Design Thinking Promoting the Deep Integration of STEM and SEL

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Abstract: With the development of science and technology, the change of major social contradictions and the requirements of dance education in the new era, the integration of STEM education and SEL is considered as an important direction of dance education reform in primary schools. As a method to cultivate learners' creative problem solving, design thinking can promote the deep integration of STEM education and SEL. This study discusses the characteristics, similarities and differences of STEM education and SEL in detail through concept elaboration and case study, and analyzes the problems existing in the process of school promotion and the needs of integration. This study puts forward the application of design thinking as an innovative thinking method to connect and promote the effective integration of STEM education and SEL. At the same time, the deep integration model of design thinking is constructed, which is illustrated by practical cases, and some application methods and strategies are further put forward, which provides ideas for schools at all levels to design and implement dance education courses in primary schools.

Keywords: Design thinking, STEM education, SEL, Dance Education.

1. PROBLEM STATEMENT

In order to gain a competitive advantage in the future global economy, countries all over the world are formulating a framework to cultivate students' core competence, so as to cultivate their ability to solve problems, cope with challenges and innovate [1]. The Framework of Learning Goals in the 21st Century clearly summarizes three dimensions of students' learning goals: creative thinking, critical thinking, problem solving and strategies [2]. Horizon Report 2017 (K-12 Edition) mentions the key elements of future educational technology, including the rise of STEM learning. It emphasizes interdisciplinary and interdisciplinary terms, and combines school curriculum with the real world, so that students can explore and creatively solve problems from a new perspective [3]. In 2016, China officially released "China Students' Core Competence", which includes three modules: cultural foundation, independent development and social participation [4]. In 2017, the Ministry of Education issued the Dance Curriculum Standards for Primary Schools (2017 Edition), emphasizing the cultivation of students' comprehensive literacy and ability. In 2022, the Ministry of Education of China emphasized the integration of SEL into the curriculum system [5]. It can be seen that STEM education and SEL have become the key driving force of the current dance education reform, and are regarded as one of the best ways to cultivate students' comprehensive literacy and ability. However, in reality, how to adapt the existing curriculum system of the school to the development needs of students' comprehensive literacy and ability, and how to transform and integrate colorful STEM education and SEL into subject teaching are important challenges faced by the school dance education reform.

2. THE FOUNDATION OF DEEP INTEGRATION OF STEM EDUCATION AND SEL

A. Interdisciplinary integration characteristics of STEM education

In 1986, the National Science Council of the United States put forward the concept of STEM (Science, Technology, Engineering, Mathematics) for the first time in the report "Undergraduate Science, Mathematics and Engineering Education" [6]. Later, American scholar Georgette Yakman put forward the concept of STEAM, Fine which A not only refers to art, but also refers to beauty, Language, Liberal and Physical art [7]. STEM itself was established for American students to gradually lose interest in science and engineering knowledge, aiming at cultivating high-end

talents for interdisciplinary problem solving [8]. As a new way of learning knowledge, STEM education takes project-based learning as its implementation process, and comprehensively applies knowledge of science, technology, engineering, art and mathematics to subject education, aiming at promoting technology-driven teaching innovation [9].

Professor Yu Shengquan summarized the characteristics of STEM education: interdisciplinary, interesting, experiential, situational, collaborative, design, artistic, empirical and technical enhancement [10]. Through interdisciplinary integrated teaching, STEM education emphasizes solving real problems, knowledge and ability, innovation and creativity, interdisciplinary migration of knowledge and its relationship with learners. STEM education not only refers to the simple integration of several disciplines, but also applies multi-disciplinary knowledge to projects that students are interested in, or solves problems they encounter in their lives. This requires students to master knowledge not only in the primary cognitive stage of memory and understanding, but also in the advanced stage of analysis, application and migration. Research shows that this interdisciplinary way of learning knowledge can stimulate students' interest in learning [11].

B. SEL's student-centered characteristics

Social emotional learning (SEL), organized by the University of Illinois in Chicago, USA, is initiated by the non-profit organization Collaboration for Academic, Social and Emotional Learning, which includes a series of educational practices and teaching methods [12]. It is a development of educational methods and concepts and has a positive impact on world education [13]. SEL is a student-centered education method, which encourages students to participate in actual situations, and supports students' learning by using tools and methods such as group discussion, cooperative projects, role-playing, scenario simulation and reflective diary, aiming at cultivating students' communication ability, cooperation ability, problem-solving ability and emotional management ability [14].

From the connotation point of view, SEL is an orientation that pays attention to the development of students' social emotions [14]. It emphasizes cultivating students' social skills, emotional management ability, decision-making, moral judgment and sense of responsibility, so as to promote students' overall growth and happiness [9]. For primary school dance education, SEL can help primary school dance education to better cultivate students' comprehensive quality, emotional expression and emotional management, social skills and cooperative spirit [15]. By introducing SEL, primary school dance education can realize a learning style that pays attention to students' overall development [16]. It not only pays attention to the cultivation of technology, but also pays attention to the cultivation of students' emotional intelligence, social skills and comprehensive quality [16]. This will help students to get a more comprehensive growth in dance learning and make progress in interpersonal communication and emotional expression [17]. SEL is based on multiple intelligence theory, emotional intelligence theory and social learning theory, and is implemented by constructing a supportive learning environment [18]. It emphasizes the interaction and trust between teachers and students, encourages positive learning atmosphere and social relations, and truly realizes the cultivation and overall development of students' comprehensive quality [19].

C. Demand for deep integration of STEM education and SEL

To sum up, STEM (science, technology, engineering and mathematics) and SEL (social affective learning) represent different fields of education, but they are different and related in concept, training goal and cognitive style.

From the origin, STEM (Science, Technology, Engineering and Mathematics) education originated from the understanding of modern society's demand for talents in the fields of science, technology, engineering and mathematics, and then gradually moved to the field of basic education, forming an interdisciplinary learning mode, mainly cultivating students' scientific thinking, problem-solving ability and innovation ability to meet the challenges in the field of science and technology; SEL originated from the demand for students' all-round development. Student-centered education method is used to cultivate students' social emotional ability, interpersonal skills and emotional management ability, so as to improve their emotional health and interpersonal skills.

In the process, STEM education is based on subject knowledge, with project-based teaching as the learning method, and teachers organize students to participate. SEL emphasizes students' participation and active learning. It advocates students to participate in actual situations and learn through cooperation, discussion and problem solving.

In terms of learning output, STEM education mainly includes the mastery of subject knowledge and skills, as well as the cultivation of innovative thinking, problem solving and teamwork ability. SEL learning mainly includes the improvement of emotional intelligence, including emotional management, self-awareness and decision-making ability, as well as the development of social skills, including cooperation ability, empathy and interpersonal skills.

It can be seen that STEM education pays attention to the cultivation of subject knowledge and skills to meet the challenges in the field of science and technology. SEL education pays attention to the improvement of emotional intelligence and social skills to improve students' emotional health and interpersonal skills. Although the emphasis of STEM and SEL is different, they are related in some ways.

Both STEM Education and SEL pay attention to students' cognitive, emotional and social development, devote themselves to cultivating a series of skills for students, emphasize students' interaction and active participation to promote their learning and development, emphasize the application of learning to practical situations, help students develop cooperative ability, conflict resolution skills, active communication and listening skills, and cultivate empathy and emotional intelligence, so as to better understand the feelings and needs of others and pursue students' all-round development and growth.

To sum up, both of them pay attention to the comprehensive development of students, emphasize the cultivation of students' skills and abilities, and advocate students' active participation and practical application. STEM education pays attention to the cultivation of subject knowledge and innovation ability, while SEL education pays attention to the development of social emotional ability and interpersonal skills. Combining STEM education with SEL education can promote students' all-round growth, cultivate comprehensive talents with scientific thinking, problem-solving ability and emotional intelligence, and make them more competitive and adaptable when facing future challenges.

So how to promote the deep integration of the two? By extracting the essential characteristics of STEM education and SEL, innovative thinking becomes a possible intermediary to integrate them. In recent years, design thinking has become a popular creative training method in primary chools in Europe and America, which plays an important role in cultivating students' innovative thinking and ability [20]. As an interdisciplinary crossroads, design thinking provides a natural bridge between art, science and other disciplines [21]. The process of using design thinking to solve problems requires not only rich and comprehensive scientific and cultural knowledge, but also the use of various tools to create prototypes and finally form finished products, which is undoubtedly a possible tool or method that is very suitable for the integration of STEM education and SEL.

3. DESIGN THINKING AS AN INTERMEDIARY FOR THE DEEP INTEGRATION OF STEM EDUCATION AND MAKER EDUCATION

A. The connotation of design thinking

In Simon's view, an important difference between artificial science and natural science is that artificial science cannot be separated from human design, and the integration of artificial and natural science cannot be separated from human thinking [22]. This can be regarded as the embryonic form of the concept of Design Thinking. In 1987, Peter Rowe of Harvard School of Design formally put forward the concept of DesignThinking in his book Design Thinking [23]. In 1991, David Kelley founded IDEO and applied design thinking to the business field [24]. In 2004, David Kelley founded the Institute of Design at Stanford, opened the course of design thinking, and formally introduced it into the field of education [25]. Different scholars have different understandings of design thinking. Some scholars believe that design thinking is to guide learners to master a series of innovative methods and skills such as creative conception, prototype iteration and testing by providing appropriate thinking support and method support, and finally realize innovative problem solving or innovative product design [26]. Some scholars also believe that design thinking aims at using creative methods to meet the needs of end users as much as possible [27]. Timothy brown, president and CEO of IDEO, said: Design thinking is a people-oriented innovative way, which is refined from the methods and tools accumulated by designers, and integrates people's needs, technical possibilities and demands for business success. At the same time, he pointed out that design thinking cannot be simply regarded as an analytical thinking, but a process of inspiration, conception and implementation.

To sum up, design thinking is a set of people-oriented problem-solving methodology, which emphasizes that solving problems should start from people's needs, seek innovative solutions from multiple angles, and create more

possibilities. From the perspective of the development of innovation ability, if this way of thinking is transformed into a teaching mode or a learning mode, it will be of great significance to the development of students' core literacy, and at the same time, it will provide a new way for the school's subject teaching [28].

B. The process of design thinking

As a method or tool to cultivate learners' creative problem solving, design thinking has been developed by many scholars at the specific operational level. The initial model of design thinking is a linear model established by Simon, which includes three stages: analysis, synthesis and evaluation. On the basis of linearity, the model proposed by Brown adds a circular model, which includes three stages: Inspiration, idea and Implementation [29]; The design thinking model proposed by IDEO company includes five stages: Discovery, Interpretation, idea, Experiment and Evaluation [30]; The British Design Association put forward the double diamond model, which includes four stages: Discover/Research, Define/Synthesis, develop/idea and Deliver /Implementation [31]. At present, the most widely used EDIPT model developed by Stanford Design Institute includes five stages: Empathize, Define, Ideate, Prototype and Test.

Empathize: Also known as "empathy", it requires designers to think from the perspective of users. Generally speaking, it is empathy, so as to gain a common sense of an object and ensure that the output results meet the needs of users. The common methods at this stage are observation, listening, investigation, etc. The purpose is to deeply understand users and collect as much information as possible.

Define: On the basis of collecting a large amount of information, accurately define the user's requirements, make the requirements operational, and facilitate the next stage to find feasible solutions.

Ideate: This stage is the key to solve the problem. According to the needs formed in the previous stage, various methods to solve the problem are put forward as much as possible to break the inertia thinking. The most common method is the "brainstorming" method.

Prototype: This stage requires making a rough and simple original model of a product or a specific function in a product, which is used to test the solution proposed in the previous stage, and also provides a prototype of the original work for continuous iteration. A prototype can be a concrete product model or a simple simulation of a small-scale environment or process.

Test: At this stage, we will use the realized product prototype or simulation environment to strictly test whether the problem has been solved and whether the requirements have been met. This stage is very important, and some ideas may be redefined in the process, and even new problems may be discovered. It should be noted that the five stages of the thinking model are non-linear, and users can repeat the whole process or something at any time.

C. The internal relationship among design thinking, STEM education and SEL

In order to distinguish the relationship between design thinking, STEM education and SEL, the author combs the internal relationship among them from multiple dimensions in Table A. As can be seen from Table A, STEM education and maker education have the basis and trend of integration, and design thinking can be used as a method to complete the deep integration process of STEM education and SEL. From the aspect of content foundation, STEM provides subject knowledge and skills, SEL provides social emotional skills and emotional management, and design thinking provides implementation processes and methods to solve problems. The combination of the three acts on the learners' learning process.

4. DESIGN THINKING MODEL OF DEEP INTEGRATION OF STEM EDUCATION AND SEL

A. The Integration of Design Thinking and STEM Education

Anderson and others revised Bloom's classification system of educational goals in 2001, in which the "cognitive process" is divided into memorization, understanding, application, analysis, evaluation and innovation from primary cognition to advanced cognition [32]. From the cognitive process, STEM education emphasizes the mastery of subject knowledge, that is, students' cognition is required to be in the primary stage of memorizing, understanding and using, and the whole learning process of students is dominated by teachers, ignoring the development of students' advanced cognition [33]; STEM education itself emphasizes the application of comprehensive knowledge to solve real problems,

and can achieve good results with the design of thinking system and complete processes and corresponding methods. See Table B for specific integration.

B. Integration of Design Thinking and SEL Elements

Compared with STEM education, SEL education focuses on students' social and emotional development process, which requires students to have a series of social and emotional abilities and qualities, which will ignore students' academic and technical learning and development to some extent [34]. Therefore, in SEL practice, when cultivating students' social and emotional abilities and qualities, it is necessary to help students acquire academic and technical studies, and to master relevant methods and tools in advance to ensure students' all-round development, also known as "enabling" skills [35]. Carroll and others also conducted in-depth exploration and research on the integration of design thinking into K12 classroom. The results show that design thinking can provide students with a set of practical thinking methods, which can effectively cultivate students' imagination and creativity, interdisciplinary learning, problem-solving ability and self-confidence [36]. See Table C for specific integration.

C. Construction of Design Thinking Fusion Model

In fact, there are few theories and practices that can be referenced about the integration of STEM and SEL, but the separate research on them is very extensive.

STEM focuses on cultivating students' knowledge and skills in the fields of science, technology, engineering and mathematics, encourages students to solve challenges in real life by analyzing problems, finding solutions and applying innovative thinking, and emphasizes the connection and integration between different disciplines. SEL pays attention to thedevelopment of students' social skills and interpersonal relationships, emphasizes the importance of self-awareness and self-evaluation, helps students understand their emotional state and needs, cultivates their decision-making and problem-solving abilities, teaches students how to set goals, make plans, manage time, maintain motivation and cope with challenges, and helps students establish positive interpersonal relationships and effective cooperation. Combining STEM and SEL can provide a more comprehensive and comprehensive learning experience and cultivate students' cognitive, emotional and social abilities, thus laying a solid foundation for their personal development and future success. How to integrate them into a whole is a problem worth thinking about.

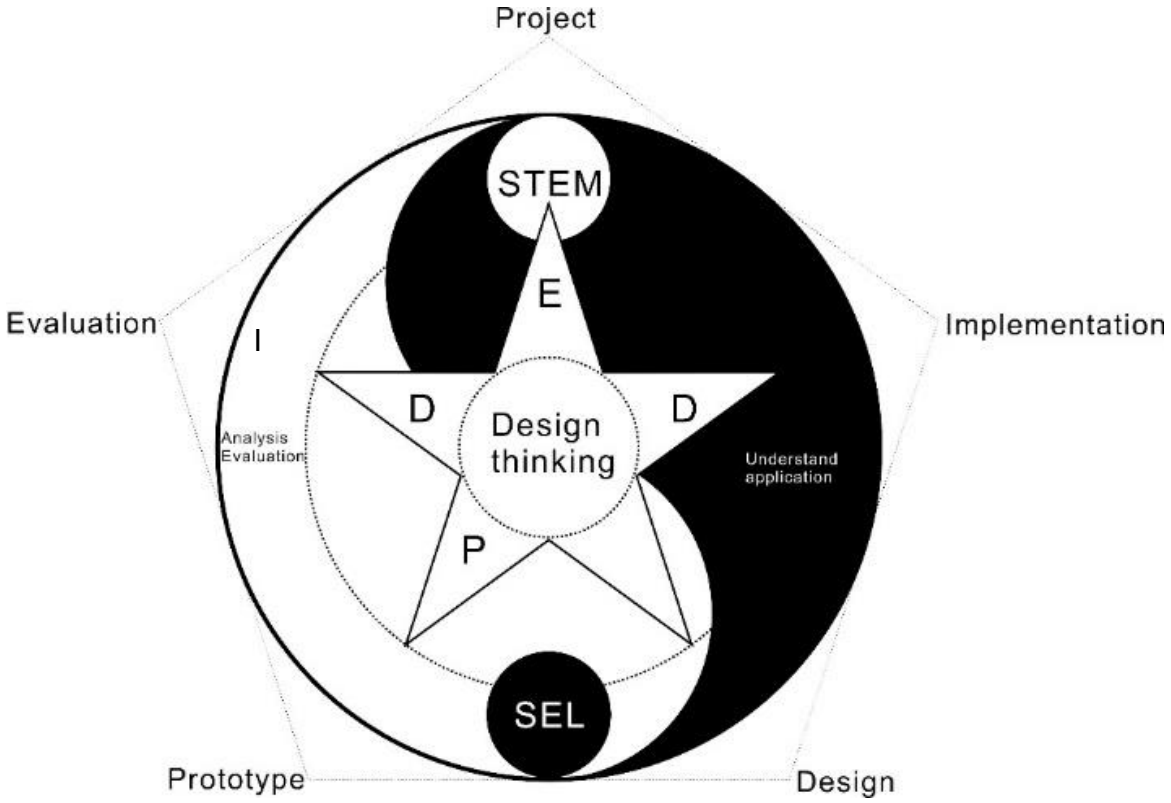

Figure A. Design Thinking Fusion Model

Table A. Comparison of elements of STEM education, SEL and Design thinking

	STEM education	SEL	Design thinking
Background	Initiation of education system and social participation	Social initiation and educational participation	Initiation in business field, educational participation
Porpuse	Improve students' interest in science and engineering knowledge	Improvement students' emotional health and interpersonal skills	Solve the innovation needs of enterprises and organization and the complex problems encounteredd in life
Content source	Knowledge of science, technology, engineering, art, mathematics and other disciplines	Students self-generated ideas	Unsolved unhealthy structural problem in society
Content acquisition	Based on project learning and experiential learning	Participation and active learning	Design thinking process and methods in each process
Tools	Determine the adoption of tools as needed	Cooperate, discuss and solve problems	Whiteboard, plasticine, newspaper, timer, marker, scissors, etc
Results	Grasp the knowledge and complete the task	Improve emotional intelligence	The results are various, but they must be visual and easy to iterate
Development quality	Interdisciplinary problem-solving ability	Emotional intelligence and social ability	Think lide designer and streamline problem solving
Indivudual role	Teachers' organization and students' participation	Students' autonomy and teachers' assistance	Joint participation and collective wisdom

Table B. Integration of design thinking stages with STEM education process

Stage	STEM project task	STEM project learning methods	STEM project learning tool support
Empathy	Find the problem to be solved from real life and think about the necessity, importance and feasibility of solving the problem	Observation, experience, interview, empathy, relevant case analysis, etc	Video and audio shooting equipment and production software, interview outline, digital terminal, text recording tool, drawing tool, etc.
Demand	Deeply participate in the problems and projects found, and accurately define the problem requirements, that is , refine the big problems into small ones that can be solved	Date collection and induction, seminars, brainstorming, expert consultation, etc	Network equipment, video and audio shooting equipment and production software, writing and painting tools, etc
Imagination	Brainstorm the problems to be solved and seek the best solution in combination with the actual situation	Brainstorm, list problems, plan list	Mind manager, graphic making software of tools, electronic whiteboard, etc
Prototype	Visualize the solution as a reference for later iterations	PPT report, video production, copy production, physical production, etc	3DMax, programming, card, plasticine, office software, video and audio production software, etc
Test	Test the prototype of the design, and you can choose the combination of group test and user test	Observation and analysis, role playing, task simulation, expert evaluation, etc	Evaluation of demand materials, questionnaires, etc

Table C Integration of design thinking stages with SEL process

Stage	SEL learning task	SEL learning methods	SEL learning tool support
Empathy	Clear learning and chanllenges, and collect relevant information and materials	Observe and imitate	Emotional expression icons, emotional recognition games or questionnaires.
Question	Analyze relevant information and connect it with learning challenges	Reflection and sharing	Questionnaire, focus group discussion or personal feedback form
Imagination	Develop new SEL learning methods, activities or resources	Brainstorming and mind mapping	Brainstorming applications, mind manager or creative cards
Prototype	Turn the idea into a visual prototype as a reference for later iteration	PPT report, video production, copy production, physical production, etc	Visual prototype tools, wireframe or charting software
Test	Test the prototype of the design, and you can choose the combination of group test and user test	User feedback and evalution	User questionnaire, user interview guide or observation record form

Table D Specific elaboration of the application of fusion model

Project	Meaning	Requirements/Tools	Ways/Means	Operation
Purpose	Solve the problems in subject teaching and life, and cultivate students' comprehensive literacy and ability	Select the questions raised by students and define the target requirements accurately, which can presented on commercial canvas	5Why analysis method, ABCD method to describe external behavior (object, behavior, conditions, standards)	Teachers need to collect the survey information of a problem, accurately define the demand of the problem, and form a open, practical, challenging and interesting problem
Enabling skills	Step by step backward the prerequisite knowledge and skills that students may use in each learning link	A process of reverse analysis, starting from the goal to be achieved, gradually deduces the subordinate skills that learners need to master	Analytic hierarchy process	Starting from the ultimate goal, the paper gradually deduces which subordinate skills learners must have, and so on
Imagine	Seek more possible solutions to the problem	Follow the principles of postponing comments, being whimsical, not digressing, one person at a time, illustrated with pictures and texts, the more the better, etc. and provide sufficient ideas for building the model	Sample date method, brainstorming, mapping creative ideas, 635 method, bionics method, KJ method, attribute enumeration method, CCS paper ideas, 7*7method, construction method	This is a process of collecting ideas, and the whole brainstorming process can be recorded by mind mapping
Prototype	Select several feasible schemes to make a prototype,	Open source hardware, computers and other electronic technologies,	Video, APP-POP, story sketch, role-playing, 3D model	In this process, teachers can instruct students on the technology used in

Project	Meaning	Requirements/Tools	Ways/Means	Operation
	which can be used to test the solutions proposed in the previous stage and iterate continuously	paper and pens, cards, plasticine, Lego blocks, wooden boards, glue, scissors and colored paper, etc		model construction, and also help student choose the presentation mode of the prototype
Evaluation	Use the product prototype of simulation environment to strictly test whether the problem is solved, and at the same time, pay attention to the cooperative process	This is a process of seeking feedback and learning, and some problems may be redefined during this process, and even new problems may be discovered	Formative evaluation and summative evaluation	Explain your views, ideas and creativity through exhibitions, performances and speeches. Do not be afraid of failure in this process, it takes repeated iterations to achieve the target requirements

Table E Application case of design thinking fusion model

Name of the case	Initiate ideas and build a little rider on the grassland	
Target task	1. Learn about Mongolian riders and horseback riding culture through the study of Mongolian children's dancing little rider on the grassland 2. Master the basic posture and hand shape of Mongolian dance related to horse dance, and learn to move in a variety of paces 3. Create a dance: a little rider on the grassland	
Enabling toos	Mongolian	Students need to collect relevant imformation to understand the Mongolian national customs. In addition, teachers also need to prepare lessons to explain, give tips and instructions to stimulate students' inspiration. For example, prepare a fable or story about horses, pictures and video materials of Mongolian riders and harness (saddle, whip, etc)
	Basic element	Students need to master the basic posture and hand shape of horse dance related to Mongolian dance, learn how to move with multiple steps, analyze its main points, and think about the shape of each part of themselves as a small rider on the grassland, and then put forward their own ideas and interpret their significance. In this process, teachers need to teach the specific actions based on them, as well as the usage scenarios and displayed national characteristics, so that students can understand and understand the meaning of each basic action.
	Theme action	Students create their own dance moves according to their own ideas and music
	The nature of dance	Students need to learn the creative factors of dance (action, time and space), and further propose and design dances suitable for showing their own characteristics. This process requires teachers to sort out and explain knowledge, such as quantifying time (speed, rhythm); Action components (form, strength, quality); Spatial organization (route), etc. In addition, it is necessary to explain the knowledge points related to mathematics, physics, engineering and technology in action, time and space.
	Dance parts	Students need to learn and master the dance props and costumes needed to create a dance, and then combine their own ideas to design what props and costumes are needed for their

		own dance. During this period, teachers need to sort out the systematic knowledge involved or necessary to explain.
	Dance creation	Students should learn how to create a dance and how to prototype it. Teachers need to teach corresponding skills selectively. Of course, students can start with the imitation of existing dance materials and think about their own dance creativity.
	Display mode	Through performance, sharing, competition, etc. Students need to learn how to use video software. The teacher need to teach corresponding skills selectively.
Design scheme	At this stage, students have basically finished learning the corresponding courses and knowledge, and they are eager to apply what they have learned to their creations. However, the premise is to let the students in the group think about how to compose and create dances, what the choreographed dances want to express and how to realize them. They can record the thoughts and ideas of each group member in the form of mind maps and live demonstrations, and collect collective wisdom.	
Prototype works	Students can use video software, Lego bricks and other tools to make prototypes and synthesize all forms suitable for their group display.	
Evaluation and reflection	This process is a process of seeking feedback, and team members can upgrade and iterate the current products repeatedly before the specified date; The final evaluation is a combination of process evaluation and summative evaluation, which is conducted by teachers' unified evaluation, mutual evaluation among groups and mutual evaluation within groups.	

As a method to promote the deep integration of STEM education and SEL, design thinking needs to analyze and integrate the close relationship among many elements, so as to design a series of program steps and supporting tool resources to form a complete and operable dynamic system. The process of the integration of STEM education and SEL can be represented by Taiji schema. The interaction of Yin and Yang represents the deep integration of SEL and STEM education. Design thinking is the connector and driving force for the deep integration of the two, which connects the integration of STEM education with emphasis on subject knowledge and SEL with emphasis on emotional cultivation. As a methodology, it drives the interdisciplinary and innovative learning process supported by the two. The outer circle is the project-based learning design process driven by design thinking, as shown in Figure A.

As the core of the whole model, design thinking bridges the integration of STEM education and SEL in the form of method intermediary, and realizes the common development of STEM education, design thinking and SEL. The outer circle of the model shows the basic elements of project-based learning.

In terms of objectives/projects, it can be integrated as: solving problems encountered in subject teaching and life and cultivating students' innovative ability.

In the process of implementation, teachers can accurately define the problem or project the problem, and reasonably design the specific operational goals that students want to achieve. In terms of enabling/tools, teachers start with the problems that need to be solved, and gradually infer the prerequisite knowledge and skills that students may use in each learning link, that is, the knowledge that may be used in each subject in STEM education.

In the design/scheme stage, teachers inspire students to seek more possible solutions to problems, and list all the methods one by one, mainly the collection of collective thinking. Students can use the knowledge of various subjects learned in the previous stage to think about countermeasures and solve problems across disciplines. In this process, students and teachers are tolerant and receptive to every possible solution without making any criticism.

In the prototype/work section, teachers can divide students into heterogeneous groups, and each group of students, after in-depth thinking and fierce debate, selects several possible solutions to draw sketches and make prototypes. The prototype can be a visible object, such as the results in SEL, or a simple simulation of a small-scale environment or process, which is used to test the solution proposed in the previous stage.

In the evaluation/reflection stage, whether the problem is solved and whether the demand is met is strictly tested by using the realized product prototype or simulation environment. Reflect on the problems existing in the operation and the direction of improvement in order to obtain more ideal results.

5. APPLICATION AND CASE OF DESIGN THINKING FUSION MODEL

A. The application of design thinking fusion model

The reason why design thinking can promote the integration of STEM education and SEL is that design thinking itself is a complete problem-solving process and a reasonable inquiry learning method. A complete problem-solving process refers to the fact that students can apply knowledge to their actual creation and produce prototypes. It is a complete continuum of linear thinking and nonlinear thinking. When designing teaching with design thinking, each link can be iterated and upgraded, and any process can be iterated or upgraded according to the emphasis of teaching objectives. Reasonable method means that good design thinking can help instructional designers to jump out of the limitations of thinking and find the convergence point between dance teaching design and social and dance education reform and development. Therefore, design thinking can be applied to STEM education and SEL to optimize the teaching process and redesign emerging courses in the new technology environment. See Table D for the meaning, requirements, methods and operations of each link.

B. Application cases of design thinking fusion model

In the practical application of the deep integration of STEM education and SEL, this study takes the design of China primary school dance textbook Little Rider on the Grassland as an example, and expounds the three-month curriculum arrangement. Teachers sort out the interdisciplinary knowledge points involved in this course, list knowledge as a scaffold, and let students create their own "little rider on the grassland" as part of the teaching goal. The course strives to make students full of passion and motivation, start their own learning journey with clear learning goals, and show their learning achievements in the form of finished products. Finally, through comprehensive evaluation, an excellent group was selected to give a generous reward. This course will be conducted in groups. These cases are shown in Table E.

Using design thinking tools to guide the integration of STEM education and SEL is a brand-new curriculum arrangement idea and form, and also a novel education model, which can make teachers have passion for teaching and students have motivation for learning. In addition, the application of this model not only enables students to master the necessary interdisciplinary knowledge, but also cultivates their comprehensive literacy and ability.

6. CONCLUSIONS AND SUGGESTIONS

This paper proposes to optimize STEM education and SEL by using design thinking, so as to promote their deep integration, which provides an idea for schools to implement core literacy and promote innovative practical education, and is conducive to improving learners' cognitive process, making up for the shortcomings of SEL and STEM education and optimizing teaching process. In view of the current situation of dance teaching or curriculum activities in schools, we should actively integrate design thinking, SEL or STEM education, and gradually promote discipline integration and design thinking embedding. Relevant strategies and suggestions are as follows:

A. Reconstruct the subject teaching process with design thinking

Actively improve teaching design, add the concepts of design thinking, SEL and STEM education into curriculum design, improve students' participation in class, and conditionally implement project-based teaching. Project-based learning is a practical way combined with reality, which enables students to master subject knowledge more efficiently and cultivate students' social and emotional skills in the process (novelty, 2018). Design thinking itself is based on projects, learning knowledge and solving problems in projects. Therefore, project-based learning process can be combined with design thinking to rethink classroom teaching design.

B. Integration of design thinking to update STEM education and SEL process

Integrating STEM learning and SEL with the process and method of design thinking as the process. In empathy, students and teachers jointly discover real-life engineering projects and technical products to ensure that the designed projects meet students' interests and abilities; In the demand link, students are required to participate in the project investigation deeply, negotiate with teachers and accurately define the problem demand; In the creative process, use brainstorming and other methods to generate possible solutions, optimize the products in the project and form sketches; In the prototype stage, to make a model of the solution, the model can be video, Lego building blocks, which is convenient for testing and iteration. In the process of testing, whether it meets the requirements is tested through

group simulation, demonstration, role-playing and other ways. Repeat the whole process until a satisfactory solution is found.

C. Integrating design thinking, STEM and SEL to reform the comprehensive practical activity class

Comprehensive practical activity course is a new course form put forward in the current curriculum reform in China. SEL and STEM education in Chinese schools are set up separately. The course of comprehensive practical activities emphasizes that students apply what they have learned and enhance their exploration spirit and innovative consciousness through practical experience. These aspects are consistent with the goal of design thinking, aggregate the process and concept of design thinking, and connect the characteristics of STEM education and SEL, which is of great significance for schools to carry out the course of comprehensive practical activities.

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