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Identify the components of the STEAM curriculum in elementary school

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Abstract

Background: The integration of art in the curriculum is essential for the development of children's creativity and prevents the lack of connection between mathematics and science with the real demands and needs of the world. As an art-centered integrated approach, STEAM can help teachers, students and employers meet this need. The present study was conducted to design a STEAM curriculum model for elementary schools in Iran.

Methods: The research method used in this article is qualitative thematic analysis. The study population included all existing research on STEAM in databases of Amazon, ProQuest, UNESCO, Google Scholar, Eric, and Emerald from 2000 to 2020. Sampling was done purposefully or theoretically, i.e. through the conscious selection of specific individuals or elements for research by the researcher. Then, 200 articles and 10 books were selected as purposive samples.

Content analysis covers a wide range of methods and techniques. The theme network, developed by Stride-Sterling in 2001, is used in theme analysis in this research. The theme network systematizes the basic themes, the organizing themes, and the pervasive themes, based on a specific process.

Results: STEAM curriculum design was inferred based on Drack interdisciplinary skills approach model, after content analysis. The analyzed curriculum elements include objectives, content, teaching methods, assessment, learning activities, time and space.

Conclusion: Identifying the components of the STEAM-based curriculum based on the Drake interdisciplinary approach can be used by teachers and school principals to design teaching and write lesson plans, and to help foster creativity in students. To connect with the real world and the job market.

Key Words: Art, Creativity, Interdisciplinary approach, STEAM.

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1- INTRODUCTION

The Organization for Economic Co-operation and Development (OECD) encouraged countries to implement the STEM (Science, Technology, Engineering, and Math) approach for developing the students' talents. STEM is an educational method that combines the disciplines of science, engineering, technology and mathematics and incorporates them into its curriculum according to the relationship they have with each other; but it must be noted that the challenges faced by future generations require creative solutions, and STEAM alone cannot pass this ability on to the new generation. Of course, science, technology, engineering, and math are the core subjects of scientific knowledge, and they are important aspects of many jobs, but they focus only on the capabilities of the left side of the brain, or the analytical part of children's brains. Attention to the features of the right side of the brain has led to the addition of art to the STEM framework in recent years (1).

In 2012, the idea of STEAM teaching for starting innovative children's schools began in the United States and, simultaneously, in some other countries around the world. The letter "A" in STEAM means the presentation of the arts and humanities, as well as their use in teaching, with the aim of increasing children's participation in STEM disciplines, trying to adapt primary education services to the needs of the labor force in the economy. The acronym of "STEAM" is relatively new and is attributed to Yakman; He discovered how to understand the principles of mathematics and science through art. He also sought to prevent the segregation of the STEM fields and to develop a valid integrated approach by incorporating the arts into these fields. Proponents of STEAM believe that combining art is essential for the growth of children's creativity, and also helps math and science to be linked to the real demands and needs of the world. "STEAM is an evolving educational model of how to organize academic science topics including: science, technology, engineering, art, and math in an environment with integrated curriculum applications" (2).

STEAM fans believe this is a fair way to engage and prepare children for 21st century skills and careers. STEAM is a fair approach because in line with considering the educational requirements, it addresses issues that children are interested in. STEAM also includes learning methods that help children enjoy their explorations and designing solutions; they include different strategies such as making use of drawing, computer graphics, performing arts, creative thinking, and even fun problem solving (3).

The aim of this study was to evaluate the effectiveness of STEAM training in cultivating energy concepts among seventh grade students. The study sample consisted of 74 students from two different classes in experimental and control groups. The STEAM approach was applied to the experimental group, and the control group was trained according to the usual curriculum. Data were collected through semi-structured interviews with 10 students. The results show that STEAM education has a positive effect on students' conceptual understanding and has reduced or changed the number of misconceptions (4).

Research was conducted on the subject of teaching science as a part of STEAM education with the aim of improving student interaction. This descriptive qualitative research showed that contemporary approaches to STEAM education provide a strong connection to local contexts and community issues that students may be familiar with as a part of their everyday life. The use of STEAM instruction usually involves guided learning through questioning, where

students learn through direct experience of nature and technology that leads to high-levels or abstract thinking (5).

Another study examined the impact of the STEAMPunk program on high school girls' learning. The results showed that STEAM is an approach to teaching STEAM that encourages interdisciplinary activities, creativity, innovation and entrepreneurship. Using project-based learning and design strategies, the program enabled girls to increase their self-confidence to enhance their ability to produce solutions to real-world problems (6).

Yet another research entitled "Development and technical experience of a plastic injection machine for STEAM training" was conducted among the elementary students. In traditional technical education exhibitions, elementary school students used posters, visual aids, and oral presentations to introduce different types of technical and vocational education; but the results of the exhibitions were not as expected and there was a gap between schools and industries. To solve this problem, an industrial-level plastic injection machine was introduced for STEAM educational applications (science, technology, engineering, art, and mathematics). This innovative educational model could motivate students and allow them to understand the latest technology trends to find the right growth areas and find the right career orientations in the future (7).

A further study, conducted on the role of languages and literacy in STEAM, showed that each of the disciplines of STEAM content (science, technology, engineering, art and mathematics), uses a language with its own grammatical structures, technical vocabulary and cultural expression (8).

Starzinski (2017), in his study entitled "Essential Elements of the STEAM Learning Model for Elementary Schools", indicated that in STEAM education, instead of using the old methods, the ease with ambiguities and risk assessment in testing unknowns is essential. There are many benefits for teachers regarding the use of STEAM, including: integration of content with desirable results, originality of assignments, and easily making the complex and transferable content understanding for their students (9).

The results of the international tests show that the success of Iranian elementary students in four-choice questions and areas of knowledge is higher than in solving descriptive problems. These results necessitate the need to change, improve, and update science and math teaching approaches, and since all courses are taught by a teacher in the elementary school, it is possible to use integrated educational programs such as STEAM programs (10).

Similarly, in many other countries, science education faces many challenges; many students are disinterested in the experimental sciences and see no connection between their lives and the science curriculum (11). And despite the shift of the content of the elementary school curriculum to a guided exploratory approach in some countries such as Iran (12), many of these programs, as Harlen states, are incoherent; hence, using an integrated approach will help give an overview to the students (13). Thus, in the experimental sciences textbooks of elementary schools, neglect of the scientific-technological literacy skills, the process skills in learning basic sciences, and no engagement in scientific activities, weaken students in scientific skills (14).

In such schools and educational centers, art education is not, commonly, very important and does not have a proper place in the school curriculum, that is, it has been pushed to the margins of the educational system and has been neglected in the curriculum (12). One of the issues

and challenges facing educational and curriculum planners is how to establish a relationship between art and the other curricula, in a way to provide the students with relevant and applicable knowledge (13).

STEAM curriculum design is equivalent to an integrated curriculum. Integrated models by instructors are usually classified into interdisciplinary, multidisciplinary and trans disciplinary formats. The difference between these three types of combinations is in how the fields are used or connected to each other. The interdisciplinary curriculum focuses on identifying common themes of the disciplines and organizes the curriculum around the students' direct research, while the standards for organizing the multidisciplinary curriculum revolve around a single theme (4). The research literature does not definitively state whether STEAM is an interdisciplinary, multidisciplinary, or interdisciplinary approach, meaning that it may have the characteristics of all of them, depending on the method of execution (5).

The Drake's curriculum model of the Interdisciplinary-Skills Approach, offers skills that can be developed through multiple disciplines. This model seeks to teach the ways of thinking, research ability, and mathematics skills in integrated forms (6). In addition to the purpose, content, training, and evaluation, Darke's model pays special attention to the elements of the design of space and time in the design of the interdisciplinary educational activities.

Accordingly, the present research aimed at identifying and explaining the characteristics of the STEAM curriculum, by reviewing and analyzing the content of the related books and articles, through the content analysis method and based on the approach model. Thus, the main purpose of this research is to identify the elements of the STEAM curriculum based on Drake's interdisciplinary skills approach model in elementary school.

2- MATERIALS AND METHODS

This research is of qualitative type with survey design and documentary data collection. The data analysis is conducted based on the Attride-Stirling thematic analysis. To compile this research, in the form of a qualitative research paradigm, a content analysis method has been used to analyze the data. Content analysis is a way to identify, analyze and report patterns in qualitative data. This method is a process for analyzing textual data and converts scattered and diverse data into rich and detailed data. According to Brown & Clark, Content analysis is a method used to both express and explain reality (15), in the form of the extracted themes which are patterns found in data that, as Boyatzis states, at least describe and organize observations and at most interpret aspects of the phenomenon (16).

The data of the research were, primarily, extracted by the researcher, based on Max Kyoda 10 software using Attride-Stirling theme analysis method in which the network of themes, based on a specific process, is sySTEMatized into the basic themes, organizing themes and comprehensive themes (17). After extracting the themes and components, the STEAM curriculum elements were organized, based on Drake's interdisciplinary curriculum model.

2-1. Data collection

All Internet resources, books, dissertations, Persian scientific databases and authoritative English scientific databases, such as the website of the United Nations Educational, Scientific and Cultural Organization (UNESCO), Google Scholar, Proquest, Amazon were searched based on the keywords: STEAM, Drake interdisciplinary curriculum, STEAM curriculum, STEAM curriculum element characteristics.

2-2. Inclusion and exclusion criteria

Refinement and evaluation of the articles began with studying of their titles and abstracts. At this stage, the articles related to adult education, business, workforce empowerment, and other non-related topics were removed, and those related to STEAM elementary education, STEAM curriculum design, and teaching were selected. In the next step, in addition to the title and abstract, the introductions, findings, discussions, and conclusions of the articles were reviewed. In total, 500 articles and 12 books in English about STEAM education were reviewed, among which 10 books and 200 articles were selected for the analysis of concepts and identification of Steam-based teaching components. In addition, the articles and books obtained the necessary criteria to enter the research, based on the evaluation structure described in **Table 1**.

Table-1: Criteria considered in the critical review of texts

1. Is the article a survey work that seeks to determine the impact of the STEAM curriculum on students' creativity or describes a STEAM curriculum?
2. Does the article or book seek to explain the benefits of a STEAM-based curriculum for elementary school students?
3. Has the article or book explored new aspects of the STEAM curriculum?
4. Has the article or book explained the background of the STEAM program?
5. Has the article or book described the components of STEAM and its impact on learning science and math?

In the next stage, the data analysis was performed using Max Kyoda 10 software and led to the identification of components and elements of the STEAM curriculum.

In order to ensure the validity of the research and in order to ensure the accuracy of the findings, the opinions of some experts familiar with the field of integrated curriculum were used. The intercoder reliability was also calculated. For this purpose, one of the curriculum planning experts familiar with coding was asked to participate in the research as a secondary coder; the extent to which the two experts agreed on how to code the same content was calculated. The intercoder reliability was obtained to be 90.1%, which indicates a high reliability.

2-3. Ethical considerations

Due to the fact that this research is of qualitative library-based type, to observe the ethics, in all quoting the source are exactly mentioned. This research is taken from the doctoral dissertation of Morteza Zarei, a student of Hormozgan University, with the code of 1539062.

3- RESULTS

The theme analyses were performed using the MaxQda 10 software and based on Drake's interdisciplinary curriculum model, which includes purpose, content, teaching method, evaluation, and learning activities, as well as the time and space.

The results of the analysis of the themes regarding the goals of the STEAM approach showed that the organizing themes in this field include: "Practical use of technology, practical use of art, mutual interaction between the students and society, occupational skills training, 21st century skills development, deepening learning, the comprehensive development of the child, and having a fair approach to educational issues using art".

Through STEAM teamwork, the students are able to activate their multidimensional intelligence capabilities and holistic learning principles. Creative educational design and providing more opportunities for people to develop confidence and creativity, along with increasing their interest in science, technology, engineering, math, art and learning as a general principle is done through practical constructions.

Paying attention to the features of the right side of the brain has led to the addition of art to the STEM framework. The arts promote cultural development, and stimulate conscious imagination and functioning in society; they act as a bridge between scientific understanding and the use of sustainable endeavors.

STEAM helps children better understand the concepts rooted in other disciplines, perspectives, and cultures, so that they can collaborate and work with each other while maintaining their identity. Influencing students to fulfill their social responsibility for achieving social justice is another valuable goal achieved specifically through the integrated learning of the arts.

Regarding the exploitation of social justice, interdisciplinary works should be done by research teams from all disciplines, and citizenship is something that can be learnt in the classroom through problem-based learning, which is one of the strategies used in the STEAM-based curriculum.

STEAM is a fair way to engage and prepare children for the 21st century skills and careers; because it also addresses issues that children are interested in. It prevents the one-discipline bias and allows unrestricted creativity in the classroom linking career and economic planning, as well as the ethics and values; and prepares students to apply aesthetic principles along with the use of technology.

One of the STEAM's goals is to encourage economic stakeholders to value the more creative job candidates. Another goal of creating STEAM is to reach the highest level of Bloom's classification to ensure that it engages its students in higher order thinking. In STEAM-designed courses, the teachers support high-level cognitive skills such as abstraction, analysis, application, organization and interpretation.

The art component "A" in STEAM indicates its orientation towards having a more humane and equitable approach to learning by considering the social and creative aspects of problem solving. After all, most of the unspecified problems are not related to science, math, engineering, or technology, and most solutions to complex problems require the creative and innovative perspectives that exist in STEAM education. Teachers can use STEAM to guide students to find ways to the true nature of interdisciplinary problem solving through the arts and social sciences.

3-1. Content analysis

The results of the content analysis regarding the appropriate content in the STEAM approach revealed the following organizing themes: Problem-based learning is a constructivist learning framework that prepares students for complex, unstructured problem-solving. Problem-based learning is usually considered as a group risk with the participation of students, which is considered as a cognitive apprenticeship in the learning environment.

Combining disciplines in STEAM education can be challenging for teachers who specialize in a special subject and content. Teachers should purposefully write lesson plans for problems related to living. Most real-world problems are multidisciplinary and can provide different standards. In the context-based or thematic approach, the focus is on teaching

scientific concepts in the context of the learners' everyday life, and it is with this strategy that life becomes more attractive and scientific concepts sound more relevant and meaningful to the learners.

The concept of 'integrative designs' in engineering is a turning point for STEAM training. The processes of communication, combination and integration between the training programs in the five STEAM disciplines should be done without creating conflict.

The integrated lesson plan brings together all the topics to produce a coherent lesson plan in which all the lessons are connected to a main theme. Technology integration is an essential element, but the focus is on nurturing students who can produce technology; because they do consume technology out of school and the goal is to increase student learning through technology.

A humanistic approach to innovation creates a set of tools for designers to combine the needs of people, technology facilities and the requirements of business success. STEAM attempts the students with enjoyable learning methods, using the design, computer graphics, performing arts, creative thinking and fun problem solving.

Once the STEAM program is fully developed, there are a number of well-structured interdisciplinary projects and other integrated activities based on the standards, such as research, creative expression and problem solving using the technology, engineering processes, and understanding the facts of society. STEAM is based on integrated learning structures that require schools to abandon segregated learning models and implement an interdisciplinary curriculum.

3-2. Teaching methodology

The results of the analysis of the themes regarding the teaching methodology of STEAM approach showed that the organizing themes in this field include: "Teaching design, multidisciplinary teaching, interdisciplinary, transdisciplinary, the use of context-based approach in teaching, and the continuous professional development of teachers with the participation of specialists".

The teachers facilitate learning in various areas, and most importantly, support students. The goal is to create an environment where peers work together. Teachers can use STEAM to guide students to find ways to the true nature of interdisciplinary problem solving through arts and social sciences.

In projects, the students are connected with experts in multiple subject areas to identify interesting ideas in the world around them via the Internet. The specialists in the curriculum design work together to model the appropriate strategies for enjoying the experts' skills and assistance in problem solving and to involve students in the subject. Lack of teacher familiarity and interest in STEAM teaching are the challenges facing its development. Relevant planning should, then, be done with the presence of content experts, interested in the STEAM approach.

Designing the strategies is challenging for the teachers, because the standards may be removed or added as they begin the process of integrating them in the unit. Teachers often start with a general idea of the standards required to be covered in a particular course. And make changes when creating a unit.

Talking to the students and parents, paying attention to hobbies and topics that students often discuss or share with their peers is a good way to find the topics they need. Another way to understand the importance and salient topics for students is to pay attention to the students' questions or to conduct surveys.

Some instructors prefer a transdisciplinary approach to STEAM education, since it provides the students with more opportunities for learning through problem-solving, and they can acquire a more holistic perspective, which is essential for success in accepting future careers.

The research literature does not definitively state whether STEAM is interdisciplinary, multidisciplinary, or transdisciplinary, meaning that STEAM may have the characteristics of all them, depending on the method of implementation (18). Students use their integrated knowledge to complete a project, solve a problem, or create an artistic response during the learning process.

Using cognitive skills to support students in learning complex thinking skills provides opportunities to use these skills in a variety of ways. Interactive skills describe how students are involved and motivated to collaborate and participate.

The context-based approach emphasizes the fact that learning is related to the personality and emotions of the audience. In this process, learning experiences are obtained from the interaction with the learning environment; and the personal construction of knowledge occurs as a result of the interaction between one's current knowledge and experiences with the environment. In simple terms, context and environment affect learning.

During the STEAM unit, instructors or experts can help students in the classroom as they solve problems by answering questions, discussing skills and pathways related to industry and academia, and demonstrating how the answers may be explored in the real world; and they provide feedback for students on final solutions.

An accepted framework called Experience-Based Professional Development (PBPD) proposes shifting the status of traditional professional development to providing credible opportunities for teachers to participate in purposeful professional development as they practice their skills in the real context. In PBPD, the professional development is experience-based, context-oriented and multifaceted, and focuses on the acquisition of new skills in the classroom.

3-3. Assessment

Based on the analysis of themes regarding the evaluation in the STEAM approach, the following organizing themes were extracted: "production-based evaluation, participatory evaluation, choice in evaluation, final evaluation, formative evaluation, performance measurement".

The final evaluation of STEAM should focus on measuring the understanding and ability to demonstrate the content and exercises within STEAM research. The final evaluation should be directly related to solving the problem stated in the problem outline. The problem should be clearly stated in the content and exercises of mathematics and science. The final assessment should be directly related to solving the problem mentioned in the lesson plan statement. Each standard should be evaluated based on the standard alignment table. And the students should have the choice to decide on the method of demonstrating their learning.

Formative evaluation includes: two- to four-item short tests, peer-to-peer thinking and subject sharing, presenting thought drafts, inspecting the projects, prototype modeling, classroom exit tickets, self-feedback, one-minute presentations, and observations. The formative evaluation plan develops during the research.

3-4. Learning activity

The analysis of the themes regarding the learning activities in STEAM approach revealed the following organizing themes:

" Valid projects for homework, students' participation in planning, attention to students' needs and interests in designing activities, Problem-oriented, and research-oriented activities".

A combination of different factors such as engaging teachers in the learners' special needs, paving the way for their professional development for responding the current needs, addressing the prerequisite knowledge and skills for dealing with the integrated projects, modeling and independent practicing, and direct feedbacks in the classroom can enhance the efficiency of the professional development . Problem-based learning helps students to develop metacognitive skills, procedural knowledge, problem-solving skills, participatory learning skills, and to understand how these skills are applied in society.

STEAM attempts to apply learning methods that create an enjoyable exploration and problem-solving process for children. They include drawing, computer graphics, performing arts, creative thinking, and fun problem solving. Furthermore, providing the students with different choices gives them opportunities to express themselves in a variety of ways.

Researchers believe that participatory learning helps students use democratic principles to reduce competitive prospects and build strong relationships through peaceful dialogue. Thus, the studies investigating its effects on the students' civil liability show that by placing students in problem-based environments requiring interdisciplinary research, they can address issues in the community and the world around them. Apart from the subject matter, the arts are suitable as an imaginative tool for innovation.

STEAM is a project-based investment, and sharing is one of the core ideas of the project. Students need to create something they can share with others. This issue has a lot to do with the motivation, communication, vision construction, and mutual learning for managing the project.

Research-based learning increases the students' content knowledge in science and enables them to transfer their knowledge, which leads to success in mathematics and engineering. Artistic research fosters creativity, while enabling the instructor to teach in a variety of ways, which in turn increases the likelihood of retaining knowledge in the mind.

3-5. Time and space

The analysis of the themes about time and space in the STEAM approach showed the following organizing themes: "Spatial and temporal diversity of activities, time constraints, diversity of teaching aids".

Sufficient time and space must be provided for the learner to be able to design, execute, debug, modify, expand, and edit projects. Allocating enough time to the classroom gives students access to experts and materials, and some time outside the school may also be required for the projects. In the context-based approach, the teacher needs diverse learning environments such as classroom, laboratory, home and farm. In this process, the teacher presents the concepts with examples from the surroundings.

There are concerns about the shift to indirect teaching, the prolonged daily activities, the time consumed for facilitating and guiding the students' learning and project-based activities. Assessing project works and non-cognitive skills can be challenging if enough time and support are not provided for the development, execution, and review of the projects.

STEAM units do not need to be equipped with high- tech facilities. With a number of online tools there will be many options. The integrated approach requires the

collaboration of laboratory environments and rich high-level learning environments.

The STEAM curriculum design model based on the Drake model is shown in **Fig 1.**

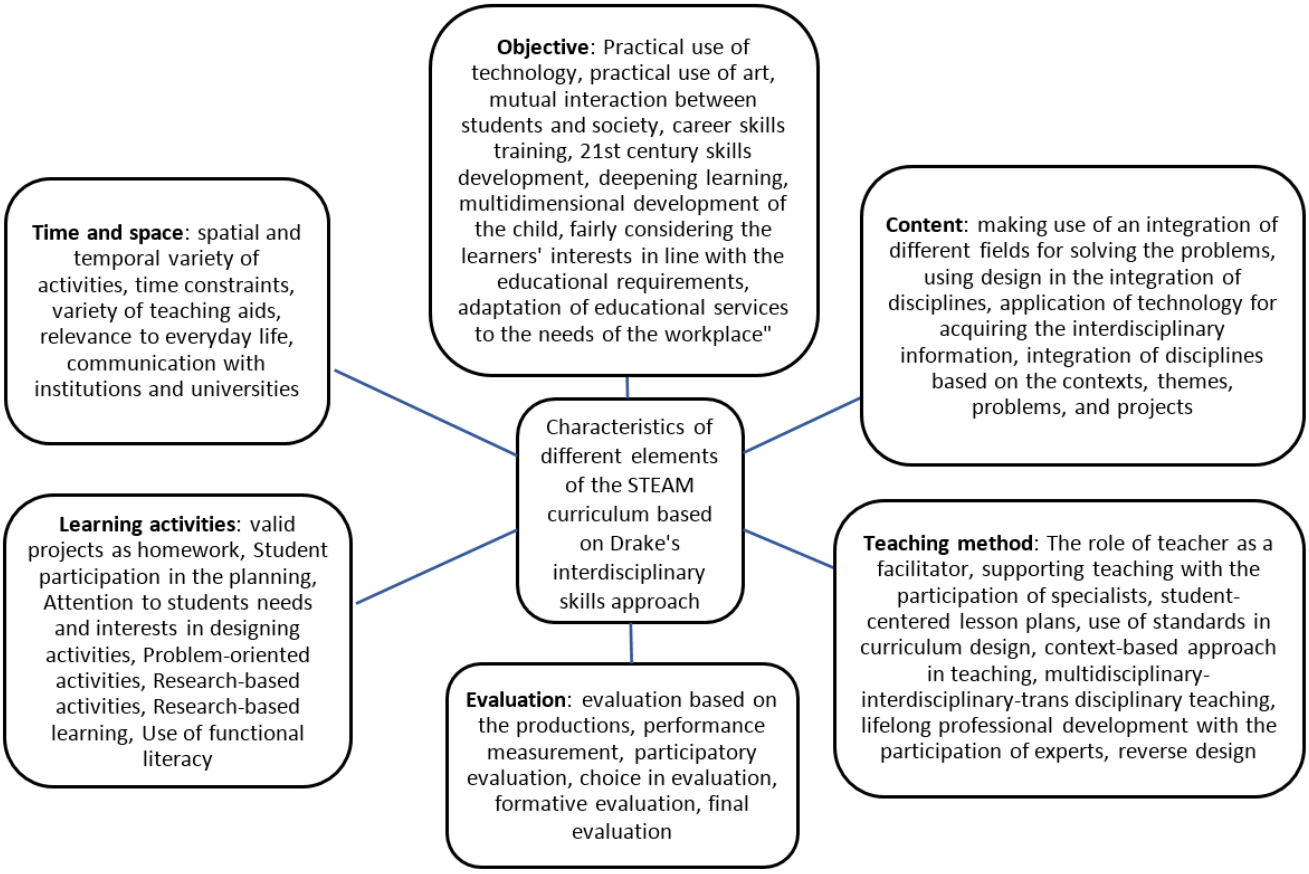

Fig. 1: The Conceptual Model of Steam Curriculum Based on Drake's Interdisciplinary Skills Approach Model

4- DISCUSSION

In this research, the components of the STEAM curriculum have been identified based on Drake's model of curriculum elements and interdisciplinary skills. The purpose of this study was to identify the STEAM curriculum elements based on this model.

The main goals of STEAM education in the elementary school are to support the integration of art education in public education and to motivate educational employers to hire artists and designers in order to stimulate creative thinking (2).

Questions and answers, critical thinking, participation, communication, creativity and digital citizenship are among the success factors of teachers in designing STEAM lessons. Positive cooperation of teachers, school staff, families and community experts in order to share ideas for enriching students' learning experiences are among the important factors involved in learning (4).

On the other hand, integrating different disciplines in STEAM teaching can be a challenge for teachers who specialize in one subject and content, because teachers have to purposefully write scenarios (lesson plans) for problems related to the learners' place of residence and learning context (3). Most real-world problems are multidisciplinary and can meet different

standards. However, writing an interdisciplinary issue does not guarantee that teachers will have the necessary skills to cover all the disciplines in the course in a proportionate manner. This level of expertise required can be particularly challenging in higher grades, where STEAM issues become increasingly complex (9).

The use of an STEAM-oriented interdisciplinary approach is suggested in elementary education in which students have the opportunity to learn holistically through problem-solving, as it is an essential requirement for success in accepting future careers. Effective teaching requires a high level of expertise for being able to communicate between disciplines. They should be able to identify gaps in their content knowledge and fill gaps with resources and subject matter specialists.

There are concerns about the shift to indirect teaching, the prolonged daily activities, the time consumed for facilitating and guiding the students' learning and project-based activities. Without sufficient time and support to develop, execute, and review, evaluating project work, learning debates and non-cognitive skills can be challenging (14), which is solvable with flexibility and diversification of training and evaluation.

In the STEAM curriculum, final evaluation is done based on the productions and final tests. The final evaluation of STEAM will focus on assessing the earners' perception along with their ability to demonstrate content and do exploratory exercises (10). STEAM-based evaluations are done through both formal and informal formative assessments, which can help students with different cognitive and learning styles to achieve academic success.

In this regard, the following has been briefly mentioned in the research background: STEAM education has a positive effect on students' understanding of concepts and reduces misconceptions about scientific concepts; Creates a strong connection to local contexts and community issues that students may be familiar with as part of their everyday life; allows students to understand the latest technology trends and find the right areas to grow and find the right career direction in the future. Among the main benefits of STEAM is the originality of homework along with its capability of transferring complex contents to students.

Hence, the results of the present study can help planners, principals, and elementary school teachers to use the identified elements of STEAM curriculum based on Drake's model to design and implement STEAM training in their classroom. Include in your lesson plan.

4-1. Study limitations

Conducting this study is associated with challenges and limitations, including the lack of reliable sources in Persian and STEAM specialists in Iran, that led to the necessity of obtaining information from the specialists abroad for which restrictions of communication in English were faced.

5- CONCLUSION

The results of the present study demonstrated that the elements of the STEAM curriculum based on Drake model (including purpose, content, teaching method, evaluation, learning activities and time and place) benefit from unique characteristics of "Practical uses of technology, practical uses of art, mutual interaction of students and society "," integration of different disciplines in order to solve problems, use of design-oriented integration of disciplines, , integration of disciplines based on context, themes, problems, and projects, "The role of teacher as a facilitator, participation of specialists in supports of the teaching

process, student-centered lesson plans, standards-based designs, context-based approaches to teaching, multidisciplinary-interdisciplinary-interdisciplinary teaching , lifelong professional development with the participation of experts, reverse designs, evaluation based on the productions, performance measurement, participatory evaluation, choice in evaluation, formative evaluation, final evaluation, using valid projects as homework, student participation in the planning, attention to students needs and interests in designing activities, problem-oriented activities, research-based activities, research-based learning, use of functional literacy, spatial and temporal variety of activities, time constraints, variety of teaching aids, relevance to everyday life, communication with institutions and universities. These properties can be used by teachers and school principals to design curriculums and Lesson plans. They can also help cultivate creativity in students and connect the lessons to the real world and the job market by taking advantage of the benefits of art in STEAM.

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