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Designing an Interpretive Structural Model of Hybrid Education (Face-to-Face and Virtual) in the Form of SWOT

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ABSTRACT

Objective: The present study was conducted with the purpose of designing an interpretive structural model of hybrid education (face-to-face and virtual) within the SWOT framework.

Methods: This research is applied in terms of purpose and exploratory in terms of approach. The statistical population consisted of 36 experts and specialists in the fields of educational sciences and educational management at universities in Lorestan province. Using purposive sampling and the theoretical saturation method, 14 participants were selected.

Results: A semi-structured interview tool was employed to collect data. To ensure the validity of the qualitative part, Kendall's coefficient of concordance (0.759) was applied, while the reliability of the qualitative data was confirmed through the recoding method (0.92). The results indicated that the interview instrument had appropriate validity and reliability. Considering internal factors (strengths and weaknesses) and external factors (opportunities and threats), the SWOT matrix was developed after the third stage of the Delphi method and consensus among participants. A total of 38 indicators were confirmed for internal factors (19 strengths and 19 weaknesses) and 20 indicators for external factors (10 opportunities and 10 threats). Consequently, an aggressive strategy was adopted, and 14 strategies were identified and prioritized. Finally, an interpretive structural model of hybrid education strategies was presented.

Conclusions: The findings of this study provide a comprehensive and structured understanding of the key factors influencing hybrid education within the SWOT framework. By validating and prioritizing internal and external indicators, the research offers a strategic foundation for strengthening hybrid education in higher education institutions.

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Introduction

Education, as one of the most fundamental human needs, plays a key role in personal and social development. It facilitates the transfer of knowledge, skills, and values from one generation to another, thus laying the foundation for individual and collective progress (Beauchamp & Kennewell, 2022). On the one hand, education is a tool for transferring knowledge and skills to individuals; on the other hand, it plays a crucial role in strengthening personal and social competencies (González-Salamanca et al., 2020). Recent studies have revealed a direct relationship between education level and quality of life (Sussman, 2025). Education also enhances employment opportunities, improves income, and raises living standards. At the social level, it reduces inequalities and fosters civic participation (Muller, 2022). Moreover, education increases awareness of social rights and responsibilities, thereby promoting democracy and the rule of law (Schulz et al., 2025; Smith & Johnson, 2023). It also plays a significant role in poverty reduction and social justice. Individuals with higher education levels are more likely to obtain sustainable and well-paid jobs, which in turn reduces poverty in society (Kuldasheva et al., 2023). Therefore, addressing current issues in education, particularly teaching methods, is a priority (Sivarajah et al., 2019).

In general, teaching methods are categorized into face-to-face and distance learning. Face-to-face learning, where teachers and students are physically present in the same environment, has traditionally been considered the dominant model due to its direct interaction and face-to-face communication. This method effectively meets educational and social needs while strengthening interpersonal skills (Stovin et al., 2022). However, with the expansion of digital technologies and the internet, virtual learning has rapidly emerged as an alternative or complementary method in many educational systems. Virtual learning enables learners to access resources anytime and anywhere, offering flexibility but also presenting challenges such as infrastructure requirements and reduced social interaction (Bozkurt & Sharma, 2023).

With technological progress and social change, teaching methods have shifted from traditional face-to-face instruction toward virtual and hybrid education (Mulenga & Shilongo, 2025). Hybrid education, which combines in-person and virtual education, has been introduced as an innovative approach to enhance learning quality and maximize the benefits of new opportunities (Singh et al., 2022). By leveraging the advantages of both modes, hybrid education can better address diverse

educational needs (Mulenga & Shilongo, 2025). It not only increases flexibility and access to resources but also preserves essential face-to-face interactions for the development of students' social and emotional skills, which remain fundamental goals of education (Adera, 2025). At the same time, education systems require well-designed strategic plans to achieve their objectives (Redecker & Punie, 2013). These plans should be tailored to social, economic, and cultural conditions, making optimal use of traditional, virtual, and blended approaches (Sammut-Bonnici et al., 2020).

SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) can serve as a strategic tool in this regard (Schmillen, 2021). By applying SWOT, educational managers can identify strengths and weaknesses in their systems and capitalize on opportunities while managing potential threats (Helsper & Eynon, 2023). SWOT analysis, combined with strategic planning, is considered a cornerstone for successful educational development. It helps higher education institutions define their competitive advantages and positioning (Hsieng et al., 2015). Moreover, SWOT provides schools, universities, and institutions with insights into effective and ineffective elements within the educational environment (Nkambule, 2023). It can influence decisions regarding financial planning, management, and long-term educational strategies (Morrison, 2018). Previous research on teaching methods and SWOT has highlighted hybrid education as one of the most effective approaches. For instance, Basori et al. (2023) identified flipped classrooms, station rotation, and self-blended learning as the most widely used hybrid education models in vocational education. Similarly, Sarkar (2023) emphasized hybrid education as a necessity for modern education, promoting collaborative, practical, and computer-assisted learning. A review of such studies shows that many were conducted in response to global disruptions in education—such as school closures due to disasters, pandemics, or conflicts—aiming to fill learning gaps and facilitate adaptation.

Hence, the need arises for a new hybrid education model aligned with Iran's Fundamental Transformation Document of Education. Additionally, disregarding educational principles can lead to reduced effectiveness, lowered motivation, diminished self-confidence, early fatigue, and even depression. Thus, education and study, like any specialized field, require adherence to appropriate learning principles. In Lorestan province—one of Iran's western regions and a significant hub for secondary education—any educational transformation has nationwide implications. Given the diverse teaching preferences of teachers, it is necessary to explore the conditions and requirements

of hybrid education (face-to-face and virtual) to propose practical and advanced solutions. Accordingly, educational leaders and policymakers must identify the key factors influencing hybrid education and take responsibility for implementing them. Therefore, the present study aims to design an interpretive structural model of hybrid education strategies for secondary school teachers in Lorestan province within the SWOT framework.

Material and Methods

This study is an applied research with a descriptive–exploratory design, conducted to identify the components and indicators of a hybrid education model (face-to-face and virtual) for secondary school teachers in Lorestan province. The approach relied on both theoretical foundations and expert insights, which necessitated a qualitative orientation. The research population consisted of 36 faculty members and part-time lecturers in the fields of educational sciences and educational management at universities in Lorestan province. To implement the qualitative phase, the study first employed library research to review theoretical foundations and previous empirical studies. Following this, two qualitative methods were used: field observation, to record detailed field notes about observed phenomena, and semi-structured interviews, to directly gather participants' perspectives regarding the four dimensions of SWOT (strengths, weaknesses, opportunities, and threats). Sampling was conducted using the snowball technique with purposive selection, applying the principle of theoretical saturation.

A total of 14 experts and specialists in educational sciences and educational management were interviewed. Data collection stopped once no new insights were emerging, confirming saturation. The main data collection tool was the semi-structured interview. From these interviews, 63 internal codes and 43 external codes were identified, while the library study produced 54 internal codes and 50 external codes. Based on these codes, a Delphi questionnaire was designed to categorize, refine, and validate the extracted indicators under the SWOT framework. Experts were asked to revise, combine, or reclassify the codes where necessary. Through three rounds of the Delphi method, a Kendall's coefficient of concordance of 0.759 ($p = 0.000$) was achieved, indicating a high degree of agreement among experts. Finally, 19 codes were confirmed as strengths, 19 as weaknesses, 10 as opportunities, and 10 as threats. These validated indicators were used as the basis for designing the data collection instrument for secondary school teachers. At this stage, the

Internal Factor Evaluation (IFE) matrix with a total weighted score of 2.59 and the External Factor Evaluation (EFE) matrix with a score of 2.58 were constructed. These results placed the hybrid education model in the aggressive strategy quadrant of the SWOT matrix.

Afterward, the proposed strategies were ranked and prioritized using the Quantitative Strategic Planning Matrix (QSPM). To establish the structural relationships among strategies, Interpretive Structural Modeling (ISM) was employed. Data analysis was carried out using SPSS version 21.

Results

The central research question of this study was: What is the interpretive structural model of hybrid education (face-to-face and virtual) within the SWOT framework for secondary school teachers in Lorestan province? To address this, the study followed the five essential steps of SWOT analysis. First, the components and indicators influencing hybrid education were identified, resulting in a total of 210 indicators. After three rounds of the Delphi method and consensus among experts, 38 indicators were confirmed for internal factors (19 strengths and 19 weaknesses) and 20 indicators for external factors (10 opportunities and 10 threats). At this stage, the strategy matrix was constructed. To determine the relative importance (weights) of the extracted indicators, a questionnaire was designed and distributed among 14 experts familiar with hybrid education. Using Excel, each indicator was assigned a weight (ranging from 1 to 4). After aggregation, the weighted scores were calculated for both internal and external factors. The results showed that: For internal factors, the total weight was 1, with rankings from 1 to 4, and the total weighted score reached 2.59. For external factors, the total weight was also 1, with rankings from 1 to 4, and the total weighted score was 2.58. The SWOT strategic matrix indicated that internal factors leaned more toward strengths and external factors leaned more toward opportunities, placing the system in the aggressive strategy position.

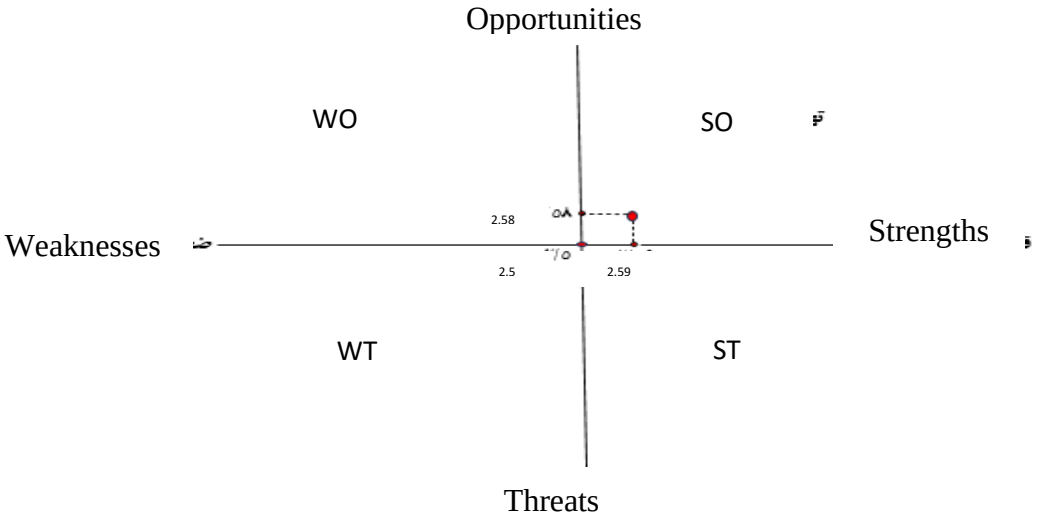

Figure 1. Strategic positioning of hybrid education on the matrix

Therefore, it can be concluded that the most appropriate strategy for implementing hybrid education (face-to-face and virtual) among high school teachers in Lorestan Province is the aggressive strategy. By prioritizing the aggressive strategy and considering other strategies introduced in this study, the proposed strategies were identified and prioritized based on expert opinions. To determine the hierarchy of accepted strategies in the SWOT phase, the Quantitative Strategic Planning Matrix (QSPM) was employed. Table 1 presents the prioritization of the strategies confirmed by the experts.

Table 1. Prioritization of selected strategies for hybrid education

Rank	Strategy	Score	Priority
2	Research and self-directed learning	5.51	1
1	Creativity and innovation	5.46	2
9	Balancing hybrid education	5.33	3
3	Flexibility in the educational system	5.14	4
13	Structural development and infrastructure	4.89	5
7	Critical thinking and practice	4.86	6
10	Meritocracy	4.65	7
4	Content preparation	4.63	8
12	Integration and coherence	4.62	9
5	Human resource empowerment	4.53	10
11	Economic strategy	4.5	11
8	Evaluation and supervision	4.24	12
14	Educational impact	4.08	13
16	Expansion of educational spaces	3.69	14

The analysis indicated that the structural development and infrastructure strategy possessed the highest level of influence among all strategies, while content preparation showed the least influence. Conversely, the educational impact strategy demonstrated the highest level of dependence, and the structural development and infrastructure strategy the lowest. These findings formed the foundation for constructing the interpretive structural model (ISM) of hybrid education strategies.

Research Model

For the modeling phase, the Interpretive Structural Modeling (ISM) method was applied in four main steps:

Step 1: Development of the Self-Interaction Matrix Based on the prioritized strategies of hybrid education (Table 1), a self-interaction structural matrix was designed. This matrix was used to capture experts' judgments on the relationships and mutual influences among the selected strategies.

Table 2. Structural self-interaction matrix of hybrid education strategies

Hybrid education strategic	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.creativity & innovation	X	X	X	V	A	O	X	A	O	A	O	O	A	**X**
2. Research and self-directed learning		X	X	V	A	O	X	A	V	A	A	O	A	**X**
3. Flexibility in the educational system			X	V	X	V	V	A	V	X	V	O	A	**V**
4. Content preparation				X	A	O	A	O	X	A	A	O	A	**V**
5. Human resource empowerment					X	V	V	A	V	X	A	X	A	**X**
6. Expansion of educational spaces						X	A	X	X	A	A	O	A	**X**
7. Critical thinking and practice							V	A	A	X	A	X	A	**X**
8. Evaluation and supervision								V	A	X	A	A	V	**X**
9. Integration and coherence									V	A	A	A	A	**X**
10. Balancing hybrid education										V	A	V	O	**X**
11. Meritocracy											V	A	O	**X**
12 Economic strategies												V	A	**X**
13. Structural development and infrastructure													V	**X**
14. Educational impact														**X**

Step 2: Conversion to the Final Reachability Matrix the symbols and letters used to denote the type of relationships (e.g., direct influence, mutual influence, or no influence) were converted into binary values (0 and 1).

Table 3. Final achievement matrix of hybrid education strategies

Hybrid education strategies	1	2	3	4	5	6	7	8	9	10	11	12	13	14	influence
1.creativity & innovation	1	0	0	0	0	0	0	1	0	0	1	1	1	1	6
2. Research and self-directed learning	1	0	0	0	0	1	0	1	0	0	1	1	1	1	7
3. Flexibility in the educational system	1	1	1	1	1	1	1	0	1	1	1	0	0	1	11
4. Content preparation	1	0	0	1	1	1	0	1	1	1	1	1	1	1	11
5. Human resource empowerment	1	0	0	0	0	1	0	0	0	0	1	0	0	0	3
6. Expansion of educational spaces	1	0	1	0	1	1	0	1	1	1	1	1	1	1	11
7. Critical thinking and practice	1	0	0	0	0	1	1	0	1	0	0	0	0	0	4
8. Evaluation and supervision	1	0	0	1	0	1	0	1	1	0	1	0	1	1	8
9. Integration and coherence	1	0	1	0	0	1	1	1	1	1	0	1	1	1	10
10. Balancing hybrid education	0	0	0	1	0	1	1	0	1	0	0	0	0	1	5
11. Meritocracy	1	1	1	1	1	1	1	1	1	1	0	1	0	1	12
12 Economic strategies	0	1	0	1	1	1	1	1	1	0	1	0	0	1	9
13. Structural development and infrastructure	0	0	0	0	1	0	1	1	1	0	0	1	0	1	6
14. Educational impact	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Dependence	9	10	7	10	8	10	11	6	12	4	12	4	4	5	14

This transformation produced the final reachability matrix, from which the influence power and dependence power of each strategy were calculated. The results indicated that: The structural development and infrastructure strategy had the highest level of influence among the strategies. The content preparation strategy had the lowest influence. In terms of dependence, the educational impact strategy exhibited the highest dependence, whereas the structural development and infrastructure strategy showed the lowest.

Step 3: Level partitioning: The strategies were then classified into hierarchical levels by examining their reachability, antecedents, and intersections.

Table 4. Determining the levels of hybrid education strategies

Hybrid education strategic	Output	Input	Subscription	Level
Research and self-directed learning	1,2,3,4,7,14	1,2,3,5,7,8,10,13,14	1,2,3,7,14	3
Creativity and innovation	1,2,3,4,7,9,14	1,2,3,5,7,8,10,11,13,14	1,2,3,7,14	3
Balancing blended instruction	1,2,3,4,5,6,7,9,10,11,14	1,2,3,5,8,10,13	1,2,3,5,10	5
Flexibility in the educational system	4,9,14	1,2,3,4,5,7,9,10,11,13	4,9	2
Structural development and infrastructure	1,2,3,4,5,6,7,9,10,12,14	3,5,8,10,11,12,13,14	3, 5,10,12,14	4
Critical thinking and practice	6,8,9,14	3,5,6,7,8,9,10,11,13,14	6,8,9,14	1
Meritocracy	1,2,4,6,7,9,11,14	1,2,3,5,7,8,9,10,11,12,13	1,2,7,9,11	
Content preparation	1,2,3,5,6,7,8,9,12,14	6,8,10,11,12,1	6,8,12	5
Integration and coherence	4,6,7,9,14	2,3,4,5,6,7,8,9,10,11,12,13	4, 6,7,9	2
Human resource empowerment	1,2,3,4,5, 6,7, 8,9,10,12,14	3, 5,10,13	3,5,10	5
Economic strategy	2,4,5,6,7,8,9,10,11,14	3,11,13	11	6
Evaluation and supervision	5,7,8,9,12,14	5,8,10,12,13	5,8,12	4
Educational impact	1,2,5,6,13,14	1,2,3,4,5,6,7,8,9,10,11,12,13,14	1,2,5,6,13,14	7
Expansion of educational spaces	1,2,5,6,13,14	1,2,3,4,5,6,7,8,9,10,11,12,13,14	1,2,5,6,13,14	1

The outcomes were as follows: Level 1 (most dependent strategies): Expansion of educational spaces, educational impact. Level 2: Content preparation, balancing blended instruction. Level 3: Creativity and innovation, Research and self-directed learning, Critical thinking and practice. Level

4: Human resource empowerment, Integration and coherence. Level 5: Flexibility of the educational system, Evaluation and supervision, Meritocracy. Level 6: Economic strategy. Level 7 (most influential strategy): Structural development and infrastructure.

Step 4: Development of the ISM-Based Model by considering the hierarchical levels, the interpretive structural model of blended learning strategies was developed (Figure 2).

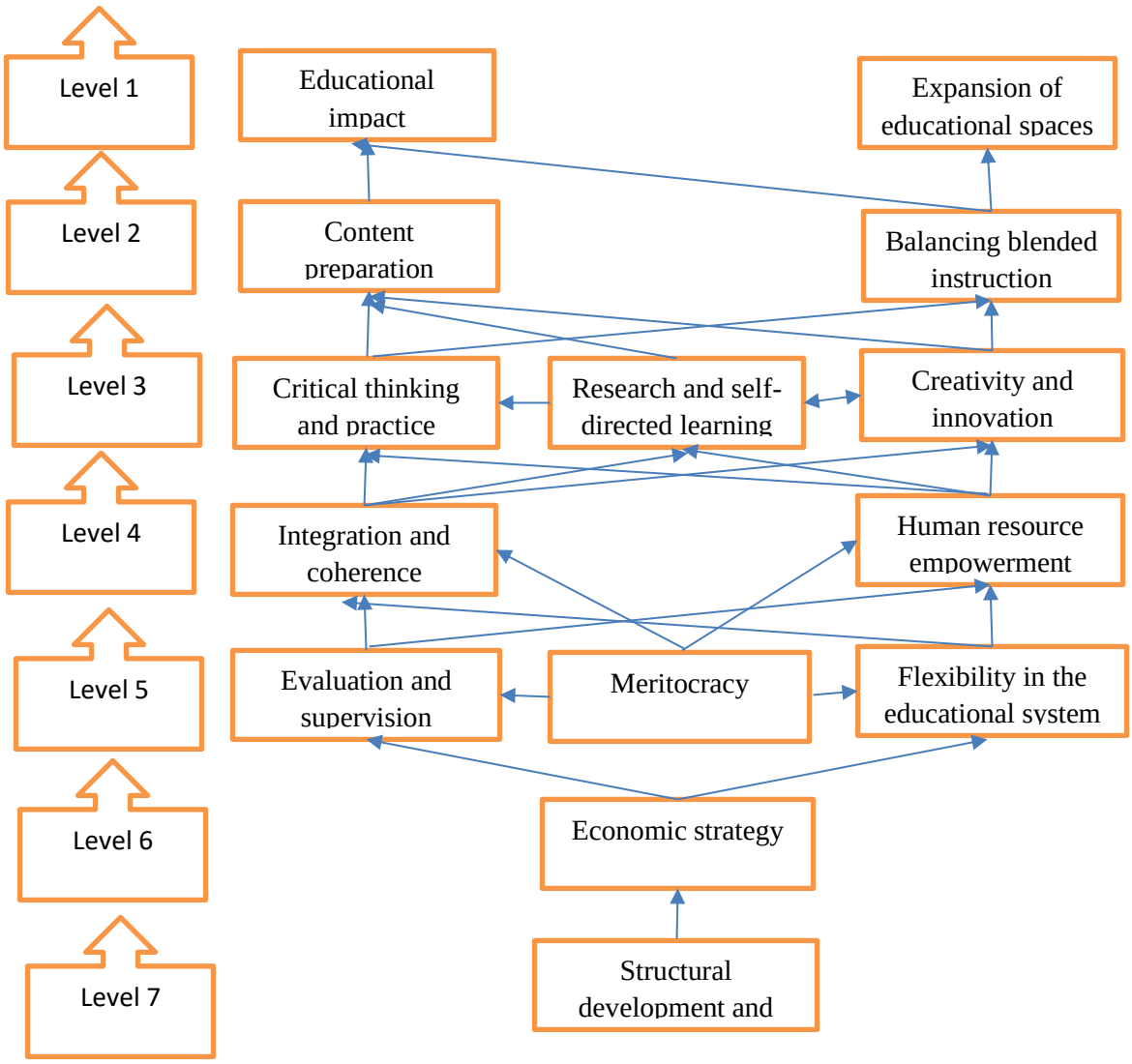

Figure 2. Interpretive Structural Model of hybrid Learning Strategies

The model highlights that the structural development and infrastructure strategy serves as the foundation of the system, exerting influence over all other strategies. It is the cornerstone for

successful implementation of hybrid learning, since without a strong infrastructure, other strategies cannot be effectively operationalized. Following this, the economic strategy plays a pivotal role by directly influencing the flexibility of the system, supervision mechanisms, and meritocracy, and indirectly impacting other strategies. The mid-level strategies (e.g., empowerment, integration, creativity, and self-directed learning) serve as bridges, linking foundational strategies with operational outcomes. Finally, the strategies at Level 1 (expansion of educational spaces and educational impact) are the most dependent, influenced by nearly all other strategies, and represent the outcomes of implementing hybrid education successfully.

Discussion

Modeling in the field of education is of great importance, as it helps identify key influencing components and contributes to structuring educational phenomena. In practice, it enables the application of scientific knowledge to organize educational processes more effectively. In recent years, various new models have been developed in different areas of education, one of which is the hybrid education model that takes into account the transformative role of virtual environments in teaching and learning.

Hybrid education utilizes a combination of instructional materials such as media, digital tools, and educational technologies. The purpose is to create an optimal mix that addresses specific educational challenges at minimal cost while maximizing learning effectiveness. This approach has proven to be more effective than relying solely on either traditional face-to-face or purely virtual methods. The core of hybrid education lies in designing a balanced instructional mix that not only reduces costs but also ensures deeper learning, better knowledge retention, and more efficient use of time (Doig & Hogg, 2019). The present study aimed to design an interpretive structural model of hybrid education strategies within the SWOT framework. The results identified strategies across seven hierarchical levels, ranging from foundational (structural development and infrastructure) to highly dependent outcomes (educational impact and expansion of learning spaces).

Modeling in the field of education, aimed at identifying influential components, plays a crucial role in today's educational system. In fact, it represents the practical application of scientific knowledge in structuring educational phenomena. New models are being designed and applied

across various educational domains, among which the blended learning model has gained prominence, particularly given the influential role of virtual spaces in teaching and learning. Hybrid education integrates diverse instructional materials such as media and educational technologies, with the goal of developing an optimal combination to address educational, service-oriented, and organizational challenges. Consequently, blended learning has proven to be more effective than purely virtual instruction. A critical aspect of hybrid education lies in selecting the most efficient combination of materials and methods that maximize learning effectiveness while minimizing costs. Educational institutions and organizations must adopt hybrid education strategies and learning theories within their systems to deliver accurate and reliable content in a timely manner to qualified learners. In this regard, hybrid education constitutes a form of deep learning, facilitated by various technologies, which not only identifies the shortcomings of traditional face-to-face and purely online methods but also enhances efficiency, reduces costs, optimizes time, and increases both knowledge retention and long-term learning outcomes for students (Dwig & Haag, 2019). The present study, conducted with the aim of designing an Interpretive Structural Modeling (ISM) framework for hybrid education (face-to-face and virtual) within the SWOT analysis, identified strategies across seven levels.

First-level strategy: Expanding the educational space. One of the primary advantages of hybrid education is its capacity to extend learning beyond the classroom (Srivastava & Srivastava, 2024). This allows learning to occur anytime and anywhere through diverse tools such as videos, podcasts, scholarly articles, and interactive resources, fostering student engagement and preparing learners for the future (Vitriol & Mehnasundaram, 2024). Personalized learning plans are enabled, ensuring flexibility and greater learner autonomy (Begam & Sampoorna, 2021).

Strategy of instructional effectiveness. This refers to methods and practices aimed at enhancing learning quality and student engagement by creating an interactive and stimulating environment, which ultimately fosters enduring knowledge, skills, and attitudes (Ayub et al., 2023). Content preparation strategy. The effectiveness of hybrid education is strongly tied to the provision of organized, engaging, and diverse instructional content, which motivates learners and facilitates conceptual understanding (Stratton, 2020; Kumar et al., 2021).

Balancing in-person and virtual instruction. Success in hybrid education requires proper balance between its components, ensuring that both face-to-face interaction and digital accessibility are leveraged optimally (Anthony et al., 2019; McKenna et al., 2020).

Creativity and innovation strategy. This strategy focuses on fostering dynamic, interactive environments that promote critical thinking, problem-solving, and innovation, supported by modern digital tools such as virtual reality, augmented reality, and educational games (Adra, 2025).

Research and self-directed learning. This strategy encourages students to become independent, lifelong learners capable of critical inquiry and self-motivation (Teng et al., 2022). Thinking and practice. Learners are provided opportunities to apply knowledge in real-world contexts, thereby enhancing problem-solving and decision-making skills essential for professional success (Castro, 2019).

Empowerment of human resources. Teacher training and professional development are vital for successful blended learning, enhancing instructional quality and organizational efficiency (Adams et al., 2010; Darling-Hammond, 2017). Integration and coherence. Achieving consistency across all components of hybrid education fosters more meaningful and enjoyable learning experiences (Bachler, 2020). Flexibility. This strategy allows adaptation to diverse student needs, learning styles, and rapidly changing educational contexts (Muñoz-Rodriguez & Sanchez Rojo, 2020). Evaluation and supervision. Continuous monitoring ensures that learning objectives are met, weaknesses are addressed, and instructional quality is improved (Kayali, 2024). Meritocracy. This emphasizes tailoring educational opportunities to individual learner abilities and progress, thereby improving both motivation and learning quality (Satalan, 2022). Economic considerations. By optimizing resources and reducing costs while maintaining instructional quality, blended learning proves economically advantageous (Galvis, 2018). Infrastructure and capacity building. Establishing strong technical and organizational structures is essential for successful hybrid education implementation (Almari et al., 2014).

In summary, these strategies are theoretically well-grounded and supported by prior research, as confirmed by the expert panel in this study. However, a major limitation lies in the lack of empirical implementation of the developed model, which should be considered in future studies as a complementary phase. Additionally, it is recommended that, based on the exploratory strategies

of this study, a questionnaire be developed for subsequent research, ensuring both validity and reliability.

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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