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Analysis and Validation of the Concept of Smartness among Iraqi Elementary School Students

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ABSTRACT

Objective: The primary objective of this investigation was to critically examine and substantiate the notion of smartification within the context of Iraqi elementary school students.

Methods: The methodological framework employed was a mixed-method approach, encompassing a qualitative dimension rooted in the synthesis research model as delineated by Klein, alongside a quantitative dimension involving validation through consultations with domain experts in curriculum planning and media as well as information management. The field focus of the synthesis study aimed to elucidate the concept of smartification, utilizing reference texts that delineate the analysis of this concept. The sampling technique adopted in the synthesis study was purposive. Data analysis was conducted qualitatively through the synthesis study methodology, while the quantitative analysis was performed utilizing the Lawshe coefficient (Content Validity Ratio).

Results: The analysis of the survey responses indicated that the management system encompasses various domains including the administration of school affairs, management of educational resources, human resource management, financial resource oversight, equipment management, technological infrastructure, and security measures; the teaching and learning environment is intricately linked to the curriculum, educational content, pedagogical approaches, educational materials and equipment, as well as evaluation and implementation factors; empowerment is associated with the development of student competencies, teacher capabilities, staff qualifications, managerial skills, and professional development courses; hardware is connected to essential equipment, peripheral devices, communication technologies, and resource centers; while software pertains to content management systems, communication applications, educational software, administrative software, and security and support systems.

Conclusions: The outcomes of this research may serve as a foundation for the conceptualization of smart learning environments within Iraqi educational institutions.

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Introduction

The role of social development is manifested in observable behavioral characteristics. Every behavior in children emerges based on learned values and their unique physical characteristics. The transition of a child into primary school is accompanied by particular behavioral patterns, and it is the responsibility of the school to either adjust or model these behaviors (AkbarKhansari et al., 2023; Correia & Marques-Pinto, 2016). Through this process, the alignment of behaviors with human and divine values becomes possible. Media literacy, in this regard, is defined as the ability to access media, critically understand and evaluate various aspects and content of media, and create communication across diverse contexts (Felini Ed D, 2014; Potter, 2013).

The primary school period is a crucial stage in which students are in a state of emotional, physical, and psychological growth. Therefore, teachers and parents must be aware of the distinct characteristics of students at this age in order to address their various needs more effectively. The importance of this stage in fostering and developing students' talents is such that, within the framework of the new education system, it has been referred to as the "foundation" stage (Einarsdottir, 2006). Childhood, with its receptive and eager spirit for learning, provides a fertile ground where every activity leaves an enduring imprint, much like a carving in stone (Elango et al., 2015).

A "smart school" is an institution in which all processes—including management, supervision, control, teaching–learning activities, instructional and supplementary resources, evaluation, documentation, and administrative affairs—are implemented based on information and communication technology (ICT), with the aim of improving the educational and research-oriented system (Soltani, 2012). Smart schools have the capacity to offer diverse educational opportunities for students, including those with attention deficit hyperactivity disorder (ADHD), in ways that enhance their academic performance. In this context, the production of knowledge positions smart schools as educational environments that pave the way toward a knowledge-based society. The establishment of smart schools is one of the strategies adopted to respond to modern educational needs (Mogas et al., 2022).

In these schools, learning is individualized, self-directed, and integrated across different subject areas. Instructional content is not limited to printed textbooks (Albu, 2015) but also includes e-books, multimedia software, and information databases. The smart school model represents an

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innovative educational approach that, by integrating ICT with curricular programs, brings about fundamental changes in teaching and learning processes (Ibrahim et al., 2013). Within this approach, the teacher assumes the role of a guide rather than a transmitter of knowledge, while the student becomes an active, creative, critical, and engaged participant, as opposed to a passive consumer of knowledge. Furthermore, assessment shifts from a results-oriented to a process-oriented system (Bajaj & Sharma, 2018; Yamijala et al., 2025).

Advancements in science and technology have made changes in educational activities inevitable. In this regard, the smart school initiative has been implemented to create a platform for continuous, enjoyable, and deep learning, as well as to strengthen students' motivation and creativity (Behjatiardakani et al., 2018; Huh & Lee, 2020). These schools, built upon ICT and technologies such as artificial intelligence and the Internet of Things, have transformed educational processes through multimedia content, peer-to-peer teaching–learning interactions, and enhanced student engagement. This paper first introduces smart schools and outlines their objectives and characteristics. It then examines the implementation process, required infrastructure and technologies, and existing challenges. Finally, it reviews the presence and development of smart schools both globally and in Iran (Farahani & Khoda Bande Loo, 2016)

The education system requires schools that, by harnessing ICT, enable continuous learning and provide individuals with novel opportunities to experience life in the information society. Here, technology should be regarded not merely as a tool but as an empowering infrastructure for professional education (Pan et al., 2022). The widespread use of ICT in teaching and learning, alongside shifts in global educational paradigms, has created the conditions for the emergence of smart schools. These schools represent a key requirement of knowledge-based societies, aiming to foster students' knowledge skills and entrepreneurial abilities (Seraji & Soleimani, 2016).

A review of previous studies reveals that no comprehensive research has yet been conducted on analyzing and validating the concept of smart schooling among primary school students in Iraq. Existing studies have only addressed relatively related topics. For example, Jahani et al. (2020), Singh and Miah (2020), Li et al. (2015), Varela-Candamio et al. (2018) and Tan et al. (2024) have shown that technological advancements have brought about transformations in all aspects of human life, and the use of ICT—particularly the internet and smart school applications—represents an effective method for addressing educational challenges.

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Smart schools, with their flexible curricula, innovative teaching methods, broad range of educational programs, and emphasis on the central role of students—while considering individual differences, needs, interests, and talents—can help reduce or eliminate the gap between students' educational attainment and their potential. As an ICT-based educational initiative, smart schools aim to innovate teaching–learning processes globally, enhancing the quality of education by making intelligent use of media resources.

From a theoretical perspective, the significance of this research lies in the importance of primary school education for students' learning and future life. The primary stage is one of the most critical phases of education and personal development, where personality is established and shaped. Many individual problems originate in this sensitive stage due to lack of attention or inadequate guidance in the growth process, and these issues often persist into later stages of development (Sekarasih et al., 2018). Therefore, students' development at the primary level is a key determinant of lifelong well-being, and this period offers a vital opportunity for preventing future problems and promoting personal skill development (Alcorn & Cheesman, 2022).

The smart school model is a comprehensive and integrative approach that requires active student participation in the classroom. These schools foster both collaboration and healthy competition, with teachers structuring lessons and activities in ways that enhance cooperative learning and student interaction. Smart school environments stimulate curiosity, which, in turn, leads to increased classroom engagement. Students, teachers, and administrators work together in a coordinated manner to meet all students' educational needs. In today's rapidly evolving world, technology has entered education in transformative ways, and one of the most significant opportunities it presents is the smart classroom. Through modern tools and technologies, substantial improvements in teaching and learning processes can be achieved.

Since smart classrooms aim to enhance learning outcomes not only at the local but also at the systemic level, analyzing the strengths and weaknesses of these approaches is of high importance. This paper examines the current state of education and its challenges, introduces the technologies used in smart classrooms and notes that while international studies have achieved notable advancements in conceptualizing smart schooling, domestic research has primarily focused on recognizing its importance and necessity or on measuring its prevalence based on predefined indicators.

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From a practical standpoint, the findings of the present study can strengthen theoretical knowledge about the concept of smart schooling and assist educational institutions, curriculum planners, and pedagogical specialists in taking effective steps toward its implementation. Accordingly, the research seeks to answer the following question: How can the concept of smart schooling be analyzed and validated among primary school students in Iraq?

Material and Methods

This study employed a mixed-methods design. In the qualitative phase, the concept of smart schooling was analyzed using a research synthesis approach based on the deductive model and following the Klein conceptualization framework. Subsequently, for validation purposes, the extracted information was presented to experts in the fields of curriculum planning and media and information management. Based on the analysis of the concept of smart schooling and the specific characteristics of primary school students, the conceptual framework of smart schooling for primary school students in Iraq was developed.

In the quantitative phase, aimed at validating the proposed framework, experts in curriculum planning and media and information management were asked to assess the validity of both the identified components and the overall framework. The research scope for the synthesis study included reference texts related to the analysis of the smart schooling concept published between 2010 and 2025.

The statistical population for validating the components identified through research synthesis, as well as for validating the overall smart schooling concept, consisted of experts in curriculum planning and media and information management. The qualitative sample in the synthesis phase included 47 sources selected through purposive sampling. For the quantitative validation, two purposive, criterion-based groups of 10 experts each were selected, in line with the minimum required number for conducting a content validity assessment.

Data collection for the synthesis phase was conducted through a library-based method, with note-taking used as the research instrument. In the validation phase, researcher-developed questionnaires were employed. Data analysis in the qualitative phase was conducted through research synthesis, while in the quantitative phase, the content validity ratio (CVR) was calculated using Lawshe’s coefficient to assess the validity of the components identified from the synthesis.

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Results

The findings derived from the comprehensive analysis and critical evaluation of the existing literature, aimed at elucidating the concept of smartness, are systematically illustrated in Table 1. Table 1 Categorized constructs that delineate the concept and its constituent elements of smartness.

Table 1. Categorized concepts representing the concept and components of smartness

No.	Code of related concepts	Replaced concepts	
1	Student Affairs Management Education Management Exam Management Evaluation	School management	Management system
2	Information Resource Management Resources Needed for Curriculum Development Communication with External Resources Using Technology in Teaching and Learning	Educational resource management	
3	Documents and Office Affairs Administrative Affairs Management Promotion and Transfer Management Administrative Staff Training Management	Human Resources Management	
4	Budgeting Accounting Reporting Recruitment	Financial resource management	
5	TIME AND ATTENDANCE DEVICE LAPTOP COMPUTER INTERACTIVE WHITEBOARD	Equipment management	
6	Up-to-date school website Active membership in the school portal Automation system Internet for information search	Technology	
7	Physical Security Information Security IT Security Appropriate Antivirus Software	Security	
8	Preparing students for life in the digital age communication skills Emphasis on thinking skills Developing reflective geometric thinking	Curriculum	Teaching and learning environment
9	Preparation of multimedia educational content Preparation of electronic educational content Use of multimedia content in learning Use of electronic content in learning	Educational content	
10	Blended teaching methods Student-centered teaching method Support for problem-solving method Attention to research-centered	Teaching methods	
11	Digital Educational Materials .Using Computers in Education Educational Aids Image Editing Software	Educational materials and equipment	
12	Electronic assessment Continuous feedback on student performance Student-centered	Evaluation	

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	Centralized assessment of learning		
13	Administrators Students Teachers Parents	Executive agents	
14	Skills in using software and hardware Developing students' skills in using computers Preparing electronic educational content Preparing multimedia educational content	Student skills	Empowerment
15	Having the seven computer skills Multimedia content production by the teacher Electronic content production by the teacher Multimedia and digital content production	Teacher skills	
16	Sharing educational content produced through electronic portals Scientific cooperation and interaction with other smart schools Electronic communication with school audiences Use of software, hardware and the Internet	Employee skills	
17	Designing an Information Technology-Based Curriculum Making Smarter Decisions Choosing the Right Policies	Manager skills	
18	Increasing technical skills Conducting computer training courses Conducting content production training courses	Training courses	
19	Use of multimedia software Use of multimedia teaching tools Production of multimedia content by the teacher	Content software	Software
20	Internet Databases Up-to-date school website Proper server at school	Communication software	
21	Educational Slides Educational Software E-Learning Software	Educational software	
22	Attendance and absence via digital card Informing parents via SMS via automation system Connecting parents to the school system from home	Management software	
23	Filtering software Appropriate antivirus software Appropriate information security mechanisms	Security software	
24	Technology Supply and Implementation Technical Support	Supporting	

Discussion

The purpose of this study was to analyze and validate the concept of smart schooling among primary school students in Iraq. The results of the research question analysis indicated that the smart schooling framework is associated with several key domains:

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Management System – including school affairs management, educational resource management, human resource management, financial resource management, equipment management, technology, and security;

Teaching–Learning Environment – including curriculum, instructional content, teaching methods, instructional materials and tools, evaluation, and operational factors;

Empowerment – including student skills, teacher skills, staff skills, principal skills, and training programs;

Hardware – including core equipment, peripheral equipment, communication equipment, and centers;

Software – including content software, communication software, educational software, management software, and security/support software.

These findings are consistent with the results of prior research by Jahani et al. (2020), Singh and Miah (2020), Li et al. (2015), Varela-Candamio et al. (2018) and Tan et al. (2024), all of whom have referred to similar indicators in their studies. The findings suggest that despite limitations in infrastructure and access to technology, primary school students in Iraq possess a considerable level of awareness regarding the concept of smart schooling and can understand its various components.

The present study revealed that smart schooling in Iraqi primary schools is still at an emerging stage, with levels of awareness and acceptance influenced by multiple factors such as technology access, quality of educational infrastructure, and family support. Achieving the goals of smart schooling in Iraqi primary schools will require precise planning, teacher skill enhancement, and infrastructure improvement. In addition, cultural and social conditions of students must be considered to ensure that smart technologies are effectively and appropriately implemented.

Although smart technologies and technology-based education have not yet been widely or fully integrated at this educational stage, students demonstrate some familiarity with the concept and the capacity to adopt it. This suggests that smart schooling can serve as an effective approach for improving the quality of primary education in Iraq. However, current challenges—such as inadequate technological infrastructure, limited availability of smart educational resources, and a lack of specialized teacher training—are major barriers to its development. Furthermore, cultural, social, and economic factors play a decisive role in how students perceive and utilize smart

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technologies. Family and community support emerged as a key factor in the acceptance and reinforcement of smart schooling.

From a practical perspective, the study shows that achieving smart schooling in Iraq requires coherent, targeted programs that prioritize not only the provision of equipment and infrastructure but also teacher training. Educational programs must be designed and implemented in line with the cultural and social contexts of students to maximize the success and effectiveness of smart education. The analysis conducted in this study can serve as a critical starting point for policymakers and educational decision-makers in Iraq to formulate and implement strategies for expanding and deepening smart education at the primary level. By doing so, more opportunities will be created to enhance students' academic and technological skills, thus fostering comprehensive educational development in the country.

This research provided a thorough examination of the concept of smart schooling among Iraqi primary school students, offering an accurate depiction of the current situation, opportunities, and challenges for developing smart educational technologies at this critical stage. Although students in Iraq have some familiarity with modern technologies and the basic principles of smart schooling, their depth of understanding and actual utilization remain limited and are influenced by a variety of factors.

One of the most significant obstacles is the lack of adequate technological infrastructure in primary schools. The absence of modern equipment, high-speed internet, and sufficient hardware has prevented smart education from being implemented widely and effectively at this level. In addition, the lack of specialized teacher training and the necessary skills to use modern technologies has negatively affected the quality of smart schooling implementation.

Beyond technical constraints, cultural and social factors also play an important role in the acceptance and success of smart schooling. Family support, teacher attitudes, and public perceptions of technology largely determine how students interact with smart educational tools. Without cultural change and greater public awareness, technical and pedagogical efforts alone may not yield the desired outcomes.

Smart schooling represents a valuable opportunity to enhance the quality and equity of primary education in Iraq—provided that existing obstacles and challenges are addressed in a targeted and sustained manner. This study can serve as both a scientific and practical foundation for designing

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future educational policies and programs in Iraq, making the path toward smart education more accessible.

From an applied standpoint, the findings can help educators, curriculum designers, and policymakers in Iraq gain a clearer understanding of the current state of smart schooling and plan more effectively for its development in primary schools. Finally, enhancing technological infrastructure and training teachers in modern technologies are essential prerequisites for advancing smart schooling. Given the significance of this issue, it is recommended that educational policymakers in Iraq adopt a multi-faceted approach—encompassing infrastructure development, teacher training and empowerment, and culturally responsive educational program design. Moreover, fostering active participation from families and local communities in the smart education process could significantly accelerate acceptance and improve the quality of teaching and learning.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All Authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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