how to convey subject matter, motivate students, and evaluate learning (Shulman, 1986; Koehler & Mishra, 2009; Küçükahmet, 2008).Because inadequate pedagogical methods can lead to student misunderstandings, content knowledge must be paired with teaching skills and student-centered practices (Ball & McDiarmid, 1990). Furthermore, establishing cross-disciplinary connections provides students with a broader perspective, making overall teacher effectiveness dependent on integrating content with pedagogy.

Pedagogical Knowledge (PK)

Pedagogical knowledge encompasses understanding how to structure instruction, apply educational psychology, and address individual student needs to foster critical thinking and lifelong learning (Koehler & Mishra, 2008; 2009).

Building on Shulman's (1986) foundational work, Pedagogical Content Knowledge (PCK) highlights how teachers effectively teach specific topics by integrating teaching strategies, curricula, assessment, and student understanding (Tamir, 1988; Yolcu et al., 2022; Cochran, DeRuiter, & King, 1993). Furthermore, modern educational demands require teachers to combine this expertise with the selection and use of appropriate technologies (Angeli & Valanides, 2005).

Technological Content Knowledge (TCK)

Technological Content Knowledge (TCK) involves understanding how to relate technological tools to lesson content to enrich learning experiences and boost student motivation (Harris et al., 2009; Mishra & Koehler, 2006; Graham et al., 2009).Because not every tool suits every subject—such as virtual reality benefiting history more than mathematics—teachers must carefully select

technology to align with specific lesson content and instructional objectives.The continuous development of technology requires teachers to follow new tools and applications and integrate them into their lessons appropriately. This process is important both for teachers' professional development and for the quality of the education provided to students (Koehler & Mishra, 2009).

Technological Pedagogical Knowledge (TPK)

Technological Pedagogical Knowledge (TPK) involves blending pedagogical strategies with digital tools to enhance instruction, make abstract concepts accessible, and align technology with specific learning objectives (Çoklar, Kılıçer & Odabaşı, 2007). Moving beyond superficial adoption or basic technical fluency, TPK requires continuous professional development and the systematic harmonization of technology with sound pedagogical frameworks to foster deep student engagement and effective learning environments (Çoklar, Kılıçer & Odabaşı, 2007).

An Overview of Technological Pedagogical Content Knowledge (TPACK)

Teachers' professional success is closely related to the pedagogical knowledge they possess and their ability to transfer this knowledge into teaching processes. Pedagogical content knowledge contributes to the evaluation of teachers' expertise and also provides a basis for teacher education and professional-development activities (Mıhladız, 2010; Karahasan, 2010). Success in education is related to how effectively teachers can convey their knowledge and experience to students. According to Shulman (1986), pedagogical content knowledge is the competence that enables a subject to be presented to students clearly and effectively. Technological developments, in turn, have made it necessary to reassess teaching practices. Tools such as interactive whiteboards, projection devices, and geographic information systems require teachers to integrate their teaching methods with technology. As a result of this change, the concept of Technological Pedagogical Content Knowledge (TPCK) came to the fore. This approach addresses how teachers can combine their pedagogical knowledge with technological tools and develop more effective teaching strategies (Koehler & Mishra, 2005).

Teacher-training approaches have changed from the behaviorist understanding of the 1960s toward contemporary approaches based on integrating technology, pedagogy, and content knowledge (TED, 2009). This integration requires not only knowing the subject content but also understanding the methods and technological tools through which it should be taught. Therefore,

it is important for teachers to transfer their technological knowledge into classroom practices (TED, 2009; Kaya, Emre & Kaya, 2010).

Teachers' content knowledge and professional practices are supported by courses offered in faculties of education. The Ministry of National Education has also developed criteria defining teachers' professional competencies. The general competencies of the teaching profession consist of various main and sub-competencies and their related performance indicators (MoNE, 2006:1492-1540). Specific competencies for social studies teachers also address the use of technological tools and information technologies in planning and organizing the teaching process (MoNE, 2008). These regulations indicate that teachers need to master the technologies they can use in teaching, alongside their subject-matter knowledge.

The acquisition of these skills by students is directly related to teachers' technological competencies. Successfully integrating technology into teaching requires teachers to possess the necessary knowledge and equipment (Segall, 2004). Research shows that teachers with TPACK competence can identify students' learning difficulties more effectively and develop strategies to address these difficulties (Akkaya et al., 2009). However, it is also stated that technology integration does not always reach a sufficient level in practice and that shortcomings in this area exist in different countries as well (Šorgo, Usak, Aydogdu & Keles, 2011).

Pedagogical content knowledge refers to a teacher's ability to convey subject knowledge to students effectively (Uşak, 2005). In social studies teaching, it is not enough for a teacher merely to master the subject; the teacher must also present information in ways appropriate to students' levels and needs. Teachers can use their pedagogical content knowledge to identify the points students find difficult, develop suitable teaching strategies, and evaluate learning outcomes. Therefore, knowing a subject in detail is not, by itself, sufficient to teach it effectively (Akkaya et al., 2009).

Pedagogical Content Knowledge (PCK) involves bringing together a teacher's content knowledge and pedagogical knowledge with classroom characteristics and students' needs (Gudmundsdottir, 1990). This type of knowledge is not merely a matter of placing content knowledge and pedagogy side by side; it also includes how these two areas of knowledge interact during the teaching process.

At the core of PCK is a teacher's in-depth understanding of a subject and ability to convey this knowledge in ways suited to students' characteristics (Uşak, 2005). While Shulman's (1986) approach foregrounded student difficulties and teaching strategies, later research also considered knowledge of teaching concepts and assessment and evaluation among the components of PCK

(Yeşildere & Akkoç, 2010). Veal et al. (1999) state that strong content knowledge lies at the foundation of PCK. The development of a teacher's pedagogical skills is closely related to mastery of the subject being taught. Classroom observations, teacher education, and teaching experience are among the sources that support the development of PCK. Teachers' motivation, creativity, and pedagogical competencies also play an important role in this development (Uşak, 2005).

The teaching strategies used by a teacher can directly affect students' learning processes. Teachers with TPACK competence can use technological opportunities to present information more effectively, assess students' cognitive levels more accurately, and develop appropriate examples and teaching methods. It is stated that teachers who take students' cognitive characteristics into account can guide the learning process more effectively (Uşak, 2005; 2009). This situation demonstrates the importance of student-centered teaching.Technological Pedagogical Content Knowledge (TPACK) provides a framework for teachers to integrate technology with pedagogical approaches. Adopting this approach helps develop the competencies necessary for the effective use of technology in education. However, transferring TPACK into classroom practices requires specific strategies and models. TPACK is a technology-integration model that places teachers and teacher education at its center. Other technology-integration models serve different purposes and areas of application. Each of these models has its own function, while some offer different solutions to similar problems.

In conclusion, technology integration enriches learning environments, but its effectiveness depends on teachers' technological, pedagogical, and content knowledge. The Technological Pedagogical Content Knowledge (TPACK) framework provides a vital model for teachers to blend these domains, helping them select methods that meet student needs and align technology with instructional objectives. To ensure efficient use, teachers must receive continuous professional development and ongoing support to seamlessly incorporate technology into their classroom practices.

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Chapter 4

The Impact of Student Management on Improving the Quality of Education

Fethi KAYALAR[1]

Student management plays an essential role in improving the quality of education in schools. It refers to the strategies, policies, and activities used by school administrators and teachers to organize, guide, support, and monitor students' academic performance, behavior, attendance, and personal development.

Effective student management creates a positive learning environment where students feel safe, motivated, respected, and encouraged to achieve their educational goals. It also helps schools identify students' needs, address challenges, and improve teaching and learning outcomes. Therefore, student management is not limited to controlling student behavior; it is a comprehensive process that contributes to students' academic success, social development, and overall well-being.

As a central element in the field of education, students—as the subjects of learning—stand out as the most vital component, alongside other educational factors. In the context of evaluating the success of an educational system, students serve as a crucial indicator. Educational success is often reflected in the quality of the students, which manifests in the achievement of superior learning outcomes.

Student management aims to create a conducive learning environment and provide appropriate support for the holistic growth and development of students. This encompasses the management of student data, the provision of guidance and counseling, and the cultivation of harmonious relationships among students, educators, parents, and other stakeholders. Consequently, schools are expected—through the role of their teachers—to implement appropriate methods and approaches, while also making optimal use of their facilities and infrastructure. The objective is to ensure that learning activities are not merely informative, but also engaging and enjoyable for students. Furthermore, schools are expected to provide sufficient scope for students to participate actively in the learning

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process. This is intended to optimally stimulate and develop the cognitive, emotional, and psychomotor dimensions of the students.

The success of a school is generally determined by the extent to which its educational goals are achieved within a given period. Consequently, a distinction arises between effective and ineffective schools. Effective schools demonstrate a high degree of alignment between their planned activities and the outcomes they achieve. Such schools continuously refine their programs each year to foster student competencies capable of adapting to advancements in science and technology, as well as changes in the global environment. Therefore, an effective school is one that achieves a high degree of alignment between the outcomes resulting from educational planning and the goals established beforehand. Effective schools possess sound, transparent, and accountable management capable of strengthening all school components to successfully attain institutional objectives.

The methodology employed in this research is a literature review, which examines the development of student management in the context of improving educational quality.

2. STUDENT MANAGEMENT

Student management refers to the efforts directed toward organizing students throughout their time at a school—from the moment they enroll until they graduate (Patel 2026; Shelke, Khan and Avinash, 2025; Sudrajat, 2010). It encompasses activities that are consciously planned and executed for all students within an educational institution, alongside the provision of continuous guidance, to ensure that students can participate effectively and efficiently in the teaching and learning process, thereby achieving established educational goals.

Based on these definitions, it can be stated that student management involves the efforts to organize, supervise, and provide services related to students, ensuring they are able to meet their learning objectives from the time they enter the school until their graduation.

2.1. Scope of Student Management

- **Student Planning:** Planning for students is essential, as it allows for careful consideration of all relevant factors and surrounding circumstances. In this way, any issues that arise can be addressed promptly.
- **Admission of New Students:** The admission of new students is one of the most critical aspects of student management. This process involves several stages: (1) student admission policy, (2) student admission system, (3) criteria for

the admission of new students, (4) procedures for the admission of new students, and (5) issues related to the admission of new students.

- **Student Orientation:** Students who have completed the re-enrollment process enter a student orientation period at the school. This orientation takes place during the initial days of the school term. This section, which falls under the scope of Student Management, covers the following topics: (1) the rationale and limitations of student orientation, (2) the goals and functions of student orientation, (3) the first days at school, and (4) the student orientation process itself.
- **Management of Student Attendance and Absenteeism:** The physical presence of students at school is essential; without it, teaching and learning activities cannot take place. A student's presence is a prerequisite for the interaction required for teaching and learning to occur.
- **Student Grouping:** Students who have re-enrolled must be grouped or classified. This classification is not intended to segregate students, but rather to support their academic success. The activities covered in this section include: (1) the necessity of grouping, (2) discourse on grouping, (3) types of grouping, and (4) grouping and class divisions.
- **Organization of the Assessment of Student Learning Outcomes:** Assessing student learning outcomes is crucial for monitoring their progress over time. The evaluation of student learning outcomes aims to determine whether students are performing to the expected standard. The activities covered in this section include: (1) the reasons for the need to assess student learning outcomes, (2) the limitations of assessing student learning outcomes, (4) techniques for assessing student learning outcomes, (5) criteria for assessing student learning outcomes, and (6) follow-up assessment of student learning outcomes.
- **Organization of Student Learning Outcome Assessment:** Assessing student learning outcomes is essential for periodically monitoring student progress. The assessment of student learning outcomes aims to determine whether students are performing to the expected standard. The activities covered in this section include: (1) the reasons for the need to assess student learning outcomes, (2) the limitations of assessing student learning outcomes, (4) techniques for assessing student learning outcomes, (5) criteria for assessing student learning outcomes, and (6) follow-up assessment of student learning outcomes. Both aspects must be handled effectively; otherwise, it could lead to prolonged chaos and disorder, potentially disrupting all school activities.

- **Codes of Ethics, Disciplinary Boards, Penalties, and Student Discipline:** Education is based on specific norms for students. These norms and rules require students to comply with them. Furthermore, educators themselves must set an example by adhering to the traditions and rules established within educational institutions.

2.2. Objectives of Developing Student Management

The objectives of developing student management are as follows:

• *To improve relationships between schools, students, and parents.* Strong communication and cooperation between school and family serve as the cornerstone for a child's success at school. When these two vital institutions work in tandem, they maximize the child's academic, social, and emotional development. A child does not acquire academic knowledge solely at school; they also develop values, attitudes, and social skills at home. Alignment between school and family helps the child integrate the knowledge and experiences gained across these different learning environments.

Research indicates that students whose families maintain regular communication with the school and participate in school activities tend to achieve higher academic success. When families are informed about what happens at school and provide support to their children, it positively influences the learning process. Consistency between school and family fosters a sense of security and stability for the child. Discussing challenges encountered at school within the home environment—and seeking solutions together—lightens the child's emotional burden and helps mitigate adjustment issues.

Open communication between school and family enables the early identification of behavioral concerns, allowing them to be addressed through consistent approaches. Having similar rules and expectations both at home and at school prevents confusion and helps the child establish healthier boundaries.

Regular information exchange between teachers and families facilitates the early detection of learning difficulties or special needs, ensuring that the child receives timely and appropriate support.

When a family values education and collaborates with the school, it conveys to the child that learning is important. Feeling supported by their family, the child becomes more motivated to learn and develops a stronger sense of connection to their school. Families can provide teachers with valuable insights into their children's interests, strengths and weaknesses, learning styles, and personal characteristics. This, in turn, helps teachers approach each child in a more individualized and effective manner.

• *To Adapt to the changes in education.* The process of adjusting to school is a transitional period for children who are encountering the school environment for the first time or returning after a long break. Developing behaviors appropriate for the school setting is crucial for this adjustment. Adhering to rules and establishing suitable relationships with peers are among the developmental tasks a child must undertake. School adjustment signifies a child's familiarity with and comfort in the school environment, as well as their sense of school belonging and academic success. The foundation of a child's adjustment process lies in their individual abilities, skills, adaptive traits, and interpersonal environment. The concept of school adjustment is interconnected with various other facets of a child's educational experience, including their perceptions of the school environment, their actual school experiences, their sense of belonging, their school readiness, and their academic performance.

• *To ensure the effective management of educational resources.* To facilitate student learning, educational resources must be utilized in an appropriate, organized, and planned manner. In this context, educational planning, the use of infrastructure, and the economics of education come to the fore.

• To enhance student motivation and learning outcomes. Education plays a significant role in every individual's life. However, maintaining students' interest and motivation in their studies can sometimes be a challenging process. Especially today, with the increase in potential distractions, it can become even more difficult for students to stay focused and engaged in their learning.

Setting clear and attainable goals is an excellent starting point for boosting student motivation. Goals help students understand what they are working toward and provide them with a sense of direction. Specific objectives—such as achieving a certain score on an exam or successfully completing a project—serve to motivate students. Reaching these goals through small, incremental steps builds self-confidence and provides the courage to pursue even greater achievements.

Every student is unique and possesses different interests. Identifying these passions and hobbies offers an opportunity to tailor lessons accordingly. For instance, incorporating sports-related examples into a physics lesson for a student with an interest in sports can make the subject matter more meaningful to them.

Group work allows students to develop their social skills while learning from one another. Collaborating with others fosters a sense of responsibility and enhances motivation. Furthermore, receiving support within a team helps ensure that students do not feel isolated.

• To create a suitable learning environment. To achieve the desired level of effectiveness in education, a positive classroom environment must be established.

In classrooms where negative student behaviors are absent—or where such issues are easily resolved—students feel comfortable and secure, allowing them to focus their attention on the lesson. To maintain order in the classroom, students must be aware of the behaviors expected of them. While students can learn these expectations over time through a system of rewards and punishments, this approach is not only time-consuming but can also lead to unpleasant situations within the classroom. Therefore, it is essential to communicate the expected behaviors to students as soon as they begin school.

• To support the improvement of graduate quality. This objective highlights the importance of developing student management in enhancing the quality of graduates. By effectively managing students and providing a relevant, comprehensive education, student management can make a significant contribution to producing high-quality graduates who are well-prepared to meet the demands of the professional world or further education.

3. STUDENT PLANNING

Effective student planning relies on creating a realistic roadmap that balances lessons, assignments, breaks, and social activities. The focus of planning encompasses aspects ranging from the admission of students to the development of a comprehensive perspective regarding them. The steps for student planning begin with forecasting, goal setting, program preparation, scheduling, and the allocation of financial resources (Imron, 2015). At the planning stage, the institution organizes student intake based on capacity, student interests,school resources, and teacher availability (Mayasari, Arifudin, Herawati, Rosanti and Prayogi 2024).

Planning related to students covers areas such as the admission of new students, the graduation process, dropout rates, and student transfers. Specifically, this planning centers on student admission activities and the steps involved in registering or documenting individual students—a process inseparable from the recording or documentation of learning achievements—both within and outside the curriculum—as well as other relevant aspects. The initial stages of student planning include the analysis of student needs, recruitment, selection, orientation, and placement, as well as registration and reporting.

Student Orientation. Student orientation is an activity conducted during the admission of new students, designed to familiarize them with the circumstances and conditions of the educational institution where they will pursue their studies. This activity aims to ensure that students understand and comply with all regulations in effect at the school, enabling them to participate actively in the various activities organized by the institution. Furthermore, the orientation

process seeks to prepare students—physically, mentally, and emotionally—for their new environment. The level of academic success can be influenced by the school environment in which learning takes place.

Factors such as teacher competence, instructional approaches, the alignment of the curriculum with students' ability levels, the state of school facilities, classroom conditions, class size, and the implementation of rules and regulations can all affect student engagement and academic achievement.

Student Grouping: School principals and teaching staff must recognize the importance of identifying students within the learning process. A concrete step for the institution to take is to incorporate student identification activities into the planning and implementation of the school's annual program. This process should not be a one-time implementation but rather an ongoing endeavor, subject to regular evaluation for the purpose of continuous improvement and development. The primary objective of this identification is to recognize the potential of each student. Based on this potential, students can be grouped according to their abilities (Tokan, 2016).

Integration in student grouping is carried out by taking into account factors such as age, gender, and other relevant aspects. Meanwhile, differentiation in student grouping is based on individual characteristics, including specific abilities, skills, and areas of interest. In addition to these two points, other factors to consider during grouping include friendships, achievement, talents and skills, interests and areas of focus, and intelligence.

Classroom Management: Classroom management is the primary and foundational step in the hierarchy of educational management. For the sake of better education, it is becoming increasingly important to develop not only the pedagogical skills of teachers but also their managerial competencies. There are numerous variables—both external and internal—that influence classroom management. External variables include the broader environment (such as mass media) and the immediate environment (such as family, peer groups, the school's structure and resources, its management style, the number of students, and the curriculum being implemented). Internal variables, on the other hand, consist of factors such as teacher characteristics, student characteristics, classroom structure, the educational curriculum, and instructional methods.

The classroom is distinct from other social settings due to certain inherent characteristics, which in turn create unique requirements for its management. One such characteristic is "multidimensionality," which arises from the diverse life experiences that students bring into the classroom environment. A single event in the classroom can lead to a wide range of outcomes, depending on the individual characteristics of the students involved. Another feature is "simultaneity"—the

fact that multiple events occur in the classroom at the same time. While teaching a lesson, a teacher might simultaneously observe students, intervene to stop a student's disruptive behavior, and grant permission for another student to enter the room. The need to address numerous events within a short span highlights the "immediacy" or "rapidity" of the classroom environment. Because these events can arise at the most unexpected moments, the classroom is also characterized as "unpredictable." Often, a teacher does not have the luxury of time to deliberate before intervening; instead, they must make decisions rapidly. Furthermore, because events in the classroom unfold in the presence of all students, the environment is characterized by "publicness" (or "openness"). Finally, "durability" (or "long-term continuity") is yet another defining feature of the classroom environment. Spending a long time together in the same classroom enables students to develop a shared culture. Classroom management takes place under these unique conditions.

Learning Assessment: Assessing students' learning outcomes is essential for understanding their progress over a given period. The purpose of evaluating student outcomes is to determine the extent to which they have achieved performance levels consistent with established standards. Educators bear full responsibility for conducting these learning assessments. To effectively meet assessment objectives, educators must adhere to the principles of assessment techniques. In general, assessment techniques can be categorized into two types: tests and non-test methods. (Imron, 2015)

Improving the quality of education through effective student management involves a series of steps and strategies that educational institutions can implement. The following steps can contribute to enhancing educational quality through effective student management:

• *Identifying Student Needs:* First and foremost, the needs of individual students and student groups must be identified. This encompasses academic, social, emotional, and physical needs. Surveys, observations, and active communication should be employed to gain a better understanding of the students.

• *Designing an Appropriate Curriculum:* A crucial factor in achieving educational goals and objectives is the curriculum—the foundation upon which the teaching-learning process is planned and implemented. It encompasses all planned learning experiences organized by a school, based on its specific educational aims and objectives. While in traditional educational systems the term "curriculum" often refers to a set of subjects or courses arranged in a specific sequence for instructional purposes, in modern educational systems, it spans the entire spectrum of individual and collective life—covering both school-based and

non-school-based domains. In this sense, it adopts a more forward-looking perspective; it is student-centered, incorporates a comprehensive range of experiences gained through diverse activities, and seeks to foster the development of the student's personality. Viewed in this light, the curriculum can be understood as a process of selecting subjects or content, or as a structured plan designed for the systematic implementation of educational activities.

• *Utilizing Educational Technology:* According to the "constructivist" approach—which posits that learners construct their own knowledge within a specific context and through learning tasks—educational technology aims for more than just the acquisition and recall of discrete units of information; it targets the development of knowledge, skills, and attitudes. To this end, it seeks to foster learner motivation and ensure active participation in the learning process. In this way, knowledge can be translated into performance (for example, through problem-solving). Furthermore, these intended learning scenarios are not limited to primary, secondary, or higher education levels; they extend from the preschool period to vocational training, professional development, adult education, lifelong learning, and informal learning activities.

• *Providing Guidance and Counseling:* Through guidance and psychological counseling services within the educational process, the aim is to support students' social-emotional, academic, and career development, while helping them better understand and improve themselves. To achieve this, school administrators, guidance counselors/psychological consultants, teachers, and parents must work in cooperation and harmony. One essential way to ensure this is to foster an accurate understanding of these services and to develop a shared perspective on the matter.

The individual lies at the heart of guidance services. In a school setting, the individual with whom guidance is concerned is the student. Every student possesses a capacity that can be developed. The guidance approach inherently views the individual as valuable and places trust in the individual's own strengths. With the right support, an individual can become self-sufficient in resolving the problems they encounter.

• *Developing Coaching Programs:* Coaching programs that foster the development of students' character, leadership, and social skills should be established. Extracurricular programs, clubs, and social activities can help achieve this.

• *Collaborating with Parents and the Community:* Strong partnerships should be built with parents and the broader community. Parent-teacher meetings, parent education programs, and collaborative projects can strengthen parental involvement in student education.

• *Monitoring and Evaluating Student Progress:* Student progress must be monitored and evaluated on a regular basis. Data should be used to provide feedback to students, educational staff, and other relevant stakeholders. This enables the identification of areas that require further attention.

• *Training and Development of Educational Staff:* Training of personnel is a vital process for continuously enhancing the knowledge and skills of employees and adapting them to the evolving needs of an organization. Training fosters growth at both the individual and organizational levels, thereby boosting the success of both the employees and the business. Employee job satisfaction and productive performance depend on how well individuals are aligned with their workplace; therefore, businesses should place great importance on staff training.

Staff training is highly significant, both for increasing workplace productivity and for developing the qualifications of personnel for their future careers. In addition to traditional, face-to-face training, online staff training has recently become an increasingly preferred method.

• *Inclusion of Students with Special Needs:* Inclusive education refers to special education practices based on the principle that individuals with special educational needs should pursue their education—supported by supplementary educational services—alongside their peers without disabilities, within public or private preschool, primary, secondary, and non-formal educational institutions. This form of education is provided to students whose physical, intellectual, emotional, or social developmental characteristics differ from those of their age-mates, yet who continue their education—either on a full-time or part-time basis—together with their peers.

• *Continuous Evaluation and Improvement:* Regular assessments of student management practices should be conducted, and the results should be used to implement necessary improvements. This improvement process must be an integral part of student management.

• *Positive School Culture:* The school and classroom environment in which students receive their education have a significant impact on their academic and social development. Establishing a positive learning environment profoundly influences an individual's self-esteem, self-confidence, happiness, and sense of belonging.

The "Century of Türkiye Education Model" (Türkiye Yüzyılı Maarif Modeli) recognizes each individual—with their unique characteristics—as an integral part and an asset to society; it emphasizes the personalization and enhancement of the quality of educational activities. When individuals who possess social and emotional skills share the same learning environment, it contributes to the

creation of a positive atmosphere and fosters a constructive classroom and school climate.

Social acceptance refers to an individual being welcomed by others and included within a group. Ensuring social acceptance, alongside providing academic support, is a key objective of inclusion and integration practices. These practices aim to facilitate the active participation of all students—including those with special needs—in every aspect of their educational life. Teachers should be aware of the factors that influence social acceptance and take measures to promote interaction between students with special needs and their peers.

• *Parental and Community Involvement:* Parental involvement refers to families actively participating in their children's educational journey, staying informed about school activities, and maintaining regular communication with teachers. Research indicates that children whose parents are involved in their school life demonstrate higher academic achievement, develop more positive attitudes, and show improved school attendance rates. Parental involvement conveys a clear message to the child: "Education is important, and your success is valuable to me." This boosts the student's self-confidence and motivation, fostering a greater eagerness to learn. Furthermore, when teachers collaborate with parents, they gain a better understanding of each student's needs, allowing them to create personalized development plans.

The participation of parents in school-related activities is one of the most powerful factors positively influencing a child's academic performance. Activities that may seem simple—such as providing support with homework, spending time together during reading sessions, or assisting with school projects—strengthen the child's learning process.

Families who attend parent-teacher meetings and engage in regular discussions with educators gain a deeper understanding of their children's strengths and weaknesses. This awareness enables them to establish a more effective support system at home. For instance, they might create additional study programs for a student struggling with mathematics, or provide encouragement to further develop talents in areas where the child excels.

• *Student Participation:* Students should be given the opportunity to participate in the decision-making process and to express their input regarding their learning experiences.

• *Transparent Assessment and Reporting:* The process of assessing and reporting student progress should be transparent and accessible to all relevant parties. This fosters accountability.

• *Rewards and Recognition:* Rewarding and recognizing student achievements can provide additional motivation and strengthen enthusiasm for learning.

3. ENHANCING THE QUALITY OF EDUCATION

Education is one of the most significant determinants of a society's current level of prosperity, as well as the social and economic mobility between generations. It is well understood that the quality of education—rather than merely the duration of time spent in the education system—is the more critical factor for a nation's development; meanwhile, global trends are rapidly shifting expectations regarding what education should deliver. Enhancing the quality of education requires a multifaceted effort, and the policies implemented must be complementary. In this context, key priorities for the coming period should include: improving student skill levels, strengthening values-based education, enhancing the quality of schools and teachers, updating curricula and learning environments, bolstering early childhood education, ensuring equal opportunity, and establishing effective governance within the education system. (Puspita, 2021; Darling-Hammond and Gardner 2022; Supriyanto, 1997

One method applied to address various issues related to educational quality is Total Quality Management (TQM). TQM is a management strategy aimed at fostering awareness that quality is essential across all processes within an organization. The concept of Total Quality Management encourages continuous improvement by involving every member of the organization. The primary focus of TQM lies in commitment, key mapping, and development, all directed toward achieving desired goals (Aziz, 2015).

Consequently, continuous change or innovation within an institution or organization fosters a new culture of behavior. This behavior encompasses efforts to respond to changes, ultimately leading to a culture of quality within the institution. In an educational context, quality management is a process designed to meet the expectations and ensure the satisfaction of stakeholders, such as faculty members and students. Innovation, the distribution of responsibilities among staff, and the structuring of work arrangements are all integral components of educational management.

As noted here, Total Quality Management (TQM) is a practical and strategic approach that focuses on meeting internal needs and encompasses the entire organization. Its objective is to achieve better development and superior outcomes. The TQM philosophy incorporates several principles, including the continuous improvement of processes, organizational transformation, the integration of leadership roles across all levels of the organization, and management practices that do not cause harm to the organization. Thus, in any society, education can be interpreted as a continuous learning process. Educational institutions must ensure that all operations are conducted optimally, foster innovation, and remain focused on learning activities. Furthermore, these

institutions should motivate students, cultivate collaboration between faculty and the student body, and adopt a consultative approach to effectively fulfill their core mission of facilitating learning.

Educational institutions should implement innovative measures to improve performance that falls short of student expectations. The objective is to provide students with motivation and diverse practical experiences, aligned with the principles of Total Quality Management (TQM) across all aspects of educational life.

3.1. The Impact of Developing Student Management on Improving Educational Quality

Educational quality is one of the most critical issues in the field of education. High-quality education produces graduates who are well-qualified and prepared to face future challenges. Student management is a key factor influencing educational quality; effective student management supports the achievement of educational goals—namely, the development of intelligent, principled, and independent graduates. Student management encompasses the planning, organization, implementation, and oversight of all activities concerning students within an educational institution. Such activities include the admission and placement of new students, the fostering of student development, and the provision of student services.

The development of student management has a significant impact on enhancing the quality of education. Some of the outcomes resulting from the development of student management include the following:

• *Improved quality of instruction*: Student management enables teachers to teach more effectively and adapt to student needs, thereby enhancing the quality of instruction.

• *Increasing educational capacity:* Improving student management can also increase the number of students an educational system is able to accommodate.

• *Bridging the gap between practices and the learning process:* Student management involves interaction with students, aimed at narrowing the gap between implemented practices and the actual learning process.

• *Enhancing performance—internally and externally:* Beyond the primary goal of improving educational quality, the development of student management can also boost performance in terms of operational efficiency and quality, both internally and externally.

• *Protecting the rights of stakeholders*: Improving student management also safeguards the rights of stakeholders—such as teachers, students, and parents—which is reflected in the implementation of quality assurance. Various studies

indicate that the development of student management can enhance the quality of education.

3.2. Challenges in the Development of Student Management

The development of student management faces several challenges that must be overcome to achieve optimal results. Some of the common challenges encountered when improving student management include:

• *Student Diversity:* Every student has unique needs and characteristics. These challenges encompass varying learning abilities, diverse cultural backgrounds, and differences in learning styles and proficiency levels. Student management must be capable of addressing this challenge by providing an inclusive and differentiated approach to learning.

• *Technological Advancement.* Rapid technological advancements are influencing the ways in which learning and teaching take place. Key challenges in this area include the integration of technology into learning, the use of online platforms, and the management of student data. Student administration must keep pace with these technological developments, ensuring that the necessary infrastructure and expertise are in place.

• *Parental Involvement.* Another challenge concerns the participation of parents in education. Strong collaboration among schools, students, and parents is essential for achieving positive outcomes. This involves communicating student progress, engaging parents in school activities, and providing support to parents so they can effectively assist in their children's education.

• *Management of Disciplinary Procedures:* Student administration also faces challenges in managing disciplinary matters. This includes creating a safe and disciplined environment, developing fair and consistent policies, and implementing effective approaches to address negative student behavior.

• *Effective Assessment and Evaluation.* Another challenge lies in the effective assessment and evaluation of students. Student administration must be able to develop comprehensive and fair assessment methods, as well as provide constructive feedback to enhance student learning achievements.

To overcome these challenges, it is crucial for those responsible for student administration to stay abreast of educational developments, strengthen collaboration with all relevant stakeholders, and implement effective strategies that support student development in a holistic manner.

4. CONCLUSION

Effective student management helps monitor students' academic progress through assessments, classroom participation, homework, and regular feedback. When teachers identify students who experience learning difficulties, they can provide additional support and appropriate learning strategies. This improves academic achievement and helps students reach their full potential. The development of student administration is a vital effort toward enhancing the quality of education. By effectively managing students, schools can create a conducive learning environment and support their holistic growth and development. Although challenges exist in improving student management, efforts to enhance its quality are crucial for achieving optimal educational goals. Integrating technology into student management can improve the quality of education by providing greater access, more personalized learning experiences, and various tools; it is essential for monitoring and fostering student progress. However, it is important to ensure that technology is used wisely and in alignment with broader educational objectives.

Effective student management should not be limited to maintaining discipline and controlling classroom behavior. Rather, it should be understood as a comprehensive educational approach that supports students' academic, personal, and social development. Furthermore, successful student management depends on cooperation among school administrators, teachers, parents, and students. Schools should establish supportive learning environments, implement positive discipline strategies, encourage student participation, and use appropriate technologies to monitor academic progress.

In conclusion, improving student management is an important step toward improving educational quality. When schools adopt effective, inclusive, and student-centered management practices, they create better learning opportunities and contribute to the development of responsible, motivated, and successful individuals. Therefore, student management should be considered a fundamental priority in educational planning and school administration.

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