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Identification of Dimensions, Components, and Indicators of Educational Spaces in Future Elementary Schools

Mohammadreza Mokhtari[1], Fakhrodin Ahmadi[2], Khadijeh Khanzadi[3]

1. PhD student, Department of Educational Management, Ga.C., Islamic Azad University, Garmsar, Iran

2. Department of Educational Management, Ga.C., Islamic Azad University, Garmsar, Iran, ahmadif@iau.ac.ir

3. Department of Educational Management, Ga.C., Islamic Azad University, Garmsar, Iran

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ABSTRACT

Objective: This study aimed to identify the dimensions, components, and indicators of the educational environment of future schools at the elementary level.

Methods: This research employed a qualitative methodology using thematic analysis. The statistical population consisted of 19 experts in educational management, architecture, educational sciences, and specialists from the Ministry of Education, selected through purposive sampling. Data were analyzed using thematic analysis with Maxqda (Version 2018).

Results: The findings showed that the model of educational spaces for future elementary schools comprises four main dimensions: physical space, technology, educational approaches, and psychological-social support. The physical space dimension includes components such as flexible classrooms, lighting, ventilation and air quality, sound insulation, multifunctional spaces, ergonomic design, safety and accessibility, and outdoor areas. The technology dimension involves digital equipment, internet connectivity, educational software, virtual and augmented reality, robotics and programming, and intelligent learning. The educational approaches dimension includes project-based learning, personalized learning, competency-based education, holistic and interdisciplinary teaching, game-based learning, social and emotional learning, creativity and innovation education, and inquiry-based learning. The psychological and social support dimension includes family support and creating supportive learning environments.

Conclusions: In designing a model for the educational environment of future elementary schools, attention should be given to four key dimensions: the physical environment, technology, educational approaches, and psychological and social support.

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Introduction

The growth and flourishing of a society's citizens are inextricably linked to its educational system. Education can be regarded as the foundation for the intellectual and moral development of members of a cultured and dynamic society. Accordingly, achieving excellence in knowledge and culture—and further advancement in scientific domains—depends on the quality of the educational system. Providing suitable, efficient, and pedagogically aligned learning spaces is therefore one of the most essential requirements for achieving these goals (Hosseini-Nasab, 2013: 14).

In the past decade, technological, social, and cultural transformations have prompted a fundamental rethinking of the concept of school learning environments. Schools are no longer merely places for transmitting knowledge; rather, they are dynamic, flexible, and experience-based learning settings that must align with the needs of the digital generation (OECD, 2022). Research has shown that the quality of educational space design has a direct impact on students' motivation, creativity, and social interaction, and is considered a key element in shaping future-oriented education (Barrett et al., 2021). From this perspective, the learning environment functions not only as a physical context but also as a determinant of student behavior, perception, and cognitive processes.

With the expansion of smart and digital technologies, future schools are transitioning from traditional spaces to hybrid and intelligent learning environments in which in-person instruction merges with virtual learning, and human interaction is integrated with interactive technologies (Könings et al., 2023). Recent studies emphasize that the design of future learning environments must incorporate spatial flexibility, technological capabilities, and responsiveness to individual differences among students, as static environments are no longer adequate for learners in the digital age (Fisher & Cleveland, 2022). In other words, the school of the future operates as a learning ecosystem in which boundaries between physical and virtual spaces dissolve, and learning experiences continuously evolve.

Dewey (1926) defined education as an ongoing process of experiencing, reconstructing experience, and developing individual capacities that enable learners to control their environment and realize their potential. Since educational development occurs within physical, social, cultural, and psychological contexts, the environment plays a central role in shaping students' personality

and performance through curriculum, teaching methods, and interpersonal relations (as cited in Lawrence & Vimala, 2012). According to Gifford (2002), interior architecture and the characteristics of learning spaces can either enhance or hinder students' concentration (as cited in Yang, Creon & Kaor, 2014). Optimal learning space design—such as distinct entryways, quiet private and public areas, and diverse color palettes—improves mutual support and a sense of unity (McGregor, 2004).

The importance of future school learning environments is equally significant from a psychological standpoint. Environments that emphasize emotional well-being, belonging, and human connection foster a positive learning identity and sustained motivation (Veloso et al., 2023). Therefore, the design of future educational spaces must extend beyond the functional use of technology to consider the quality of relationships among students, teachers, and the broader school community. This perspective is echoed in contemporary human-centered education approaches, which conceptualize learning as an experience grounded in human interaction, creativity, and social collaboration (Dudek & Peters, 2024).

Overall, re-examining future educational spaces has become an undeniable necessity for educational systems worldwide. These environments require evidence-based design, integration of technology with educational psychology, and attention to social dynamics to keep pace with technological, cultural, and cognitive transformations among new generations. Recent research indicates that developing such environments enhances learning quality, educational equity, and student well-being, positioning future schools as sustainable learning ecosystems (UNESCO, 2023; Hannon, 2024).

The need to explore the "design of educational environments for future elementary schools" is particularly pressing given that the physical spaces of many existing schools were constructed between 1950 and 1960 and are based on Fordist educational principles. This approach—rooted in individualism and isolated learning—reflects a traditional view of schooling that prioritizes supervision over meaningful learning experiences.

Mehdizadeh and colleagues (2017) demonstrated that dynamic elements such as green space, smell, temperature, lighting, and sound have substantial effects on school environments. Sharifi et al. (2019) identified 22 major categories related to future school development, including causal conditions (technological development and acceptance, participatory policies, capital

development, and forward-looking institutional strategies), contextual conditions (learning policies, social capital, and cultural sensitivity), intervening conditions (discursive tensions, conflicts of institutional power, diversity management, and resource dependency), and strategies (discourse development, creativity, revitalizing school missions, multicultural acceptance, environmental restructuring, and pedagogical rethinking). Hannon (2023) found that the physical design of future schools must focus on the individual and social relationships to promote collective growth and mutual support. These schools should also cultivate identity formation and cultural belonging among students. Jonaha (2023) reported that learning environments significantly influence environmental literacy among elementary students, and that design and decoration enhance student learning. Mugas et al. (2022) showed that future schools will be shaped by smart design, with all structures and systems in Catalonia expected to rely on artificial intelligence and smart learning frameworks. Notably, none of these studies specifically address future learning environments tailored to elementary schools—a gap that underscores the innovation of the present study.

Given these considerations, the structural features of classrooms (such as noise and lighting) and symbolic features (such as cues indicating who belongs to the classroom) can either facilitate or hinder students' academic progress. Considering ongoing transformations in classroom environments, educational policymakers may need to address deficiencies in school facilities and superficial aspects that prevent students from reaching their full potential (Chirim et al., 2014). Evidence further indicates that learning environments play a crucial role in academic achievement by shaping how students perceive and engage with learning.

In many current schools, limited attention to students' emotional, psychological, physical, and cultural needs in designing educational spaces—combined with the neglect of vibrancy and liveliness—has led to widespread dissatisfaction among both students and teachers (Hannon, 2023). Numerous studies confirm that appropriate learning environments significantly influence memory performance and learning outcomes, highlighting the necessity of designing suitable spaces for future schools. The future will undoubtedly differ from the present, bringing new needs and requirements; therefore, planning for both "the student of the future" and "the future of the student" is essential (Perssilva et al., 2023: 233).

Given this importance, the need for extensive research on the design and management of future educational spaces is more urgent than ever. Such research can provide scientific and practical strategies to align educational systems with technological transformations, cultural shifts, and the needs of the digital generation, guiding schools toward intelligent, human-centered, and sustainable models of learning (Dudek & Peters, 2024; UNESCO, 2023). Based on these considerations, the primary aim of the present study is to identify the components, dimensions, and indicators of the educational environment of future schools at the elementary level.

Material and Methods

This study employed a qualitative methodology using thematic analysis and was exploratory in nature. The statistical population consisted of three groups: **(a)** documents and scientific texts, theses, and published articles related to the design and construction of future educational spaces from 2000 to 2024, selected from reputable databases (Scholar, Google, ERIC, EBSCO, Emerald, ScienceDirect, Springer, Magiran, and Irandoc); **(b)** expert faculty members in the fields of educational management, architecture, educational sciences, and art, all of whom held a doctoral degree and had at least three years of teaching or research experience in relevant areas; and **(c)** experienced officials from the Ministry of Education who held a master's degree or higher, had a minimum of five years of executive experience in education or educational policy, and demonstrated relevant academic engagement.

Sampling was non-random and purposive. Based on the principle of theoretical saturation, data collection concluded after interviewing 19 experts, as no new codes emerged during the twentieth and twenty-first interviews. The interviews were conducted in person and semi-structured, held at participants' workplaces following prior coordination. Each interview lasted between 30 and 90 minutes. With participants' permission, all interviews were audio-recorded and subsequently transcribed.

Data were analyzed using thematic analysis with Maxqda (Version 2018). Analysis was conducted across four levels: sub-themes, basic themes, organizing themes, and overarching themes. Several strategies were employed to ensure the credibility and validity of the findings: comparison of themes with previous studies (theoretical triangulation), cross-checking of coding by the

researcher and a statistics expert (inter-researcher agreement), and verification of themes by a subset of participants (participant validation).

To ensure reliability, all research procedures were thoroughly documented, and intra-researcher and inter-researcher agreement tests were conducted, yielding coefficients of 78% and 76.05%, respectively—both evaluated as acceptable.

Results

The highest frequency among participants was observed in the age group under 45 years (8 individuals), while the lowest belonged to those over 55 years (3 individuals), indicating that most experts were relatively younger. In terms of work experience, the group with 10 to 20 years of professional background had the largest share with 10 participants. Gender distribution was relatively balanced, consisting of 10 males and 9 females. Most participants held advanced academic degrees at the master's and doctoral levels. The predominant type of expertise was practical or experiential (11 individuals), and the highest academic concentration was in educational management (9 individuals). These characteristics highlight the emphasis on practical experience and managerial expertise in analyzing future educational environments for schools. A sample of the initial coding process used in this research is presented in Table 1.

Table 1. Sample Template of Themes

Theme	Dimensions	Components
Design of Educational Spaces for Future Elementary Schools	Physical Space	Flexible classrooms; lighting; ventilation and air quality; sound insulation; multifunctional spaces; ergonomic design; safety and accessibility; outdoor spaces
	Technology	Digital equipment; internet connectivity; educational software; virtual reality and augmented reality; robotics and programming; intelligent learning
	Educational Approaches	Project-based learning; personalized learning; competency-based education; holistic and interdisciplinary teaching; game-based learning; social and emotional learning; creativity and innovation education; inquiry-based learning
	Psychological and Social Support	Family support; supportive learning environments

Subsequently, based on the extracted sub-themes (meaning units) from the interview transcripts, the basic, organizing, and overarching themes of future educational environments in elementary schools are presented in Table 2.

Table 2. Basic, Organizing, and Overarching Themes of the Educational Environment of Future Elementary Schools

Construct	Dimension	Component	Indicator	Source	Code
The educational environment of future schools in elementary school	Physical space	Flexible classes	Movable tables and chairs, height adjustment and layout change	Bepler et al. (2014), Babakhani et al. (1400)	I10, I16
			Use movable walls and partitions to quickly change the classroom configuration and create different spaces	Nair et al. (2009), Arasteh and Shahhosseini (1402)	I11, I13
			Organized and organized spaces to store educational materials, books and various tools	Bifma (2021)	I4,I11
			Design spaces for different purposes such as education, recreation, games and relaxation	Saidi et al. (1402)	I7,I14
			Ability to change class schedules and use spaces for different activities throughout the day	Beer et al. (2018)	-----
		Lighting	Using large and suitable windows to allow natural light into the classroom	Bart et al. 2020)	I3,I9
			Using ceiling lights with appropriate brightness to evenly distribute light throughout the classroom	Babakhani, Samadi, Yousefian (1400)	I8,I16
			Using lamps with appropriate color temperature	Mendel and Heth (2020)	I14
			Adjusting light sources	Saidi et al. (1402)	I6,I17
			Installing lighting control systems based on different educational needs	Bifma (2021)	I9,I13
			Using light sensors		-----
			Use of lamps with high color rendering index	Nair et al. (2009)	I4,I12
			Use of energy-efficient lamps such as LED and installation of smart systems to reduce energy consumption	Moore and Casco (2014)	I13,I19
		Ventilation and air quality	Adequate air exchange using mechanical or natural ventilation systems to move air	Bart et al. 2020)	I1, I5
			Maintain low levels of air pollutants	Nair et al. (2009) Arasteh and Shahhosseini (1402)	I8,I15
			Maintain relative humidity	Bonia (2020)	I5,I12
			Use of high-efficiency air filters to remove airborne particles and air pollutants	Azmaty et al. (1394)	I13,I19
			Install air quality sensors for continuous monitoring	Mendel and Heth (2020)	-----
			Use of low-polluting building materials and furniture	Babakhani et al. (1400)	I15,I17
			Perform regular and proper cleaning	Bart et al. (2020)	I2,I6
			Develop and implement specific protocols to maintain proper ventilation throughout the day	Bonia (2020) Arasteh and Shah Hosseini (1402)	I3,I9
		Soundproofing	Install acoustic panels	Mendel and Heth (2020)	I4,I12,I15

		Use sound-absorbing flooring	Bifma (2021)	I1,I6
		Use soundproof doors that prevent sound from entering and leaving	Beer et al. (2018) Babakhani, Samadi, Yousefian (1400)	I1,I9
		Use double-glazed windows with gaps between the panes to reduce sound transmission from outside to inside the classroom	Tanner (2020)	I4,I10
		Design common spaces such as hallways and halls to prevent sound transmission to classrooms	Bart et al. 2020)	I7,I12
		Select and install educational equipment and electronic devices with low noise levels	Nair et al. (2009)	-----
		Geometrically design classrooms so that sounds are directed towards absorbent and less reflective walls	Moore and Casco (2014)	I15,I17
		Use materials and methods with high noise reduction rates	Bonia (2020) Arasteh and Shah Hosseini (1402)	I9,I15
	Multipurpose spaces	Easy access to educational resources and materials in different classroom spaces to facilitate learning	-----	I2,I11
		Existence of open and green spaces to connect with nature	Mendel and Heth (2020)	I3,I9
	Ergonomic design	Educate students and teachers about ergonomic principles and the importance of observing them in the educational environment	Azmat et al. (1394)	I6,I9,I18
		Design spaces that are compatible with the use of electronic devices	Bart et al. (2020)	I3,I9
		Choose non-allergenic, hygienic and safe materials and surfaces	Nair et al. (2009)	I8,I13
	Safety and accessibility	Install CCTV cameras, alarm and security systems to protect students and staff	Tanner (2020)	I12,I15,I17
		Presence of security forces or guards in schools to create a sense of security and respond quickly to emergency situations	Bifma (2021)	I3,I9
		Presence of security forces or guards in schools to create a sense of security and respond quickly to emergency situations	Bart et al. (2015)	I9,I15
		Conduct regular inspections of buildings and equipment to identify and fix problems	Moore and Casco (2014)	I13,I19
		Ensure full access to buildings and facilities for people with physical disabilities	Strucker et al. (2018)	I7,I13
	Outdoor spaces	Create appropriate sports and playgrounds to encourage physical activity	Bart et al. (2020)	I3, I8,I9
		Install safe sports equipment that meets international standards	-----	I15,I17

	Technology	Digital equipment	Use of laptops and tablets suitable for students to access digital educational resources and educational software.	Trump (2011)	I1,I10,I19
			Use of special platforms to manage and organize educational content and interact with students.	Azmaty et al. (2015)	I2,I17
			Use of modern tools for online classes and group meetings.	Bonia (2020) Arasteh and Shahhosseini (1402)	I4,I13
			Use of online software to assess and measure student performance in real time and analyze data.	Beer et al. (2018)	I11,I15
			Access to e-books, educational videos, and multimedia resources for independent learning.	Baker (2012)	I4,I8
			Use of smart systems to manage attendance, organize activities, and track student progress.	Saidi et al. (1402)	I3,I16
		Internet connection	Ensure internet speed and stability	Bart et al. (2020)	I4,I8,I10
			Ensure access to high-speed internet for all students, especially in disadvantaged and rural areas	Kamen and Snutter (2016)	-----
			Reduce internet costs for students and schools, especially in low-income areas.	Moore and Casco (2014)	I2,I7
			Provide ongoing technical support to resolve communication problems and improve the quality of internet services.	---------	I5,I9
			Use of advanced network equipment and modern infrastructure to improve the quality and speed of the internet.	Green and Brown (2024)	I14,I19
			Ensuring Internet security and protecting student and teacher data from cyberattacks	Harris and Smith (2023)	I16,I18
			Taking advantage of government programs and financial support to improve school Internet infrastructure		I5,I19
			Using network traffic management methods to ensure proper bandwidth distribution and prevent network congestion	-----	I2,I8
			Educating students and teachers on the optimal and effective use of high-speed Internet	William and Cipersad (2021)	I4,I9
		Educational software	Having a simple and user-friendly interface to facilitate student and teacher use		I3,I7,I16

			Aligned with the curricula and educational needs of schools and students	-----	I2,I9
			Existence of a technical support team to resolve user problems and questions	Wilson and Stachi (2020)	I5,I11
			Having appropriate security standards to protect the personal data of students and teachers	Green and Brown (2024)	I16,I19
			Providing collaboration and interaction between students and teachers	Azmat, Khan Vali, Nowruzian Maleki (2015)	I11
			Compatibility with a variety of devices and operating systems	He and Shea (2023)	I14,I16
		Virtual reality and augmented reality	Providing opportunities for students to actively interact with educational content through VR and AR technologies		I8,I15,I18
			Aligning VR and AR content and experiences with curriculum goals and content	William and Cipersad (2021)	-----
			Providing access to VR and AR technologies for all students	Rezaei and Vaezi (2014)	I1,I4
			Using VR and AR to provide personalized learning experiences	Anderson and Dern (2021)	I3,I9
			Evaluating the initial and ongoing costs related to implementing and maintaining VR and AR technologies	-----	I6,I10
			Producing and maintaining up-to-date and innovative VR and AR educational content	Radianti et al. (2020)	I11,I15
		Robotics and programming	Curriculum Alignment	William and Cipersad (2021)	I2,I12,I16
			Strengthening Problem Solving Skills	Sapandar and Sadrzadeh (2010)	-----
			Collaborating on Robotics and Programming Group Projects to Enhance Social Skills	-----	I8,I11
			Developing Critical Thinking Skills	Radianti et al. (2020)	I3,I5
			Technical Support and Training	William and Cipresad (2021)	-----
			Evaluating the Costs of Implementing and Maintaining Robotics Programs	Green and Brown (2024)	I7,I12
			Using Sustainable and Recyclable Materials in Robotics Kits	Hockley (2020)	I14,I17
		Smart learning	Interactive Technologies	Grant (2021)	I2,I9,I15
			Artificial Intelligence and Data Analytics	-----	I3,I9
			Internet of Things and Sensors	Green and Brown (2024)	-----
			User-centered design	William and Cipresad (2021) Arasteh and Shah Hosseini (1402)	I16

			Harmonization between tools and systems	-----	I13,I18
	Educational approaches	Project-based learning	Conformity of projects with educational goals and curriculum standards	Grant (2021)	I1,I6,I9
			Research and inquiry process	Begto and Kaufman (2019)	-----
			Time and resource management	Rezaei and Vaezi (1402)	I2,I9
			Collaboration and teamwork	Arasteh and Shah Hosseini (1402)	I5,I11
			Project presentation and demonstration	Markham (2017), Hennessy and Ambil (2019)	I16,I19
			Student motivation and engagement	-----	I1,I8
			Relationship with the real world	Begto and Kaufman (2019)	I10,I14
		Personalized training	Adaptive systems	Hennessy and Ambil (2019)	I2,I9,I11
			Providing specific learning paths for each student based on interests, talents, and educational needs	Crawford (2020)	-----
			The role of teachers as guides and coaches in the personalized learning process	Arasteh and Shah Hosseini (1402)	I5,I19
		Competency-based education	Identifying and defining competencies and skills	Grant (2021)	I4,I10,I14
			Performance-based assessment		-----
			Providing regular and continuous feedback to students for progress and improvement of performance.	Sturgis (2016)	I2,I9
			Focus on mastery	Chenari et al. (1399)	I5,I11
			Integration with educational programs		I4,I7
		Comprehensive and multidisciplinary education		Darling-Hammond et al. (2019)	I12,I16,I17
			Combine educational content from multiple disciplines to create a holistic approach to learning		I2,I19
			Encourage students to use their knowledge to solve real-world problems	-----	I15,I11
			Focus on developing critical thinking, collaboration, creativity, and communication skills	Marzano (2017)	-----
		Game-based learning	Involve students in community-based projects		I5,I7,I11
			Gradual progression and grading	Frey and Fisher (2018)	I3,I6,I9
			Exploring different strategies and learning through trial and error		I16,I18
		Social and emotional education	Self-awareness	Grant (2021)	I3,I8,I14
			and recognizing emotions	Chenari et al. (1399)	I6,I17
			Ability to control emotions		-----
			Promoting a culture of respect for differences	-----	I7,I17

		Teaching creativity and innovation	Integrating social and emotional skills into different curricula	Sobel (2017)	I14,I15,I18
			Encouraging creative thinking	Sepandar and Sadrzadeh (1399)	I2,I10
			Developing and Enhancing Creativity Skills		I16,I18
			Innovative Learning Spaces	Bransford, Brown, Cooking, Sepandar and Sadrzadeh (1399)	I5,I19
		Exploration-based learning	Asking key questions and searching for answers	Zion and Mendelovich (۲۰۱۹)	I3,I6,I13
			Teaching research methods and collecting valid data	Adelson(۲۰۲۰) Albarzi et al(۱۴۰۰) .	I9,I11
			Ability to analyze and interpret collected data and information	-----	I16,I18
	Psychological and social support	Supporting families	Providing regular and transparent communication channels between the school and families	Kim(۲۰۱۹)	I4,I5,I9
			Encouraging parents to actively participate in school activities and learning processes.	Janes(۲۰۱۹)	-----
		Supportive learning environments	Social and emotional support	Rudra et al(۲۰۱۹) . Albarzi, Khoshbakht, Mousavi(۱۴۰۰)	I3,I10,I19
			Positive student-teacher relationships	-----	I16,I18
			Providing resources and guidance to support students' academic progress	Wentzel(۲۰۱۹)	I5,I19
			Providing special educational programs for students with special needs	Tomlinson(۲۰۱۹) Albarzi, Khoshbakht, Mousavi(۱۴۰۰)	I4,I9
			Teaching students self-regulation and time management skills	Mestropiri and Scruggs (۲۰۲۱)	-----

Based on the table 2, four primary dimensions were identified:

1. Physical Environment

This dimension includes components such as flexible classrooms, lighting quality, ventilation and air quality, sound insulation, multifunctional spaces, ergonomic design, safety and accessibility, and outdoor spaces.

2. Technology

This dimension comprises digital equipment, internet connectivity, educational software, virtual and augmented reality, robotics and programming, and intelligent learning systems.

3. Educational Approaches

This dimension includes project-based learning, personalized learning, competency-based education, holistic and interdisciplinary instruction, game-based learning, social and emotional learning, creativity and innovation education, and inquiry-based learning.

4. Psychological and Social Support

This dimension encompasses family support and the creation of supportive learning environments. A visual model of the findings was developed, followed by summary reports of the coding stages.

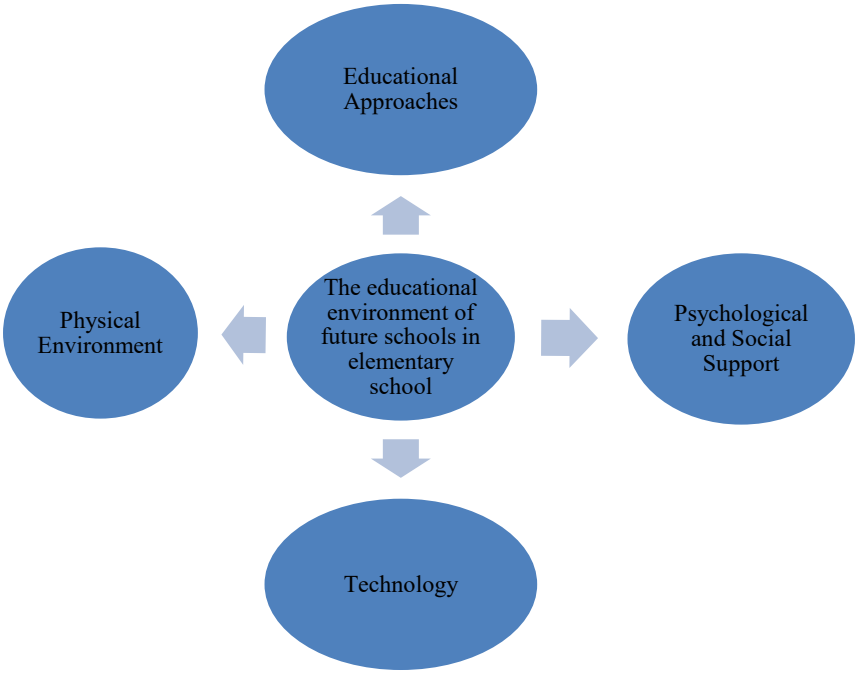

Figure 1. Thematic Network Illustrating Relationships and Interactions Among Identified Themes

Based on the thematic relationships illustrated, the design of educational environments for future elementary schools plays a foundational role in enhancing learning quality and fostering the holistic development of students. An effective learning environment must dynamically integrate the four core dimensions—physical space, technology, educational approaches, and psychological–social support—to create a safe, creative, and learning-centered setting. Key features such as flexible and ergonomic classrooms, the use of smart technologies and augmented reality, active and personalized instructional approaches, and psychological and social support for students and their families constitute essential elements of such a design. The optimal combination

of these dimensions can transform the school into a dynamic learning ecosystem, enabling children to progress in their educational journey with greater motivation, creativity, and self-confidence.

Discussion

The main purpose of this study was to identify the dimensions, components, and indicators of educational spaces for future elementary schools—spaces that can adapt to technological developments, cultural changes, and the needs of the digital generation, while supporting intelligent, human-centered, and sustainable learning. Using an exploratory qualitative approach and thematic analysis, this research sought to provide a clear picture of the physical, technological, educational, and psycho-social dimensions of future learning environments. These insights can be applied in policymaking, educational architectural design, and revising instructional programs.

The findings demonstrated that designing future educational spaces in elementary schools requires a holistic and human-centered perspective that considers four key dimensions—physical space, technology, educational approaches, and psychological–social support—in constant interaction with one another. The thematic analysis revealed that the future school, as a learning ecosystem, must be dynamic, flexible, technology-enabled, and simultaneously social and emotionally supportive. The physical and psychological environment of the school plays a fundamental role in shaping the educational experience and in fostering students' cognitive and emotional development.

In the dimension of physical space, elements such as proper lighting and ventilation, ergonomic and safe design, flexible classrooms, and multifunctional areas were among the most prominent indicators of future learning environments. These findings align with the studies of Fakhar (2022) and Barrett et al. (2020), showing that the physical quality of space directly affects students' concentration, comfort, and motivation. Furthermore, designing spaces that accommodate students with special needs and provide interaction with natural environments contributes to the development of children's motor and social skills.

In the dimension of educational technology, the use of digital devices, intelligent software, augmented reality, and robotics transforms learning from a passive activity into an interactive and exploratory process. The present findings are consistent with those of Soltani (2023), Green & Brown (2024), and Alipour (2022), all of which emphasize the role of technology in blended

learning, personalized content, and enhanced cognitive engagement. In this model, technology is not an end in itself but serves as a tool to empower teachers and learners and facilitate smart, flexible learning experiences.

In the dimension of educational approaches, elements such as project-based learning, personalized learning, interdisciplinary instruction, and game-based and emotionally engaging pedagogies are aligned with Dewey's and Bandura's perspectives on experiential and social learning. These approaches foster critical thinking, creativity, and communication skills, consistent with the findings of Sharifi (2020) and Naseri et al. (2019). Emphasizing social–emotional learning alongside cognitive development in this study supports enhanced resilience and cooperation among students.

In the dimension of psychological and social support, creating safe, encouraging, and collaborative environments is of great importance. Similar to the findings of Kharrazi (2017) and Fakhar (2022), this research showed that family support and constructive interaction between school and parents promote psychological well-being, reduce anxiety, and increase students' sense of belonging. The future school is founded on social cohesion, empathy, and mutual respect—factors that play a crucial role in children's educational and cultural development.

In conclusion, designing the educational spaces of future schools is not merely an architectural or technological project; rather, it is an interdisciplinary process integrating education, psychology, and technology. Such an approach can realize a human-centered, participatory, and sustainable learning model in elementary schools and guide the transformation of national education toward intelligent, learner-centered schooling.

However, several limitations should be considered when interpreting the results. First, the use of thematic analysis as a qualitative method involves a high degree of researcher interpretation, which may limit the generalizability of the findings. Second, conducting interviews and securing experts' availability posed significant challenges. Additionally, due to financial and time constraints, the researcher was unable to employ a mixed-methods (qualitative–quantitative) approach.

Recommendations

Future researchers should use mixed-methods designs to examine the impact of educational space design on students' creativity, mental health, and learning motivation.

Educational institutions and the Ministry of Education should adopt a human-centered approach in new school designs and involve educational architects alongside pedagogical experts.

Equipping elementary schools with smart technologies and interactive tools, combined with digital skills training for teachers, can significantly enhance learning quality.

Designing multifunctional and flexible spaces is recommended to support project-based and collaborative learning.

Strengthening effective communication between families and schools through participatory programs is essential for improving students' psychological and social well-being.

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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