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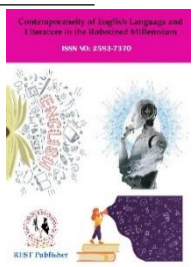

Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills using the Fuzzy Topsis Method

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Abstract: *The 5E Model Design Lesson has revolutionized the way education is delivered in classrooms. This innovative approach, which stands for Engage, Explore, Explain, Elaborate, and Evaluate, provides a structured framework that caters to various learning styles and abilities. In the "Engage" phase, students are captivated and drawn into the lesson, igniting their curiosity and interest. The "Explore" phase encourages active participation and hands-on experiences, allowing students to investigate concepts firsthand. Subsequently, the "Explain" phase provides the necessary information and context, ensuring of students' knowledge they have a solid foundation. As the lesson progresses into the "Elaborate" phase, students delve deeper into the topic, applying their newfound understanding in complex scenarios. Finally, in the "Evaluate" phase, students' comprehension is assessed, offering valuable feedback to both the teacher and the learners. This holistic approach Deep about the subject in addition to developing understanding, for 21st century success critical thinking is essential, Solving the problem and collective competence Grows. The 5E Model Design Lesson is a powerful tool that empowers students to take charge of their learning journey, making education a dynamic and engaging process. Developing 4Cs, is paramount in preparing individuals for success in the 21st century. These skills are integral for of the modern worldleading to problems. Critical thinking hones one's ability to analyze information, solve problems, and make informed decisions. Communication proficiency encompasses not only expressing ideas clearly but also active listening and effective interaction with others. Collaboration in stills the capacity to work harmoniously in teams, pooling diverse perspectives and skills towards a common goal. Lastly, fostering creativity encourages innovative thinking and the generation of original ideas. Together, these 4Cs form a comprehensive skill set that equips individuals to thrive in a rapidly evolving global landscape, ensuring they are adaptable, resourceful, and poised for success in their personal and professional lives. The Fuzzy TOPSIS method serves as a decision-making tool, particularly beneficial for situations involving uncertainty or where group consensus is essential. Through thorough analysis, comparisons, and other relevant assessments, we identify a clear need for this objective grading technique, which is widely recognized and utilized. Initiated by KAU Projects, the Fuzzy TOPSIS approach classifies projects into four distinct categories: instructional homes, staff quarters, KAU campus streets, and infrastructure projects. Engage, Explore, Explain, Elaborate and Evaluate. Critical Thinking, Communication, Collaboration and Creativity. the Ranking of Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills of Final Result in Evaluate is got the first rank whereas is the Elaborate is having the Lowest rank.*

Keywords: *MCDM, Critical Thinking, Communication, Collaboration and Creativity.*

1. INTRODUCTION

The 5E model of instruction, which stands for Engage, Explore, Explain, Elaborate, and Evaluate, is a teaching framework that encourages active learning and critical thinking. When applied to lesson design, this model can have a significant impact on the development of the 4Cs - Critical Thinking, Communication, Collaboration, and Creativity - which are essential 21st-century skills. In the context of middle school education, the implementation of the 5E Instructional Design model was investigated, specifically focusing on its impact on science learning and retention. This study was conducted with middle school students in Nahavant Nagar, selected through cluster sampling [1]. The research aimed to test two hypotheses: firstly, whether the 5E instructional design model enhances students' learning; and secondly, whether it contributes to better retention of scientific subjects compared to an incremental instructional design model. The research utilized pre-tests and post-tests administered by the

researcher over a six-week period. The 5E model, which encompasses Engagement, Explanation, Exploration, Elaboration, and Evaluation, was introduced by Roger the Bee in the early 80s. It emphasizes active engagement of learners in the learning process, followed by group activities guided by the teacher. The instructor plays a vital role in broadening students' understanding, incorporating feedback to adapt to new conditions, and evaluating learning activities [2]. In the 21st century, instruction has evolved to become more specific and professional, impacting citizens' political, cultural, and economic dimensions, thus emphasizing the interconnection between instruction and various aspects of life. This research was conducted at the School of Education, Tarbiat Moallam University, Tehran. It focused on assessing the effect of the 5E model as a new instructional design for teaching science. The study aimed to compare the impact of this model with traditional teaching methods, particularly concerning its relevance to real-life applications in science subjects. To implement this instructional design, specific teaching methods and educational planning with assessments were imperative [3]. Consequently, the study aligns with standardized educational objectives at both national and local levels, necessitating assessments or tests to be tailored to the instruction provided. Instructional design involves conceptualizing, formulating theoretical concepts, creating maps, and executing pre-planned actions to achieve specific educational goals. It can be likened to the process of designing a project, where instructional objectives serve as the blueprint for how to attain these goals effectively. This study thus delves into the intricate dynamics of instructional design, particularly within the realm of science education in middle schools [4]. In the present era, which is the 21st century, there is a notable surge in the growth of information and knowledge. Students are expected to possess a rational approach, encompassing critical and analytical thinking skills, as well as creative thinking abilities, along with elevated values and an admirable attitude. Education in the 21st century places emphasis not only on the materials provided to students but also on the learning outcomes. It acknowledges that students need to acquire the essential skills demanded [5]. Recognizing and assessing these skills, including higher-order thinking abilities, are essential in preparing students for the post-graduation challenges of the 21st century. In the 21st century the learning process is in the global economy necessary to compete knowledge and skills students with equipping aims to Consequently, the quality of learning must be elevated. Learning in this era revolves around the identification and diversification of problems, enabling students to act systematically and efficaciously solve problems while facilitating effective communication [6]. The Ministry of Culture and Education, in alignment with the demands of the 21st century, introduced a curriculum in 2013. This updated curriculum emphasizes the cultivation of creativity, problem-solving abilities, critical thinking, effective communication, collaborative skills, technical literacy, and proficiency in both life and professional domains. In this endeavor, teachers play a pivotal role in facilitating and shaping the learning experiences of students. in meeting the challenges of 21st-century learning by designing activities that encourage the adaptation of students to this modern educational paradigm [7]. Critical thinking is a distinct skill that involves the analysis and argumentation of subjects. It goes beyond mere memorization of facts and requires a contextual understanding, as well as the establishment of relationships between various contexts. Unlike rote memorization, critical thinking is an active, deliberate process through which students construct their own beliefs and engage in evaluation. This reflective process extends to productive thinking, involving the analysis of facts. To enhance critical thinking, the application of logic is essential. These critical thinking skills are crucial in making purposeful, reflective, and rational decisions about what is believed or deemed real [8]. They are often referred to as Higher-Order Thinking Skills (HOTS) and are invaluable for addressing the complex, real-world problems that characterize contemporary life. Teachers play a pivotal role in fostering critical thinking by encouraging students to engage in reflective and analytical practices. 4C expertise represents a novel approach endorsed by a group of specialists. It encompasses fundamental skills considered essential in the 21st-century workforce, as highlighted [9]. This set of abilities holds global significance, offering innovative solutions to various challenges. It emphasizes the capacity to generate and communicate ideas effectively through critical thinking, enabling individuals to creatively address real-world problems both independently and collaboratively in group settings. However, it is evident that not all students are adequately prepared to navigate the challenges of globalization, and their readiness for it fundamentally impacts their success in learning. Preliminary observations suggest that many students possess only a basic understanding of these vital concepts and skills. Moreover, there is a notable deficiency in research addressing these competencies, particularly in the context of students under 21 years of age, as traditional education methods have often fallen short in meeting these contemporary demands [10]. It is worth noting that a student's background and associated activities play a crucial role in supporting effective learning methods. These individualized backgrounds contribute significantly to a student's study habits (A. Khoiri, Kahar, & Indrawati, 2018). The 21st century has witnessed transformative shifts in mainstream society, encompassing economic, political, and cultural dimensions. In this evolving landscape, teachers play a pivotal role in guiding students towards a professional outlook aligned with the demands of the 21st century. This necessitates the implementation of development strategies for school teachers, as outlined by prominent scholars (Pear, 2001; Hargreaves, A. & Fullan, 2000; Hargreaves, 1997). The primary aim of this research is to ascertain the essential 4C skills required for students within specific educational contexts [11]. On one aspect, the 5E IPLv2 serves as a tool to gauge an individual's proficiency in setting up and implementing a 5E curriculum. Conversely, it provides valuable insights into the process of designing teaching strategies tailored

to the 5E curriculum. This tool aids teacher educators in refining their approaches, offering a structured evaluation of the model's strengths and identifying areas for improvement. To establish the tool's credibility, both the author and another experienced teacher familiar with 5E ILPv2 assessed projects based on 18 criteria. An additional teacher educator, not involved in the study, also utilized 5E ILPv2 for analysis [12]. Two comprehensive instructors thoroughly reviewed the description and independently assigned scores using the 5E ILPv2 scale and syllabus. The scores were then compared and deliberated upon until a consensus was reached. Given the limited sample size, the results were presented descriptively, opting for the categorization of items as either 'completed' or 'failed' rather than employing statistical measures. If an item received a score between 2 and 4 (indicating a range from 'average' to 'excellent'), it signified that the syllabus met the criteria. Conversely, if the marks fell below 2 (designating 'unacceptable' or 'poor'), it indicated a failure to meet the standards [13]. On one side, IPLv2 for the 5E model is employed to assess an individual's competence in crafting a lesson plan following the 5E approach. On the other hand, it aids in the development of 5E curricula and the design of teaching methods aligned with it. This tool is specifically tailored to assist teacher educators in evaluating the strengths and pinpointing the weaknesses of the 5E model's design heuristics. To ensure its credibility, both the primary author and another experienced teacher educator assessed lesson plans based on 18 scoring criteria using 5E ILPv2. An additional teacher educator not involved in the study used 5E ILPv2 for analysis. Initially, two teacher educators comprehensively reviewed the description and individually scored the syllabus using the 5E ILPv2 scale [14]. Subsequently, they assessed the syllabus separately, scoring each item to the best of their knowledge. Consensus until reached scores are compared were discussed. Small Due to sample size, the results were presented descriptively instead of relying on statistical measures, categorizing items as either 'completed' or 'failed.' An item receiving a score between 2 and 4 (indicating a range from 'average' to 'excellent') signified that the syllabus met the criteria. Conversely, if the marks were below 2 (indicating 'unacceptable' or 'poor'), it indicated a failure to meet the standards [15]. The Progressive Era emphasized the need for employees to possess the necessary skills tailored to their roles. In the 21st century, human resources must be equipped with a wide array of skills encompassing both professional and innovative capabilities. Students are expected to cultivate various skills, including proficiency in information, media, and technology usage. Practical learning and the application of media in technical engineering are also integral components of vocational education. Graduates will be further supported in acquiring 21st-century learning skills [16]. In addition to instructional expertise, teachers should possess specialized knowledge in their respective fields. Collaborating with colleagues who excel in their domains can lead to a more comprehensive understanding of how to effectively convey this knowledge in the learning process. This amalgamation of pedagogical content knowledge (PCK) was termed in the 20th century. However, with ongoing technological advancements, teachers should not shy away from embracing progress. As we enter the 21st century, teachers must adapt their teaching methods in accordance with these developments. The integration of content, teaching strategies, and technology is key to becoming an expert in one's field and fostering an enriched learning environment [17]. This amalgamation which encompasses three crucial areas of expertise: content, pedagogy, and technology. For many teachers, simply incorporating technology into their teaching practices is insufficient. Kohler asserts that teachers' efforts in the teaching and learning process may be limited and lack engagement. Therefore, specialized knowledge, as advocated by Shulman, extends beyond content understanding and necessitates proficiency in crafting suitable training strategies and skills tailored to students' needs. Consequently, TPACK arises as a vital framework for bridging technology and learning, emphasizing the importance of a teacher's comprehensive knowledge and skill set [18].

2. MATERIALS AND METHOD

Engage: In the "Engage" phase, students are introduced to the lesson's objectives in an interactive and stimulating manner. This sets the foundation for critical thinking as students start to formulate questions and express interest in the topic.

Explore: The "Explore" phase involves hands-on activities or experiments where students actively investigate and experiment with the subject matter. This phase promotes critical thinking and problem-solving skills as students seek to understand concepts through their own observations and experiences.

Explain: In the "Explain" phase, the teacher provides explanations and clarifications based on the students' observations and questions. This encourages effective communication as students learn to articulate their thoughts and seek further understanding.

Elaborate: The "Elaborate" phase encourages students to apply their knowledge in more complex activities or projects. This phase fosters creativity as students are given opportunities to think innovatively and develop their own solutions or interpretations.

Evaluate: The "Evaluate" phase assesses students' understanding of the topic through various forms of assessment, such as tests, projects, or presentations. Effective evaluation encourages critical thinking as students reflect on their learning and consider different perspectives. Overall, the 5E model offers a structured approach to lesson planning that not only imparts content but also actively engages students in the learning process. By incorporating this model, educators can effectively cultivate the 4Cs - Critical Thinking, Communication, Collaboration, and Creativity - which are crucial skills for success in the 21st century.

Method: The Fuzzy TOPSIS method serves as a decision-making tool, particularly beneficial for situations involving uncertainty or where group consensus is essential. Through thorough analysis, comparisons, and other relevant assessments, we identify a clear need for this objective grading technique, which is widely recognized and utilized [19]. Initiated by KAU Projects, the Fuzzy TOPSIS approach classifies projects into four distinct categories: instructional homes, The primary objective is to efficiently manage all construction endeavours by minimizing costs and imposing suitable penalties for any delays. In cases involving the development of KAU projects, which often face considerable uncertainty and budgetary constraints, this methodology proves to be invaluable [20]. The integration of Fuzzy with MCDM enhances the assessment process through techniques like TOPSIS. This approach is instrumental in determining the preferred weight for each criterion, subsequently bridging the gaps between actual and optimal alternatives. It employs comprehensive research to evaluate TOPSIS performance values, employing various measurements and scales to discern the best options among the layers of alternatives proposed by four different companies. This research holds significant promise for Taiwanese industries and offers strategic insights for decision-makers [21]. In the domain of facility location, the Fuzzy TOPSIS technique has been put forth as an examination method. It addresses numerous subjective criteria and provides abundant opportunities for reviewing potential sites. The technique handles the ambiguity in weights associated with all the criteria, providing numerical references for evaluation [22]. The results derived from TOPSIS assessments, which may initially appear ambiguous, are further elucidated through discrete distance measurements. Each distance scale is computed using the C programming language, providing clarity to the initially unclear TOPSIS scores. This comparative analysis, supplemented by stability ratios, is presented with detailed discussions [23]. The Hsu and Chen approach has successfully employed the Fuzzy TOPSIS technique to ensure compatibility between concepts. This approach circumvents the complexity of aggregating random fuzzy numbers and opts for weighted ratings, simplifying the rank approach while avoiding common pitfalls [24]. Efficient utilization of Fuzzy TOPSIS involves distinguishing between "Unambiguous High Quality Satisfactory Solution" and "ambiguous negative-best answer". This technique acknowledges that unambiguous ranking may not always be attainable. In all situations, the numbers are considered satisfactory. However, evaluating the proximity between ideal and anti-ideal solutions presents challenges. To address this, a novel TOPSIS approach has been proposed [25]. The proposed method involves scoring decision makers and establishing average and comparable weights for each category. Normalization is applied to all club activities, ensuring fair representation. Additionally, the process of replacing net worth values takes into account the magnitude of proximity for both negative and positive responses, aiding in distance calculations [26]. In recent years, remarkable in use Progress has been made Fuzzy TOPSIS methods. Initially utilizing fuzzy numbers, this approach focuses on relative closeness to generate ambiguity, guided by mathematical principles. The extension of this approach involves integrating alpha spacing and degrees of ideality based on fuzzy MCDM ideals and standards. This extension caters to unexplained GDM conditions, aligning with provisions set forth in collection units [27]. Within the realm of MCDM techniques, TOPSIS stands out for its ability to select pairs based on performance, ranking, and a balanced approach that addresses both subjectivity with weight and objective criteria. The introduction of Euclidean distance scaling has enhanced its effectiveness [28]. Fuzzy TOPSIS finds application in diverse fields such as supply chain management, eco-friendly solutions, and the energy industry, distinguishing itself in areas of particular interest like weapon selection and healthcare solutions [29]. It also addresses multivariate problems in attribute selection, proving valuable for tasks such as plant location selection, dealer selection for TOPSIS, and machine selection for commercial robotics [30].

3. ANALYSIS AND DISCUSSION

TABLE 1. Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills

	Critical Thinking	Communication	Collaboration	Creativity
Engage	34.56	155.63	32.63	22.05
Explore	33.48	175.15	45.63	27.30
Explain	25.63	185.62	32.16	23.10
Elaborate	38.46	125.29	55.54	25.15
Evaluate	40.63	186.35	30.16	20.89

Table 1 show the Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate it is has been Evaluate - 40.63 is Showing the Highest Value Critical Thinking and Explain - 25.63 is Showing the Lowest Value. Evaluate - 186.35 is Showing the Highest Value Communication and Elaborate - 125.29 is Showing the Lowest Value. Elaborate - 55.54 is Showing the Highest Value Collaboration and Evaluate - 30.16 is Showing the Lowest Value. Explore - 27.30 is Showing the Highest Value Creativity and Evaluate - 20.89 is Showing the Lowest Value.S

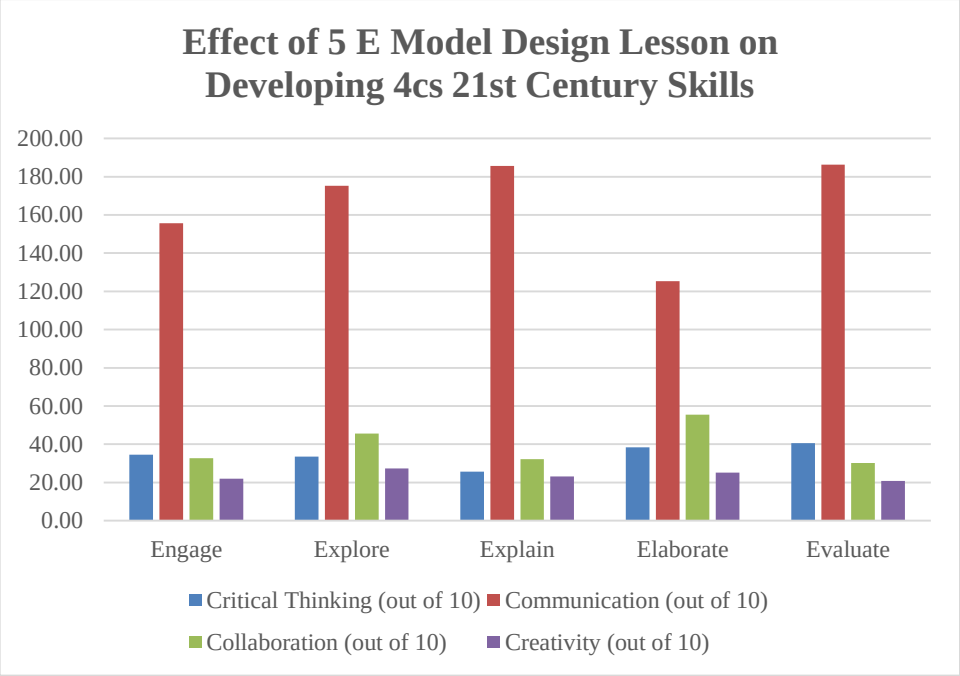

FIGURE 1. Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills

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TABLE 2. Square and Root of Value.

1194.3936	24220.6969	1064.7169	486.2025
1120.9104	30677.5225	2082.0969	745.2900
656.8969	34454.7844	1034.2656	533.6100
1479.1716	15697.5841	3084.6916	632.5225
1650.7969	34726.3225	909.6256	436.3921

Table 2 shows the Square and Root of Value Effect of 5 E Model Design Lesson on Developing 4cs 21st CSentury Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate SQRT Value.

TABLE 3. Normalized Data

Critical Thinking	Communication	Collaboration	Creativity
0.4424	1.9923	0.3609	0.4142
0.4286	2.2422	0.5047	0.5128
0.3281	2.3762	0.3557	0.4339
0.4923	1.6039	0.6143	0.4724
0.5201	2.3855	0.3336	0.3924

Table 3 shows the Normalized Data Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate is the Normalized Value.

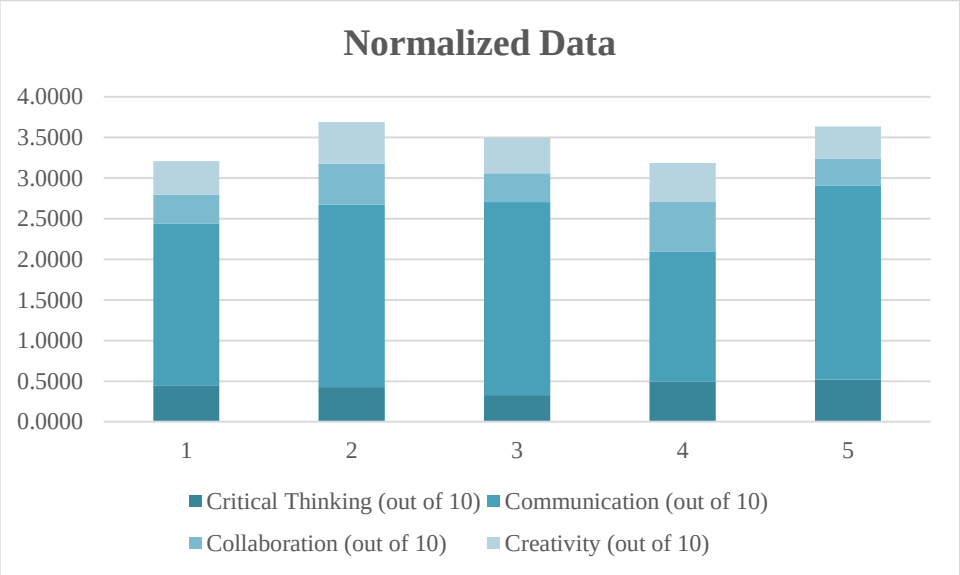

FIGURE 2. Normalized Data

Figure 2 shows the Normalized Data Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate is the Normalized Value.

TABLE 4. Calculate the fuzzy lingustic scale & Significance Value

		l	m	u
Extremely low	EL	0.1	0.3	0.5
very low	VL	0.3	0.5	0.7
low	L	0.1	0.3	0.5
medium	M	0.5	0.7	0.9
high	H	0.3	0.5	0.7
very high	VH	0.7	0.9	1
Extremely high	EH	0.9	1	1

Table 4 shows the Calculate the fuzzy lingustic scale & Significance Value Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate.

TABLE 5. Criteria lingustic scale using common value

	DM1	DM2	DM3
	Onwer	Capten	Coach
Critical Thinking	EH	VL	M
Communication	L	EH	VH
Collaboration	L	M	VH
Creativity	L	M	VL

Table 5 shows the Criteria lingustic scale using common value of Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity value.

TABLE 6. Convert the lingustic rating of decision makers into quantative value

	DM1			DM2			DM3		
Critical Thinking	0.9	1	1	0.3	0.5	0.7	0.5	0.7	0.9
Communication	0.1	0.3	0.5	0.9	1	1	0.7	0.9	1
Collaboration	0.1	0.3	0.5	0.5	0.7	0.9	0.7	0.9	1
Creativity	0.1	0.3	0.5	0.5	0.7	0.9	0.3	0.5	0.7

Table 6 shows the Convert the lingustic rating of decision makers into quantative value of Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity.

TABLE 7. Calculate Aggregated Fuzzy Weight Value

	L-FW	M-FW	U-FW
Critical Thinking	0.57	0.73	0.87
Communication	0.57	0.73	0.83
Collaboration	0.43	0.63	0.80
Creativity	0.30	0.50	0.70

Table 7 shows the Calculate Aggregated Fuzzy Weight Value of Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills for Analysis using the TOPSIS Method. Critical Thinking, Communication, Collaboration and Creativity.

TABLE 8. Weighted normalized decision matrix

Technical Knowledge (1-10)			Practical Application (1-10)			Problem Solving (1-10)			Overall Satisfaction (1-10)		
0.250703	0.324439	0.383428	1.128961	1.461008	1.660236	0.156381	0.228557	0.288704	0.124259	0.207099	0.289938
0.242868	0.3143	0.371446	1.270561	1.644256	1.868473	0.218685	0.319616	0.403725	0.153845	0.256408	0.358971
0.185923	0.240607	0.284353	1.346512	1.742545	1.980165	0.154129	0.225265	0.284545	0.130176	0.216961	0.303745
0.278994	0.361051	0.426697	0.90887	1.176185	1.336574	0.266179	0.389031	0.491407	0.141729	0.236215	0.3307
0.294735	0.381422	0.450772	1.351808	1.749398	1.987953	0.144544	0.211256	0.26685	0.117722	0.196204	0.274685

Table 8 shows the Weighted normalized decision matrix Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate is the Weighted normalized decision matrix of Value.

TABLE 9. A+, A- Maximum and Minimum value

A+	0.294735	0.381422	0.450772	1.351808	1.749398	1.987953	0.144544	0.211256	0.26685	0.117722	0.196204	0.274685
A-	0.185923	0.240607	0.284353	0.90887	1.176185	1.336574	0.266179	0.389031	0.491407	0.153845	0.256408	0.358971

Table 9 shows the A+, A- Maximum and Minimum Value Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate Maximum and Minimum Value.

TABLE 10. Fuzzy positive ideal solution

Engage	0.056924	0.282977	0.017484	0.011461
Explore	0.067053	0.103169	0.109504	0.063334
Explain	0.14067	0.006724	0.014157	0.021836
Elaborate	0.02035	0.562453	0.179652	0.042091
Evaluate	0	0	0	0

Table 10 shows the Fuzzy positive ideal solution Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate Fuzzy positive ideal solution is the Value.

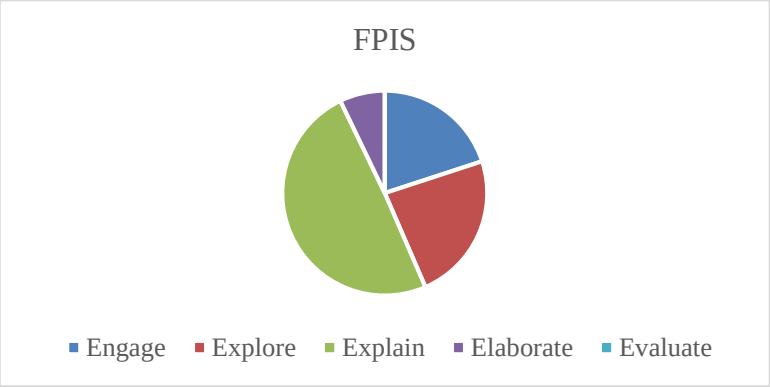

FIGURE 3. Fuzzy positive ideal solution

Figure 3 shows the Fuzzy positive ideal solution Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate Fuzzy positive ideal solution is the Value.

TABLE 11. Fuzzy Negative Ideal solution

Engage	0.083746	0.279476	0.162168	0.051872
Explore	0.073617	0.459285	0.070148	0
Explain	0	0.555729	0.165495	0.041498
Elaborate	0.12032	0	0	0.021243
Evaluate	0.14067	0.562453	0.179652	0.063334

Table 11 shows the Fuzzy Negative ideal solution Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate Fuzzy Negative ideal solution is the Value.

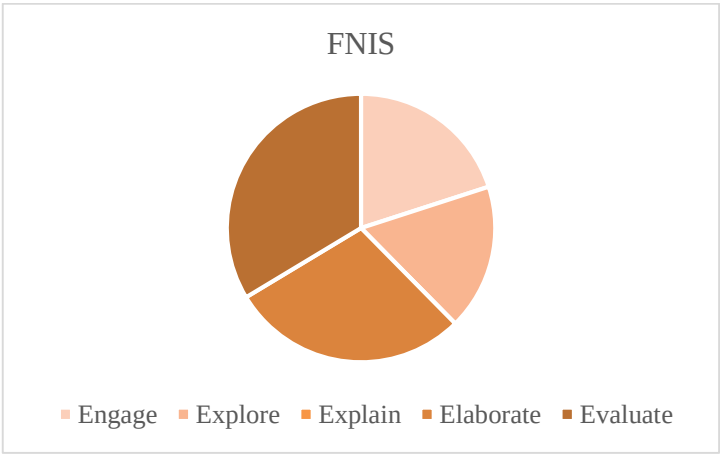

FIGURE 4. Fuzzy Negative ideal solution

Figure 4 shows the Fuzzy Negative ideal solution Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills in Critical Thinking, Communication, Collaboration and Creativity and Engage, Explore, Explain, Elaborate and Evaluate Fuzzy Negative ideal solution is the Value.

TABLE 12. Si positive, Si negative, CCi Closeness coefficient & Final Result

	Si+	Si-	Cci	Rank
Engage	0.368846	0.5772628	0.610144	4
Explore	0.343059	0.6030498	0.6374	3
Explain	0.183387	0.7627221	0.806167	2
Elaborate	0.804547	0.1415627	0.149626	5
Evaluate	0	0.9461093	1	1

Table 12 shows the Si positive, Si negative, CCi Closeness coefficient & Final Result Si positive, elaborate is having is Higher Value and Evaluate is having Lower value. In Si Negative, Evaluate is having is Higher Value Elaborate is having Lower value. Ci is calculated using the formula (5). In Ci, Evaluate is having is Higher Value and Elaborate is having Lower value.

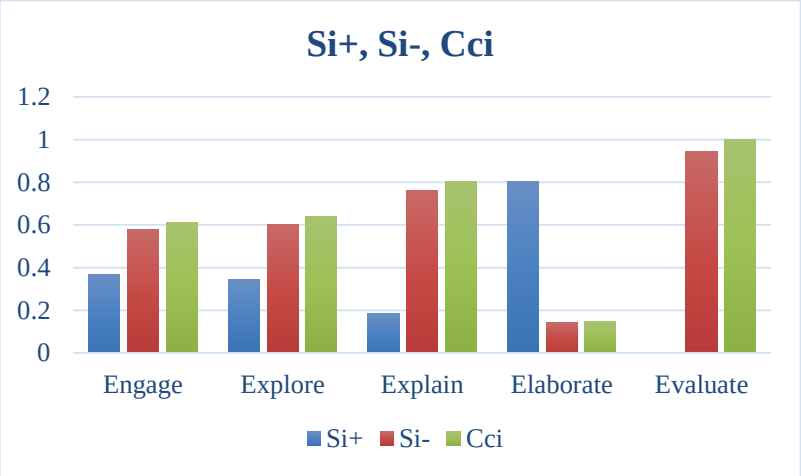

FIGURE 5. Si positive, Si negative, CCi Closeness coefficient & Final Result

Figure 5 shows the Si positive, Si negative, CCi Closeness coefficient & Final Result Si positive, elaborate is having is Higher Value and Evaluate is having Lower value. In Si Negative, Evaluate is having is Higher Value Elaborate is having Lower value. Ci is calculated using the formula (5). In Ci, Evaluate is having is Higher Value and Elaborate is having Lower value.

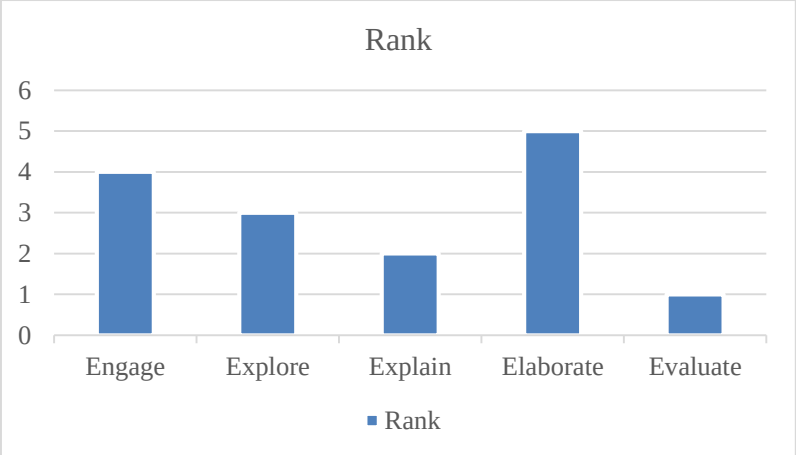

FIGURE 6. Shown the Rank

Figure 6 Shows the Ranking of Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills of Final Result in Evaluate is got the first rank whereas is the Elaborate is having the Lowest rank.

4. CONCLUSION

The 5E Model Design Lesson has revolutionized the way education is delivered in classrooms. This innovative approach, which stands for Engage, Explore, Explain, Elaborate, and Evaluate, provides a structured framework that caters to various learning styles and abilities. In the "Engage" phase, students are captivated and drawn into the lesson, igniting their curiosity and interest. The "Explore" phase encourages active participation and hands-on experiences, allowing students to investigate concepts firsthand. Subsequently, the "Explain" phase provides the necessary information and context, ensuring of students' knowledge they have a solid foundation. As the lesson progresses into the "Elaborate" phase, students delve deeper into the topic, applying their newfound understanding in complex scenarios. Finally, in the "Evaluate" phase, students' comprehension is assessed, offering valuable feedback to both the teacher and the learners. This holistic approach Deep about the subject in addition to developing understanding, for 21st century success critical thinking is essential, Solving the problem and collective competence Grows. The 5E Model Design Lesson is a powerful tool that empowers students to take charge of their learning journey, making education a dynamic and engaging process. Developing 4Cs, is paramount in preparing individuals for success in the 21st century. These skills are integra1 for of the modern worldleading to problems. In the 21st century, instruction has evolved to become more specific and professional, impacting citizens' political, cultural, and economic dimensions, thus emphasizing the interconnection between instruction and various aspects of life. This research was conducted at the School of Education, Tarbiat Moallam University, Tehran. It focused on assessing the effect of the 5E model as a new instructional design for teaching science. The study aimed to compare the impact of this model with traditional teaching methods, particularly concerning its relevance to real-life applications in science subjects. Collaborating with colleagues who excel in their domains can lead to a more comprehensive understanding of how to effectively convey this knowledge in the learning process. This amalgamation of pedagogical content knowledge (PCK) was termed in the 20th century. However, with ongoing technological advancements, teachers should not shy away from embracing progress. As we enter the 21st century, the Ranking of Effect of 5 E Model Design Lesson on Developing 4cs 21st Century Skills of Final Result in Evaluate is got the first rank whereas is the Elaborate is having the Lowest rank.

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