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Design tools in the formation of art space using the example of Changzhou High tech Second Primary School

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Title of the report Research on Design tools in the formation of art space using the example of Changzhou High tech Second Primary School

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ABSTRACT

Current basic education is shifting from the mere transmission of knowledge to the cultivation of competencies; the integration of aesthetic education with STEAM interdisciplinary education represents a crucial direction for basic education reform in the new era. Aesthetic education emphasizes sensory experiences, aesthetic judgment, and the development of creativity, whereas STEAM education leverages a multidisciplinary approach to foster students' ability to solve interdisciplinary problems; the two approaches exhibit high compatibility in terms of integrated learning and innovation cultivation. However, the traditional classroom space layout is fixed, and the teaching mode is relatively single. It is difficult to fully support project-based learning, collaborative exploration and diversified artistic creation activities. Such spatial constraints will directly hinder the integration of aesthetic education and STEAM education. Against this background, how to promote the integration practice of the two types of education through spatial design optimization has become a core research direction in the field of educational space.

This study selects the art space transformation and new construction project of Changzhou High tech Second Primary School as a practical case, takes flexible space as the core design means, and explores the primary school art space creation strategy that can integrate aesthetic education and STEAM education. The research relies on the theory of elastic space, STEAM space design criteria, environmental aesthetics and child development psychology, and comprehensively adopts case comparison, design action research and other methods to carry out analysis. The research focuses on key elastic design elements such as space division, boundary processing, multi-functional furniture, materials and light regulation, to create a composite art space that can be flexibly reorganized, functionally composited and has a better user experience. This kind of space can undertake different types of teaching activities, which can not only meet the regular single-subject teaching, but also adapt to interdisciplinary project-based learning, and at the same time fit the laws of children's cognitive development and growth.

Research indicates that flexible design tools can effectively overcome the functional limitations of traditional teaching spaces, enabling dynamic

adaptation of instructional scenarios. This study has developed a systematic flexible design methodology for primary school art spaces, addressing a research gap in the design of primary school campus spaces from the integrated perspective of aesthetic education and STEAM education. In practical terms, this research framework can optimize the art teaching environment within such schools, thereby enhancing the quality of curriculum integration and improving students 'learning experiences; at the institutional level, it can provide exemplary models for innovative future campus space design in urban primary schools, aligning with national policies on the integrated development of the five aspects of education and the construction of "future schools," and thereby demonstrating the core value of educational spaces — namely, their capacity to actively empower teaching practices and foster the development of students' comprehensive competencies.

Key words:art space, primary school environment, design tools, campus interior, spatial formation, children- oriented design, school space

INTRODUCTION. Research background. Relevance

1. Research background

Against the dual backdrop of the transformation of basic education and the optimization of children's residential environments, contemporary children's indoor space design no longer confines itself to fulfilling basic functional requirements; instead, it places greater emphasis on aligning with children's cognitive development, aesthetic cultivation, and the growth of their innovative capabilities. The ongoing implementation of the national "Five-Dimensional Education" policy has facilitated the comprehensive integration of aesthetic education and STEAM interdisciplinary education into primary school classrooms. These two educational models align closely with children's characteristics of immersive and experiential learning, thereby imposing new design requirements on primary school art indoor spaces. At present, however, the design philosophies for children's art indoor spaces in most primary schools remain outdated—characterized by rigid spatial layouts, limited functionality, and a neglect of children's behavioral patterns and physical-mental developmental stages. As a result, this kind of space cannot carry diversified teaching scenarios such as project exploration, collaborative creation, aesthetic experience, etc., and the integration and promotion of aesthetic education and STEAM education is obviously constrained. Following the traditional standardized indoor space design ideas, it is difficult to match the personalized and diversified needs of children in the process of ability cultivation. Based on this situation, this study takes children's indoor space design as the core goal, and uses elastic design to optimize the art space of primary schools. Research and try to build a composite indoor environment that can adapt to children's growth and support interdisciplinary teaching, improve the interior design system for children on campus, and help children's comprehensive development.

The object of the study is the design of indoor spaces for schools and children.

The subject of the study is on interdisciplinary indoor space design for primary schools, tailored to support art – science integrated teaching.

The structure of the work consists of an introduction, three sections, conclusions, a list of sources used and appendices.

The introduction defines the relevance of the study, formulates the goal and objectives of the study, and outlines the object and subject of the study, the

methods used, the scientific novelty of the work, the theoretical and practical significance of the work.

The first section systematically examines the core connotations, spatial value, and compatibility characteristics of aesthetic education and STEAM education; it clarifies the broad and narrow definitions of artistic spaces in primary schools; and it elucidates the intrinsic theoretical connections between interdisciplinary art-education integration and children's indoor space design. Based on the integrated educational objectives of these two types of education, this chapter extracts three core design principles: child-centeredness, interdisciplinary interaction, and the integration of artistic quality and practicality. Furthermore, it analyzes the design shortcomings of traditional campus artistic spaces—namely, rigid functional allocation, limited aesthetic appeal, and disciplinary fragmentation. The theoretical framework and design guidelines established in this chapter provide a solid theoretical foundation for subsequent design practices, the implementation of design tools, and spatial optimization strategies at Changzhou Gaoxin High tech Second Primary School.

The second section takes Changzhou High Tech Second Primary School as the research site. Through field research and interviews with teachers and students, this study identifies the school's existing challenges and reveals the urgent need for the transformation of its artistic spaces among both staff and pupils. The analysis is conducted from two perspectives — aesthetic education and STEAM — thereby providing practical design insights for the artistic space renovation of this school.

The third section takes the art space renovation project at Changzhou High-Tech Second Primary School as a case study to establish a lightweight and low-cost renovation strategy and objectives, plan five interconnected functional zones, and implement various design tools in phased stages. The renovation is expected to optimize spatial layout while, through a co-creation model involving teachers and students, foster the integration of aesthetic education with STEAM education, thereby developing a scalable framework for creating primary school art spaces.

The conclusions : In the design practice of creating art spaces in primary schools, the primary innovation of this study lies in leveraging lightweight design tools to construct versatile spaces that align with both aesthetic education and STEAM-integrated teaching. This plan integrates flexible space layout, modular facilities and co-creation mode with the joint participation of teachers and students. It can not only meet the aesthetic experience and interdisciplinary practice needs of primary school students, but also rely on the spatial environment to carry out

environmental education and build a set of design framework for the transformation of artistic space under the art integration teaching scenario of primary schools. The author writes this master's thesis in combination with the research objectives and research results of this project. The thesis has formed certain innovations at the theoretical level, and also has application value at the practical level. It can help relevant design practitioners implement the concept of elastic space into the creation of primary school art space, and promote the integration of art education and STEAM education.

CHAPTER 1

Overview of Theories on Primary School Art Space Construction

1.1.Core Concepts of Aesthetic Education and STEAM Education

Aesthetic education belongs to quality education, with aesthetic perception, artistic experience and creative practice as the core. Aesthetic education enlightens and cultivates the soul with the help of aesthetic activities, helps students form a complete aesthetic personality, and cultivates innovative thinking. There is an interaction between aesthetic space design and children's aesthetic ability: on the one hand, space design can improve children's aesthetic level, and on the other hand, children's aesthetic ability will also have an impact and feedback on space design.

STEAM education is a kind of interdisciplinary teaching model that integrates the five fields of science, technology, engineering, art and mathematics. This model is problem-oriented and focuses on practical application, inquiry-based learning and complete learning experience. The combination of aesthetic education and STEAM education is not a simple superposition of various disciplinary knowledge, but relies on the functional adaptation of physical space to realize the organic integration of aesthetic cultivation and practical exploration.

Most of the teaching spaces in traditional primary schools follow the standardized and modular solidified design ideas, and the space takes knowledge teaching as the core goal. Space layout, scale planning and material selection are all developed around the one-way indoctrination teaching mode. In contrast, the teaching form of integrating aesthetic education and STEAM education puts forward completely different requirements for teaching space.These approaches necessitate the application of professional interior spatial design principles to

reconfigure spatial functions, dimensions, circulation flows, and ambient atmospheres—thereby creating versatile artistic spaces that support autonomous creation, group collaboration, and interdisciplinary practice. Clarifying the core concepts of these two educational paradigms, and defining the connotation of artistic spaces through the lens of interior design theory, constitutes the essential prerequisite for conducting research on spatial design and creation.

1.1.1.Primary school art space and space construction

Primary school art space can be defined from two levels: narrow and broad. In a narrow sense, art space refers to the art classrooms set up independently on campus, which is a special indoor venue for teaching art courses and art creation. The art space at the broad level covers more types of art environments on campus, including art workshops, art practice areas and multi-functional creative exhibition halls. The primary school art space discussed in this study is a composite indoor system that integrates functions, scale, light and shadow and atmosphere. Traditional classrooms only undertake a single teaching task, while this kind of art space gathers multiple complex functions such as creation, display, storage, communication and practice.

In this study, the author primarily focuses on indoor spatial types, such as multi-level reflection zones, community activity centers, children's activity centers, and integrated entertainment areas. The design of these spaces typically takes into account children's age, interests, developmental stages, and safety needs. Children's activity spaces are designed to provide a safe, engaging, and educational environment where children can engage in free play, physical activity, social interaction, and learning, thereby fostering their holistic development. The characteristics of these children's activity spaces examined in this paper pertain specifically to indoor spaces.

1.2.Aesthetic education and STEAM education concept

1.2.1.Campus value of aesthetic education

Aesthetic education, as a vital component of basic education, permeates both classroom instruction and environmental pedagogy. Unlike knowledge-based education, it emphasizes aesthetic cultivation, intellectual stimulation, and character development. A well-designed spatial environment itself constitutes an

implicit aesthetic curriculum, capable of exerting a subtle and gradual nurturing effect — this constitutes the core significance of interior design in serving educational purposes.Well-designed aesthetic education spaces can, on one hand, enhance children's abilities to cooperate and communicate; on the other hand, they can accompany children's growth and help them discover their authentic selves. Such spaces exert a subtle yet profound influence on the shaping of children's personalities, the development of their aesthetic sensibilities, and their interpersonal skills.[2]Primary school represents a critical stage in the development of children's aesthetic perception. The color, material texture, light and shadow effect, composition and spatial layout of art space can bring students an intuitive aesthetic experience, help them establish a basic understanding of formal beauty, order beauty and creative beauty, and gradually form a preliminary aesthetic judgment. The creative artistic space has the characteristics of being open and adaptable, with a flexible layout and rich visual levels. This kind of environment can break the cognitive limitations and fully stimulate children's imagination and creative will.

Traditional campus spaces give priority to the use of functions and standard standards when designing, and the needs of aesthetic education are often easily ignored. The space design with art education as the core can combine artistic expression and teaching functions, so that the art classroom and campus public art environment are no longer just simple teaching venues, but become a diversified platform that can accommodate art education activities. At present, the aesthetic education space of many primary schools is still in the dilemma of homogenization and superficiality. Most of them only complete the basic interior decoration, which not only lacks artistic atmosphere, but also is difficult to match the teaching needs of functions. This kind of situation will directly weaken the practical effect of the implementation of aesthetic education, and we can also see the practical role that professional space design can play in this field.

1.2.2.Connotation and spatial adaptability of STEAM education

STEAM education integrates five key domains — Science, Technology, Engineering, Arts, and Mathematics — centering on project-based learning and problem exploration. It breaks away from the traditional compartmentalized approach to subject education, instead focusing on fostering knowledge transfer, hands-on practice, and innovative capabilities. However, despite these innovative concepts, physical spaces often fail to keep pace. The rigid configuration of conventional standardized classrooms makes it difficult to meet the requirements of the STEAM model for flexibility, openness, multidimensionality, and interactivity: such pedagogy typically employs 4 – 6 student groups as exploration units, necessitating adaptable spatial

layouts.Modular tables, chairs and movable partitions can achieve this effect, breaking the restrictions caused by fixed seat layout, and the space can be switched flexibly, adapting to different scenarios such as independent creation, group collaboration and collective achievement display. Practical projects also need to divide static and dynamic operation areas, set up special operation areas and reserve sufficient operation tables. At the same time, such projects have the characteristics of multiple iterations, and need to reserve special display walls and variable display areas to display stage plans and creative results, so that the learning process can be presented intuitively and facilitate teachers and students to review and discuss.

Objectively speaking, at this stage, many primary school art classrooms still follow the single-subject teaching-oriented design. This kind of space has weak adjustability, simple regional division, insufficient storage configuration, difficult to adapt to environmental changes, and difficult to carry complete interdisciplinary project activities. But from another perspective, art classrooms themselves have their own attributes of artistic creation, which is an advantage that other subject classrooms do not have. With the help of professional interior design, this kind of space can be functionally transformed. With flexible layout, composite partitioning and systematic storage, the space can adapt to the teaching requirements of STEAM exploratory learning and become an important place for integrated teaching.

1.3.Design principles of art space under integrated aesthetic- STEAM education

The integration of aesthetic education and STEAM teaching mode has redefined the design criteria of primary school art space. After integrating educational, interesting and interactive design elements, art space can help children grow in many aspects. This kind of space can not only take care of children's physical and mental health and meet their diversified sensory experience needs, but also guide students to actively participate in social collaboration, gradually cultivate innovative thinking, and support children's healthy growth in an all-round way.

1.3.1.Principle of children- oriented subjectivity

Child-centered design serves as the foundational core principle of aesthetic education spatial design in primary schools. This design method is obviously different from the conventional interior design and adult art space design ideas.

It no longer follows the traditional model with adult aesthetics and teacher management needs as the core. The research turns to the physiological characteristics, behavioral habits and cognitive development stages of primary school students as the primary basis for judgment, so as to fit the professional space design norms for children.

In the process of space design, it is necessary to reasonably adjust the space proportion and the height of the facilities, broaden the indoor activity line, and weaken the feeling of closed and oppressive space. The design can arrange the core functional area in combination with the visual characteristics of children. With the help of flexible partitions and semi-open space forms, it takes into account the privacy required for students' independent creation and the openness required for group collaboration. In addition, the safety and security of the space and the creation of atmosphere are also key points that cannot be ignored in the design process.The designer will select safe materials that are environmentally friendly, durable, and impact-resistant, while rounding sharp edges to eliminate potential hazards at their source. The color palette will primarily consist of low-saturation, soft hues to foster a comfortable and creative aesthetic environment. Ultimately, the essence of a child-centered design approach is to ensure that the space accommodates children's developmental needs ─ rather than requiring children to passively adapt to a fixed environment. This principle constitutes the fundamental core of educational spatial design.

1.3.2Principle of interdisciplinary interaction

Traditional art spaces are often confined by the limitations of singular art pedagogy, with stark boundaries separating different disciplines.Under the traditional labor education model, teaching objectives primarily focused on singular skill training, emphasizing that students repeatedly practice and master fundamental skills—such as the use of labor tools and adherence to standard operating procedures.[3]What inclusive education requires, however, is precisely the dismantling of such boundaries ─ rather than simply cramming several courses into the same room, it relies on flexible design and functional integration to enable multidisciplinary teaching scenarios to organically flourish within a single space.

The implementation of this principle first relies on the flexible reconfiguration of functional spaces. A modular layout and movable facilities liberate spaces from the constraints of fixed layouts, enabling seamless transitions between scenarios ─ such as art creation, hands-on construction,

scientific innovation, and seminars—based on specific teaching objectives. This design method can effectively improve the disadvantages of single function and low space utilization of traditional teaching space. The space storage system no longer only serves art consumables, but also stores different types of practical training materials such as art, engineering, science and innovation through integrated classification and storage areas, providing sufficient material support for the development of interdisciplinary projects. At the same time, the design deliberately weakens the central position of the podium, and closes the distance between teachers and students through the enclosed collaborative space and the open display area, providing hardware support for classroom thinking communication and achievement sharing. It should be clear that interdisciplinary interaction is not a simple accumulation of various functions, but a systematic integration by relying on scientific spatial planning, so that the physical space can truly undertake the integration of multidisciplinary knowledge and provide support for the implementation of integrated teaching practice.

1.3.3 Principle of unifying artistry and practicality

Practicality ensures the orderly implementation of teaching activities, and artistry injects the connotation of aesthetic education into the space. There seems to be a contradiction between the two, but in fact, they can adapt to each other and complement each other. Coordinating these two attributes in the limited teaching space is the core problem that needs to be faced in the design of primary school art space at present.

Practicality is the foundation of all spatial design, and all artistic designs must ultimately serve the actual teaching needs. The frequency of use of primary school art classrooms is high, and the creative scenes are also very diverse. The walls and floors are made of waterproof and dirt-resistant materials, with exclusive operating tables and waste storage areas, which is the basic conditions for carrying out art activities such as paint painting and handmade. The reasonable ratio of natural light and artificial light sources, and the construction of a systematic storage system, can further improve the convenience of daily teaching and space maintenance.But it is not enough to meet the practical needs. The artistic atmosphere is the core advantage that distinguishes art classrooms from ordinary teaching spaces. Through rich color matching and diverse material textures, it can effectively break the monotony of standardized teaching space.The psychological responses of children are related to the properties of color; when selecting colors, consideration should be given to saturation, brightness, and hue.[4]

Conclusions to the First Chapter

This chapter distils three core design principles, namely child-centered, interdisciplinary interaction, artistic value and practical value integration, and try to build a two-layer theoretical framework of "educational concept + space design", so as to improve the traditional art space that focuses on form and ignores teaching effectiveness, practicality and ignores the scene. The matching design is short. It can be seen from the study that the art space of primary schools is no longer just a simple teaching place, but has developed into a composite platform that carries the goal of diversified education. However, at present, many campus art spaces still have problems such as solid layout, insufficient aesthetic expression, and difficulty in adapting to interdisciplinary teaching, which are mostly rooted in the lack of professional design. The relevant theories and design guidelines sorted out in this chapter provide theoretical foundation and professional support for the case analysis, spatial optimization and application of design tools of Changzhou High tech Second Primary School in the following article.

CHAPTER 2

Current Situation Investigation and Design Tool Application of Art Space in Changzhou High tech Second Primary School

2.1. Design and Implementation of Research Scheme

This study focuses on all teachers and students of Changzhou High Tech Second Primary School as the primary subjects, and targets the following campus areas: the artistic creation zone, the multi-functional exhibition and exchange zone, the collaborative learning and exchange zone, and the flexible adaptation and reflection zone. The study design and implementation were carried out in accordance with the principles of authenticity, relevance, and systematicity. The core objectives of this study are to assess the current state of artistic space design within the school, identify the usage needs of teachers and students, and evaluate the alignment between spatial design and both aesthetic education and STEAM education.

2.1.1.School profile and research methods

Changzhou High tech Second Primary School is located in the core area of Changzhou High tech Zone. The school has been deeply engaged in the construction of aesthetic education for a long time, and adheres to the school concept of "educating people with beauty and culture". The school offers a Variety of art courses such as art, calligraphy, handicraft, creative design, etc., and regularly holds campus art festivals, art exhibitions, creative handicraft competitions and other special activities. The foundation of art education is solid, and the campus art atmosphere is strong. The layout of the campus building is regular, with a variety of art venues, including special art classrooms, calligraphy classrooms, atrium exhibition halls and multi-functional activity areas, which can not only meet the basic art teaching, but also carry the display of campus art education achievements. This school provides a suitable sample for the case analysis of primary school art space design in this study.

2.1.2.Current situation of campus art space

Based on the results of field research, this article divides the art space of Changzhou High tech Second Primary School into campus art creation area, multi-functional display and communication area, collaborative learning and exchange area, and flexible adjustment and review area. The construction status and usage of each subdivision are explained as follows:

The professional art teaching space is the core venue of campus aesthetic education, which is mainly divided into three categories: art creation classroom, multi-functional display and communication area, and collaborative learning area. The school has four standardized art classrooms, two calligraphy classrooms and a multi-functional creative classroom. The indoor basic teaching facilities are fully equipped. Drawing boards, eaels, calligraphy tables and chairs, hand tool storage cabinets and other basic equipment are complete, which can support the basic teaching of art and calligraphy regular courses. The overall layout of the space follows the traditional teaching mode, with the teacher's teaching area and the student's practice area as the core. The layout is regular and practical. However, this fixed spatial structure lacks elastic modular design, and it is difficult to adapt to diversified and personalized artistic creation teaching.

2.2. Analysis of teachers and students′ demands

Teachers and students are the core users of art space, and their needs are the primary basis for space optimization and design tool selection. Relying on the information obtained from this research, this article conducts a systematic analysis of the use needs of the art space of Changzhou High tech Second Primary School.

From the perspective of students' needs, the focus is mainly on the richness of space and the sense of participation. 87.2% of students think that the existing space is monotonous, the layout is fixed, and lacks design elements that can attract them; 79.5% of students hope to have an exclusive area for independent creation and group collaboration after class, and also hope to be able to arrange and rotate their works independently.

Judging from the needs of teachers, it mainly includes three core demands. First, the space needs to be suitable and variable for teaching. The existing layout is fixed and the function is single, which cannot support new teaching models such as group cooperation and immersive learning. Second, the space needs to be adapted to STEAM interdisciplinary teaching, but the current site lacks practical equipment and zoning planning, which hinders the implementation of integrated courses. Third, the space needs to be refined and systematically designed. The existing regional division is vague, and all kinds of resources are scattered. With the help of professional design tools to optimize the layout, it can build an art space system that integrates teaching, creation, display and experience activities, while reducing the investment in transformation.

2.3. Existing problems from aesthetic- STEAM perspective

Guided by the concept of aesthetic education STEAM, combined with field research and demand assessment results, this study sorts out the existing core problems of the art space of Changzhou High tech Second Primary School. First of all, the spatial function type is relatively single, and it is difficult to adapt to STEAM interdisciplinary teaching. The existing art space on campus is still for the single purpose of traditional aesthetic education, and the special classroom can only support basic painting and calligraphy courses. The aesthetic education STEAM emphasizes the practice of multidisciplinary integration, which requires space to carry diversified activities such as technical practice, engineering creativity, and the combination of mathematics and design. However, the existing spatial functional zoning is fixed, and the types of supporting facilities are insufficient, which restricts the development of interdisciplinary creative

courses, and cannot give full play to the comprehensive role of space in educating people.

Secondly, the problem of homogenization of space design is prominent, and there is a lack of personalized and creative expression. The existing art space in the school follows the standardized construction mode of the campus, and the layout, decoration and function tend to be unified, which neither reflects the characteristics of different sections nor meets the actual needs of the school's aesthetic education. This static and fixed design method does not meet the lively, diverse and curious physical and mental development characteristics of primary school students, and also contradicts the core requirements of STEAM education to encourage innovation and support personalized creative expression.

Third, the space lacks interactivity and experience design, and the teaching scene type is insufficient. Most of the existing art spaces adopt the model of teachers' lectures, students' passive creation, and static display of works. There is a lack of scene design that can promote teacher-student communication and create an immersive aesthetic education feeling. Art education STEAM education values students' active participation, independent exploration and hands-on practice, but the current campus art space can only complete basic teaching, and cannot build an environment of immersive aesthetic perception, independent creative exploration and interdisciplinary practice and innovation. It is difficult for space to achieve two goals at the same time. Rely on space design to improve the quality of aesthetic education, and thus support STEAM innovative teaching.

2.4. Types and applicable scenarios of design tools

The elementary school campus is an important setting that influences the physical and psychological development of children, while the indoor spaces of an elementary school constitute the environment in which they spend much of their time.[9]The design tools used in the primary school art space do not require complex professional equipment. This kind of tool follows the core principles of lightweight, easy to operate, high security, and suitable for teaching scenarios. It is mainly divided into two categories: physical creation design tools and modular layout tools. They can not only meet the needs of transformation and construction of different spaces on campus, but also meet the teaching requirements of Changzhou High tech Second Primary School.

Physical creation and design tools are the basic materials that support teachers and students' daily artistic creation and space beautification. This kind of tool has a low threshold and is suitable for all students. It includes safety manual tools, three-dimensional plastic tools and campus decoration props, such as safety scissors, environmentally friendly clay, embossed templates, three-dimensional collage materials and small printing tools. This kind of tool is mostly used in classroom wall layout, student work creation, class art corner construction and small corridor art exhibition and other scenes. Students can personally participate in space beautification, so that the art space is no longer a pre-finished fixed environment, but a creative site created by students themselves.

The modular layout tool covers movable display racks, modular operating tables, flexible partitions and replaceable display boards, which is a spatial transformation plan for the dynamic teaching environment of primary schools. This kind of tool is versatile, can be freely combined and flexibly moved, and is suitable for a variety of scenarios such as on-campus art classrooms and creative handicraft classrooms. They can adjust the space layout according to the type of course and the scale of activities, make up for the limitations of the lack of elasticity of fixed space, and at the same time meet the diversified needs of daily teaching, group creation, work display, etc.

2.5. Shaping campus artistic atmosphere from aesthetic education perspective

The core of aesthetic education is to guide students to perceive beauty and carry out the creation of beauty in normalized and immersive art scenes. At present, the art space of many schools still has practical problems such as the thin environment and atmosphere, the single form of work display, and the lack of willingness of students to participate. The intervention of design tools can improve these situations in a targeted manner, and build campus art that adapts to the physical and mental development characteristics of primary school students from the three levels of visual texture, interactive experience and cultural infiltration. The surgical environment.

Design tools can make refined adjustments to spatial aesthetics. With the help of various digital design tools, it can coordinate the color system and decoration style of the campus art space, and improve the current situation of visual clutter and style homogeneity of the existing space. In the design, take into account the aesthetic characteristics of primary school students, and choose

flexible and artistic colors and decorative elements. Students can also complete the creation of decorative works by their own hands, so as to replace the finished decorations that were produced in bulk and fixed styles in the past, add childish interest to the campus space, and form the unique environmental temperament of the school.

In addition, professional tools can also support the construction of interactive aesthetic education scenarios. Relying on facilities such as replaceable exhibition boards and modular exhibition racks, we can build a flexibly adjustable display area for student works. Students can independently complete the arrangement and rotation of works, breaking the limitations of traditional static display. In the whole process of arranging exhibits, adjusting space and artistic creation, students take the initiative to participate in the transformation of the campus environment. They are no longer just spectators of art, but also builders of beauty, so as to implement the aesthetic education requirements of environmental education.

2.6.Realizing interdisciplinary space construction from STEAM perspective

The core feature of STEAM education is the deep integration of art with the multidisciplinary content of science, technology, engineering and mathematics. This educational concept also puts forward higher construction standards for the comprehensive functions, practical attributes and innovative attributes of campus art space. At present, most primary and secondary school art teaching spaces generally have practical problems such as the lack of interdisciplinary teaching scenarios, single space functions and lack of universality. By integrating various design tools to reconstruct and transform the existing art space, such problems can be effectively solved and provide a field for the normalization of various diversified creative courses.

In specific teaching practice, digital painting tools can be combined with basic space modeling tools to lead students to carry out small space design practice and complete the digital creation of works of art. At the same time, relying on modular assembly tools, students can independently build and combine small art display devices and creative landscape works. This kind of experience activity, which combines creation and practice, can simultaneously exercise students' engineering cognition and innovation ability, truly break down the disciplinary barriers between artistic creation and engineering practice, and realize the integrated learning of the two major fields.

Overall, the integrated application of various design tools has effectively expanded the functional boundaries of traditional art space. Originally, the

teaching venue, which could only meet the needs of basic art teaching and a single function, has been transformed into a comprehensive interdisciplinary practice space with creative creation, knowledge exploration, practical application and innovative research and development. This transformation model is in line with the teaching logic and implementation requirements of STEAM aesthetic education, and also effectively makes up for the shortcomings of insufficient interdisciplinary teaching environment in primary and secondary schools.

Conclusions to the Second Chapter

In this chapter, by addressing the existing challenges of the art spaces at Changzhou High Tech Second Primary School and the needs of its teachers and students, we systematically review the types of art space design tools suitable for primary school settings and their applicable scenarios, while establishing core application principles: lightweight design, ease of operation, and alignment with pedagogical objectives. From the perspective of aesthetic education, we demonstrate the value of these design tools in shaping a campus art atmosphere and creating immersive aesthetic education environments; from a STEAM interdisciplinary lens, we explore concrete pathways for leveraging these tools to facilitate the construction of multidisciplinary integrated spaces. The application framework— "Tools → Aesthetic Education → Interdisciplinary Teaching" —developed in this chapter provides a clear practical roadmap for the subsequent implementation of optimized art space solutions at this school.

CHAPTER 3.

Art space construction practice of Changzhou High tech Second Primary School

3.1.Project design positioning and objectives

The transformation of campus art space adheres to the basic design principles of lightweight construction, low-cost control, and joint construction by teachers and students. The project relies on the idea of standardized functional layout to carry out optimization work. The whole process does not involve building structure change and large-scale demolition and renovation construction, and only iteratively upgrades the existing art space in the school.

This transformation aims to build a composite art space that adapts to the physical and mental development and learning characteristics of primary school students. The spatial function is clearly divided, and the aesthetic education atmosphere is prominent. It can adapt to STEAM interdisciplinary teaching, and at the same time, it supports the dynamic update of scenes and content. The space integrates many core functions such as art professional course teaching, creative experimental exploration, work display, interactive experience and interdisciplinary practice. In addition to meeting the regular teaching needs of daily art education, it can also be adapted to the development of various campus art special activities.

Combined with the functional layout planning of the overall space, this transformation sets three core construction goals. First, optimize the functional partition of reconstructed space. The original art space generally has the problems of mixed functions and the lack of special practice areas. This transformation specially adds an art creation area, a STEAM experimental area, a work display interactive area and a collaborative exchange and learning area to make up for the functional shortcomings of the venue, so that each teaching practice activity has an exclusive space. Secondly, rely on various lightweight design tools to refine the construction details of each region, so that the space configuration adapts to the standards of conventional art education teaching and STEAM interdisciplinary practice, and promote the integration and implementation of different disciplines such as art, science and technology, mathematics and manual practice. Finally, build a construction and operation model of co-creation between teachers and students, encourage students to participate in the whole process of space design, work creation, site layout, content update, etc., exercise students' aesthetic perception and innovative practical ability in practice, and truly implement the educational purpose of infiltrating aesthetic education with environment and cultivating students with art.

3.2.Overall spatial scheme planning

In combination with the standard functional layout requirements of the primary school art space, and based on the existing campus site conditions of Changzhou High-tech Second Primary School, this transformation project will re-comb the art space in the school and divide it into five core functional areas, namely art creation area, multi-functional display and interaction area, collaborative learning and communication area, and flexible adjustment. It is suitable for the perception area and the comprehensive activity area. The zoning

covers all kinds of indoor and outdoor scenes, and the design follows the idea of independent zoning, complementary functions, and static and dynamic separation, so as to reduce the inefficient problem of space utilization caused by mixed functions.

The positioning of each functional area is clear, and it undertakes different usage tasks. Relying on the on-campus art and calligraphy classrooms, the art creation area serves as the core venue for daily teaching to carry out painting, calligraphy, handicraft and creative design courses, which are suitable for art creation activities that require quiet and concentration. The multi-functional display interactive area centrally displays the art works of teachers and students, which is divided into two parts: permanent display and dynamic theme exhibition, which can normally present the results of aesthetic education. The collaborative learning and exchange area is arranged in the corner of the classroom and the empty space of the atrium to create a participatory and immersive art experience environment, which is convenient for students to create independently or carry out group cooperation art activities. The flexible adjustment perception area uses the corridor corner and the idle space of the corridor to create a lightweight aesthetic education corner, so that students can subtly feel the artistic influence during the break.

The five functional zones are interconnected and seamlessly integrated to form a comprehensive artistic spatial system—comprising "professional creation, exhibition of achievements, interactive experiences, and daily cultural immersion" —thereby fundamentally transforming the school's previous state of limited functional diversity and fragmented spatial layout in its artistic spaces, and fully meeting the requirements of aesthetic education and interdisciplinary teaching in primary schools.

3.3. Specific practical application of design tools

During the initial overall layout planning phase, digital spatial design tools will be uniformly employed. Simulated designs will be conducted for the zoning of the five functional areas — including their positioning, dimensional proportions, color schemes, and fixture placement—to optimize the circulation flow within each zone in advance. This approach aims to prevent interference between active and static zones, ensuring that the overall layout is well-structured and logically organized, thereby providing precise strategic support for the physical renovation project.

During the spatial zoning setup phase, modular layout tools are primarily employed. The artistic creation zone features movable workstations and dedicated storage cabinets, enabling flexible switching between individual creation and group collaboration modes; the multifunctional exhibition and interactive zone utilizes modular display panels and tiered display racks, accommodating works of varying sizes and themes; the flexible transformation and reflection zone incorporates movable partitions and creative workstations to create adaptable interactive scenarios, allowing for free iterative reconfiguration of each functional space.

In the stage of scene atmosphere creation and practical teaching application, this study combines physical creation tools and digital creation tools to carry out artistic design practice. Teachers and students rely on traditional physical means such as clay shaping, embossing technology, geometric modeling, collage creation, etc. to produce various artistic decorative works for the campus comprehensive activity area and interactive experience area. In addition, the research also introduces digital creation methods such as digital painting and simple three-dimensional modeling, which are used to produce various themed works of art to enrich the artistic content and scene atmosphere of each functional area. This creative way of combining virtual and real makes each functional space not only have practical attributes, but also retains a unique artistic texture. It also builds a practical platform for the school to carry out STEAM interdisciplinary practical activities.

3.4. Expected scheme effect and educational value

This art space design project adopts lightweight design tools, which can optimize the original art space of the school without large-scale civil construction, and achieve corresponding results in terms of space transformation and teaching results. From the spatial level, the transformed campus is divided into five functional areas, and the dynamic line organization is also more reasonable. The original problems such as mixed functions, lack of special venues, and single display forms have been properly solved. Each subdivision can cooperate with each other. The flexibility, practicality and artistic sense of the space have been improved, and the efficiency of the use of campus art education space has also been improved, forming a set of standardized, systematic and sustainable iterative primary school art space construction framework.

At the teaching level, the art space set up in the subdivision can adapt to the needs of different art education scenarios. The static creation area ensures the orderly implementation of regular classroom teaching, and the dynamic display and experience area mobilizes students' creative enthusiasm. Students participate in the whole process of program conception, work production, scene arrangement and space update in the zoning space, and their aesthetic perception, hands-on ability and teamwork ability can be exercised. The standardized functional layout with lightweight design tools lowers the implementation threshold of campus aesthetic education space transformation. In order to continuously optimize the art space of primary schools, promote the deep integration of aesthetic education and STEAM education, and form a set of long-term practical models.

Conclusion and Prospect

This study selects Changzhou High tech Second Primary School as a specific case, and systematically explores the application of design tools in the creation of campus art space. The research is combined with field research, teacher-student demand analysis, functional zoning and graphic scheme design, and then to the implementation practice scheme, and gradually form a complete research result.

Relying on field research, this study sorts out many existing problems in the school's art space. The original art space layout of the campus is scattered, with various functions interspersed with each other. There is no clear zoning logic, and the overall environmental atmosphere is monotonous and rigid. The original venue can only meet the basic art teaching, and it is difficult to meet the new requirements put forward by the integration of art education and STEAM interdisciplinary teaching. In addition, there is a shortage of special venues for teachers and students to create independently and carry out interactive exhibitions.In response, this study leveraged the actual spatial conditions of the campus to design five core functional zones: an art creation zone, a multifunctional exhibition and interaction zone, a collaborative learning and exchange zone, a flexible adaptation and reflection zone, and a comprehensive activity zone. By defining the functional positioning, spatial flow, and intended usage scenarios for each zone, this approach addressed the core issues of functional overlap and low space utilization in the original layout, ultimately establishing an indoor art space system that balances dynamic and static elements with well-defined functional divisions.

This study sorts out the feasible application path of lightweight design tools. Research on the different usage needs of the four types of functional areas, match digital design tools, modular layout tools and physical creation tools respectively, and build a complete application framework including planning and layout, space construction, and scene atmosphere creation. With the help of such tools to promote spatial transformation, research and implement the spatial co-creation model with the joint participation of teachers and students, and simultaneously promote STEAM interdisciplinary practice activities while creating a campus aesthetic education environment.This approach provides actionable, practical solutions for the lightweight renovation of art spaces in primary schools.

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APPENDIX A (Tables and diagrams)



Fig.1.Development timeline of STEAM education both domestically and internationally

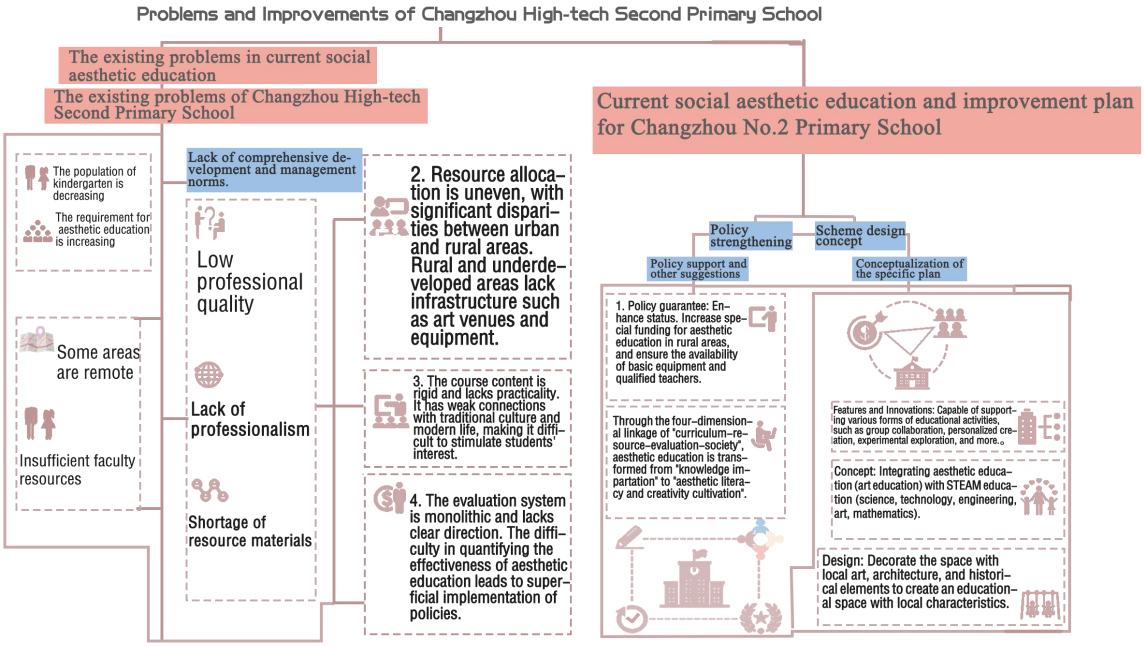


Fig. 2. Analysis of the issues in Changzhou High tech Second Primary School

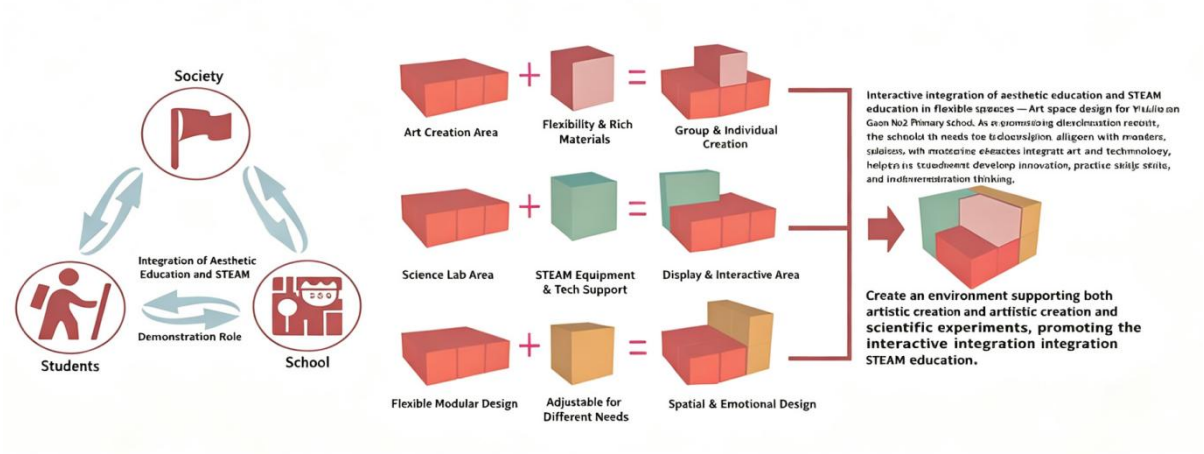


Fig. 3.Design concept of Changzhou High tech Second Primary School

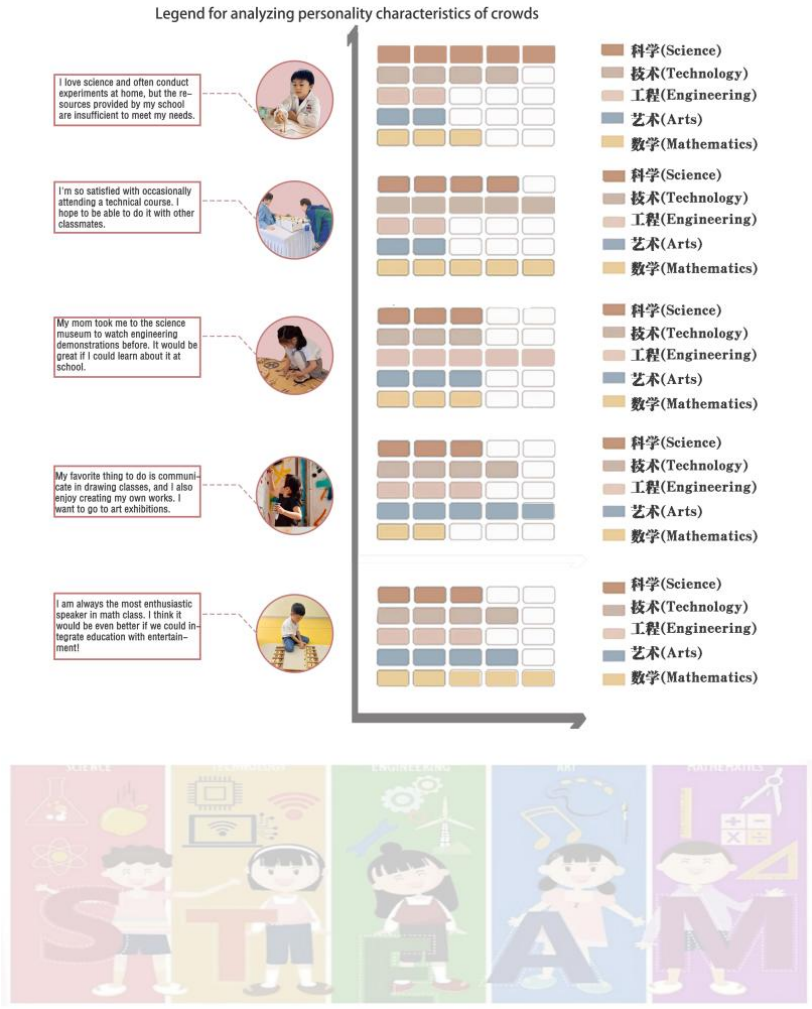


Fig. 4.Analysis of personality characteristics of students at Changzhou High tech Second Primary School

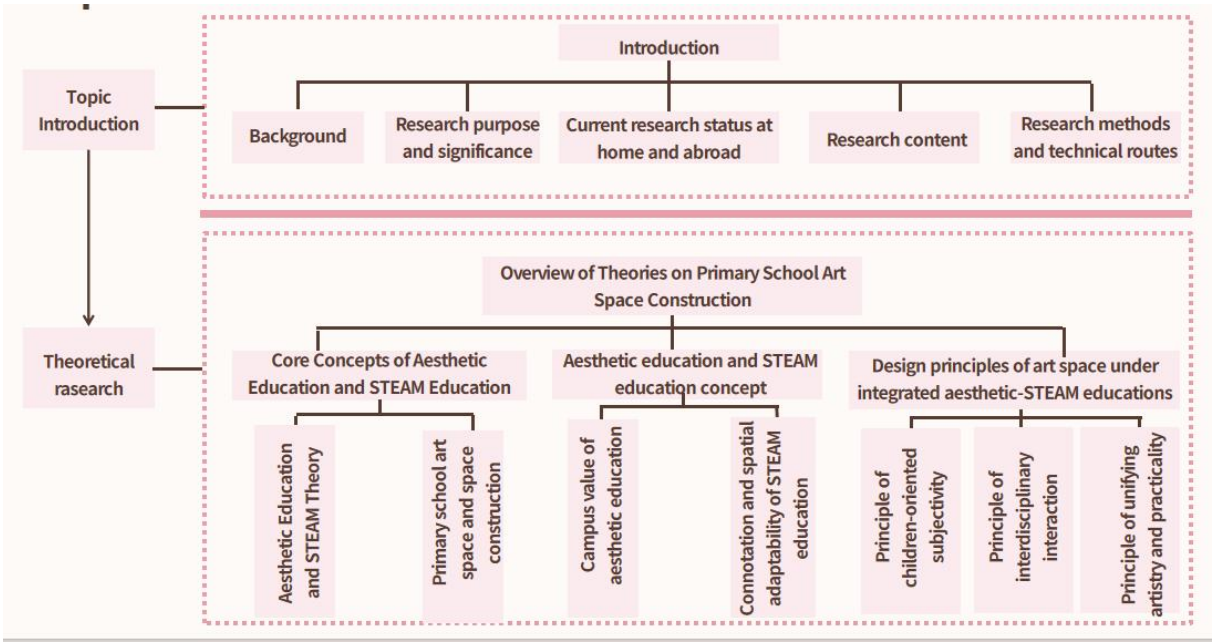


Fig. 5.Summary table of the thesis research

APPENDIX B (Picture of Research Status of Children's Space in Changzhou High tech Second Primary School)

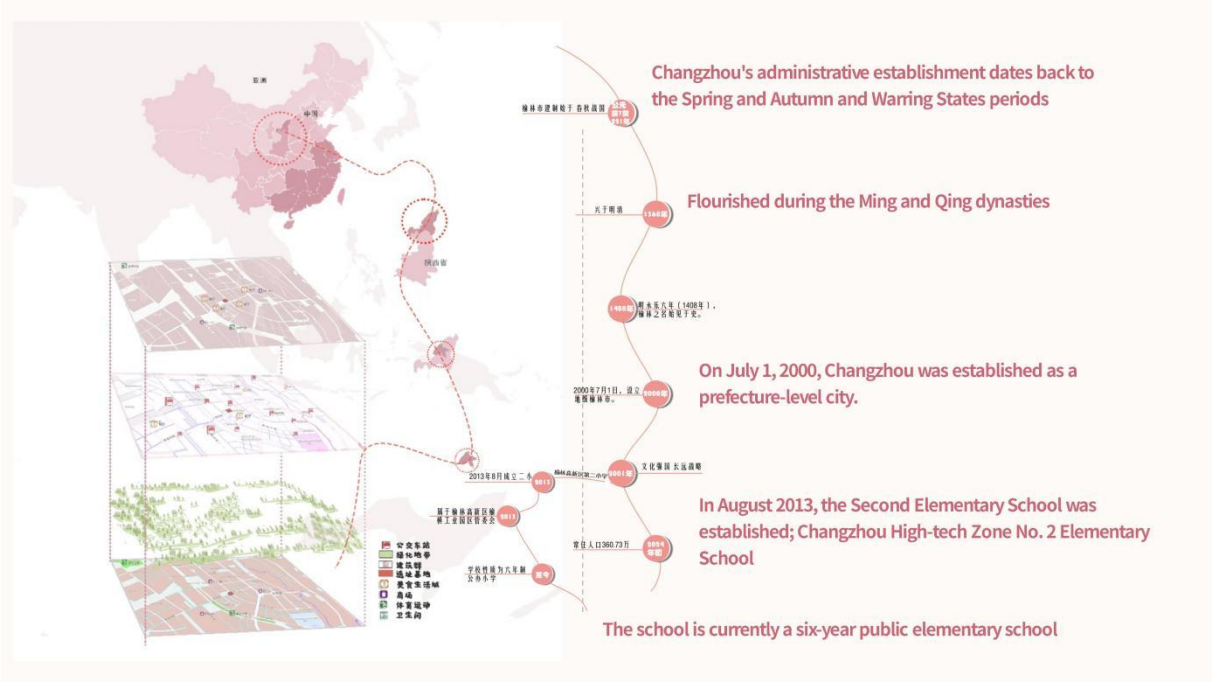


Fig.1.Location Analysis of Changzhou High tech Second Primary School

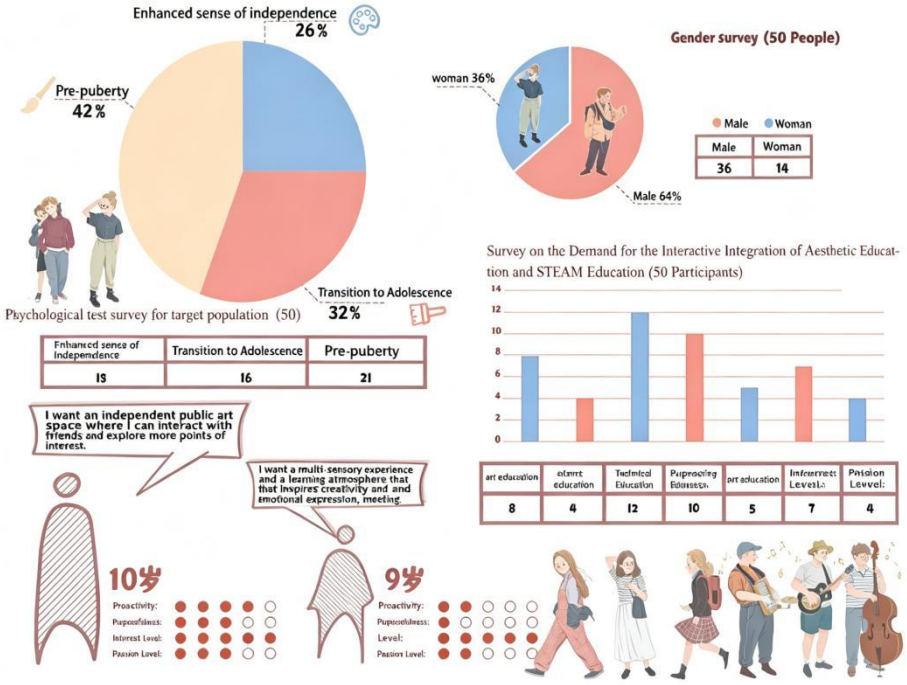


Fig. 2. Population analysis of Changzhou High tech Second Primary School

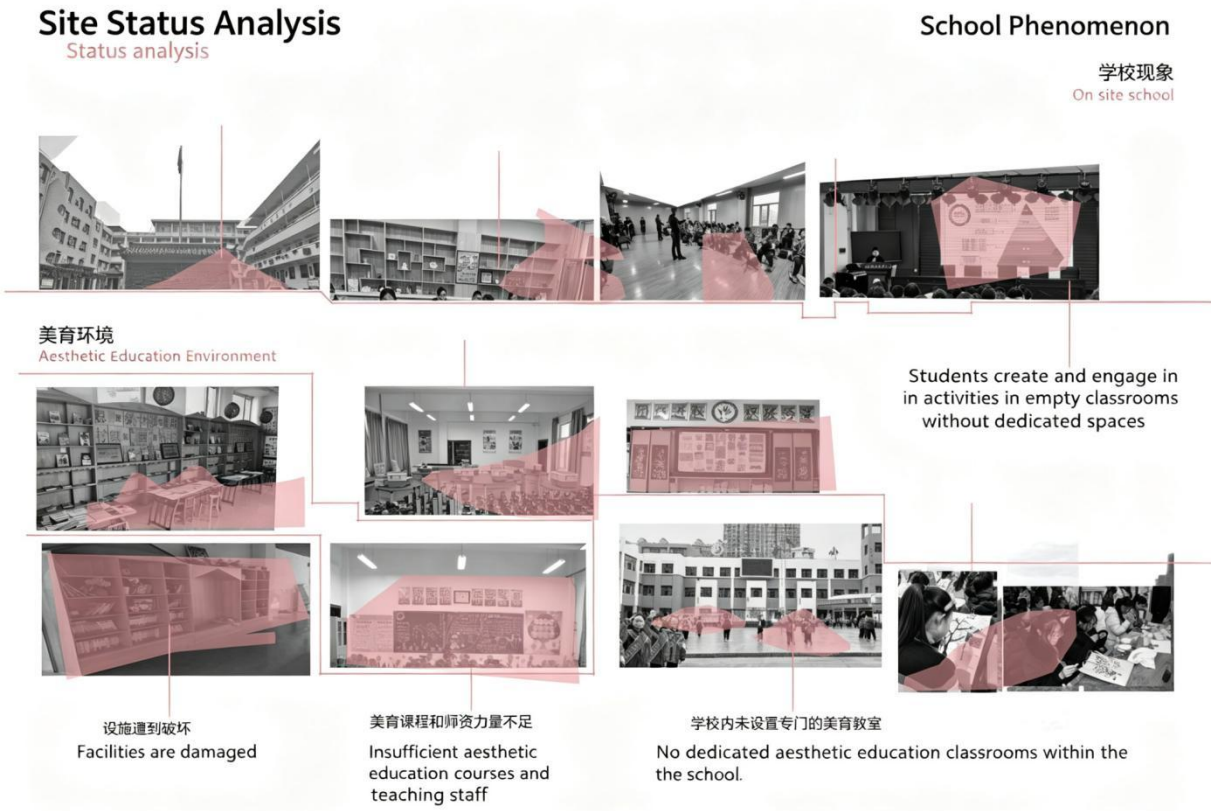


Fig.3.Analysis of the current status of the base of Changzhou High tech Second Primary School



Fig.4.Spatial analysis of Changzhou High tech Second Primary School

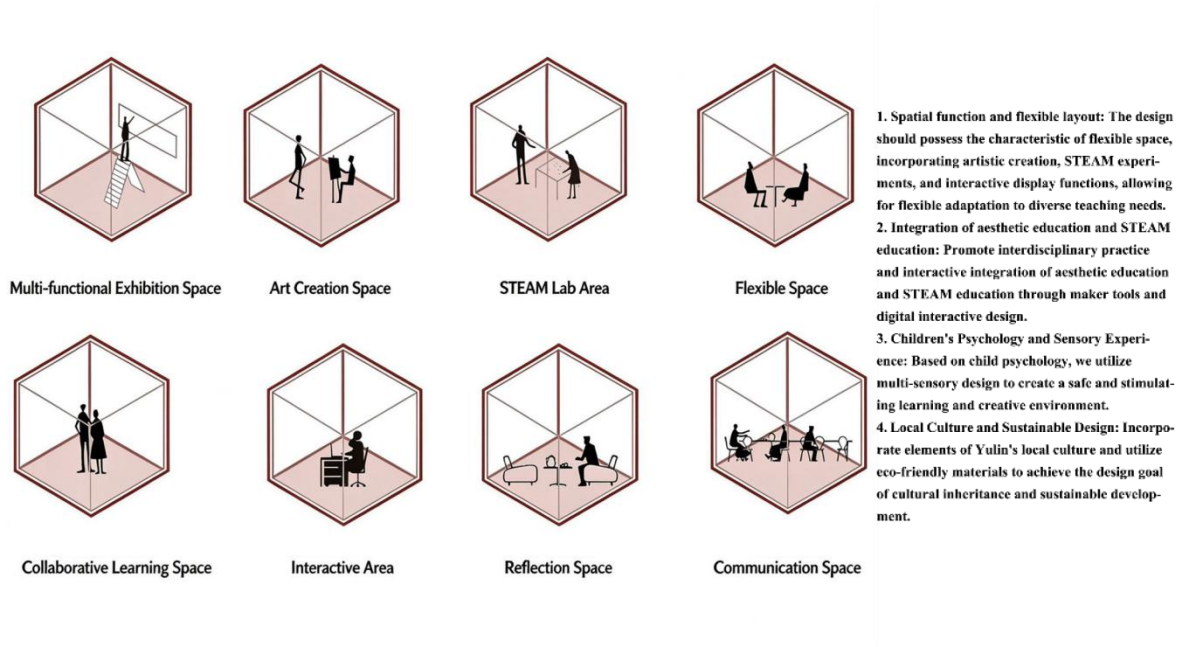


Fig.5.Functional layout analysis of Changzhou High tech Second Primary School

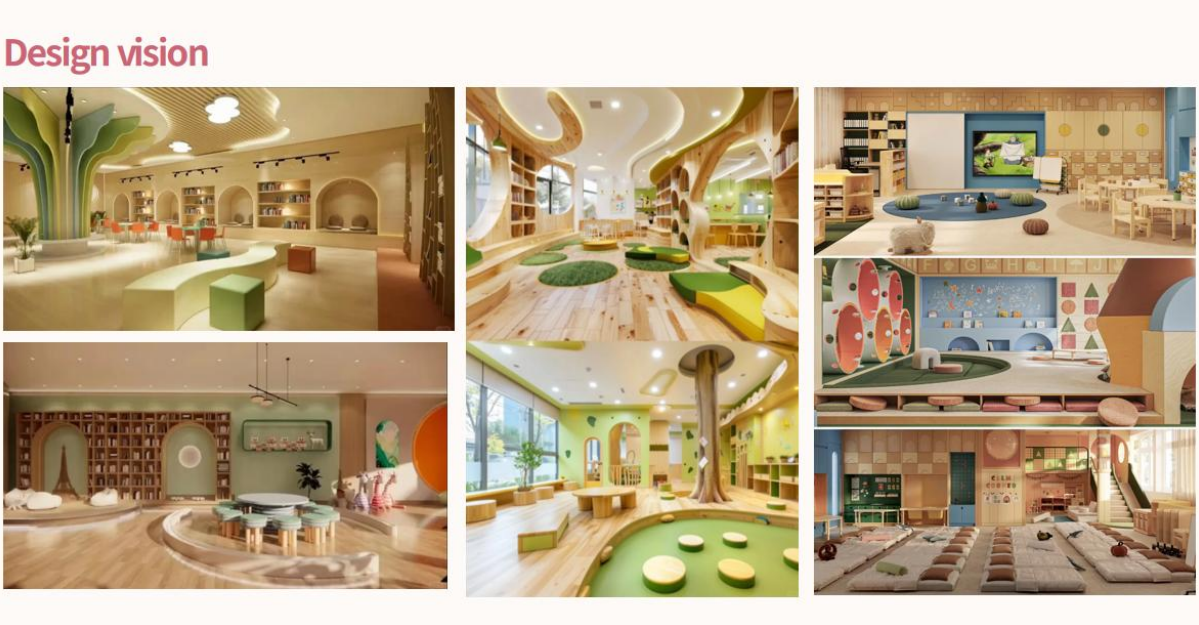
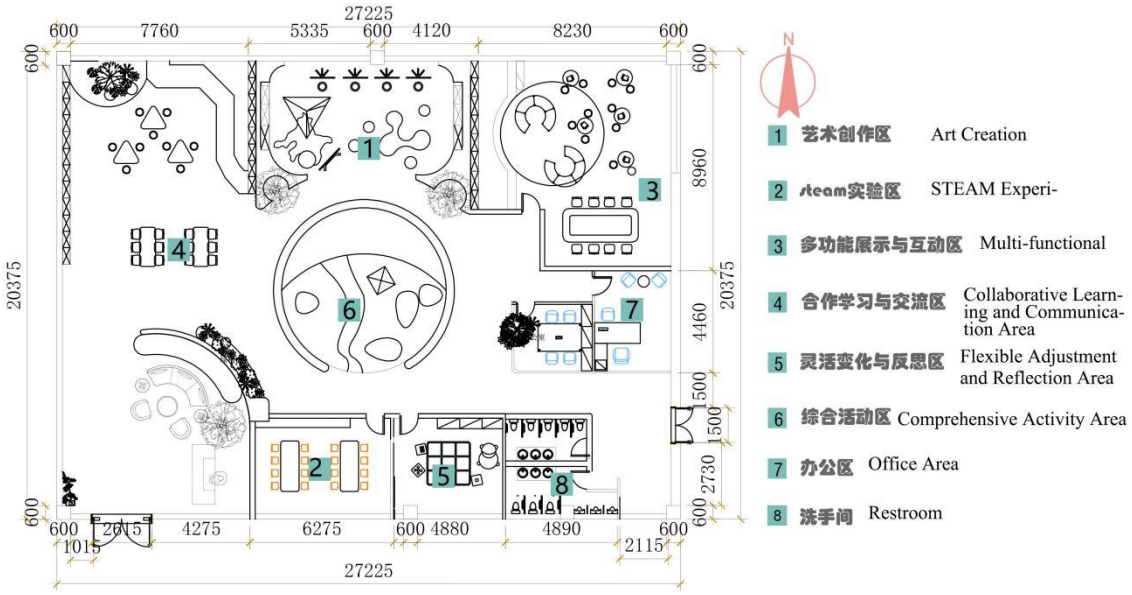
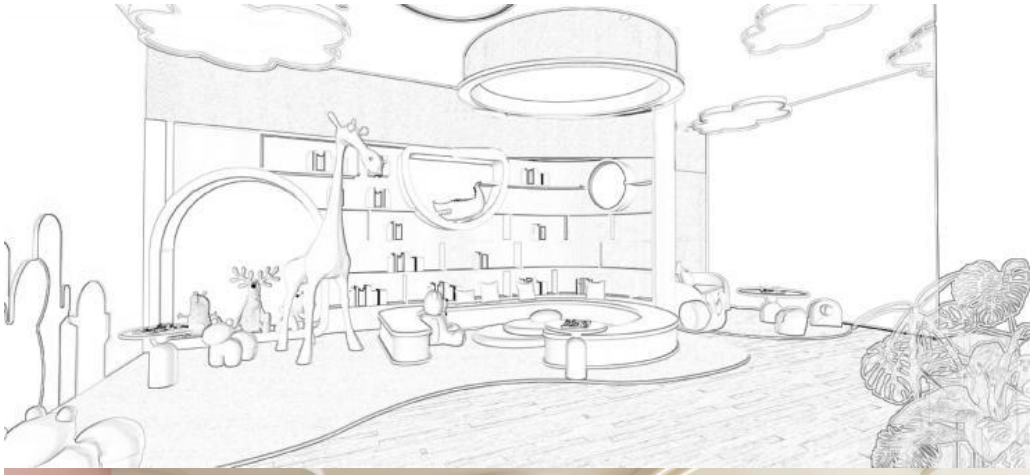


Fig.6.Design vision

APPENDIX C (project proposal)



1. Children’s space floor plan



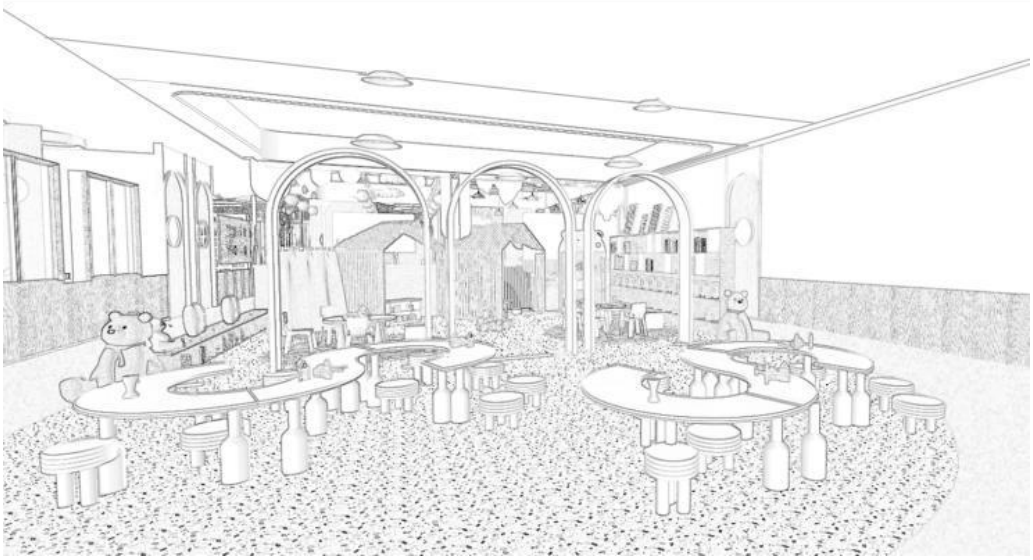


2.Art Creation





3.STEAM Experiment Area





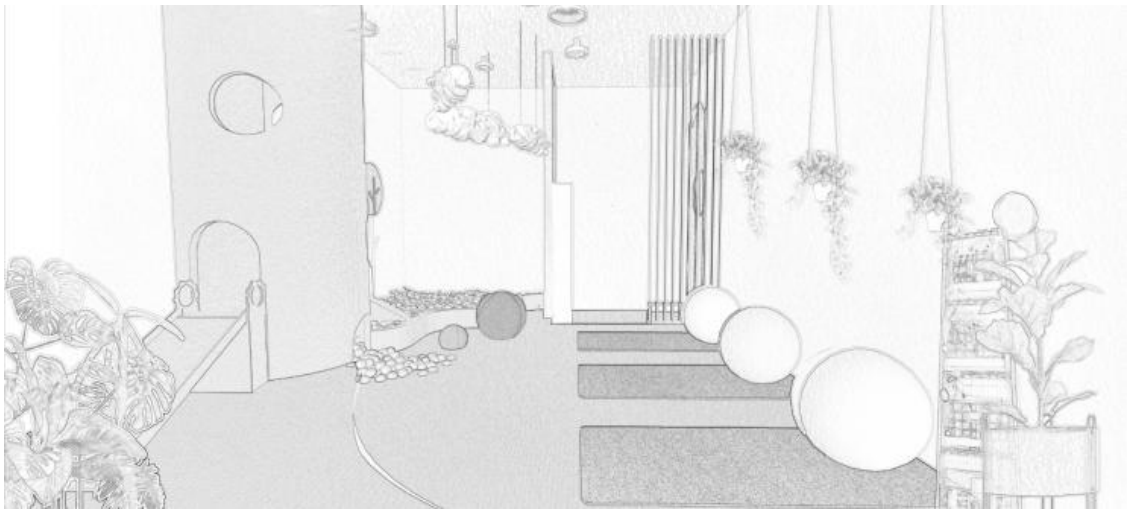
4.Multi-functional Display and Interaction Area







5.Collaborative Learning and Communication Area



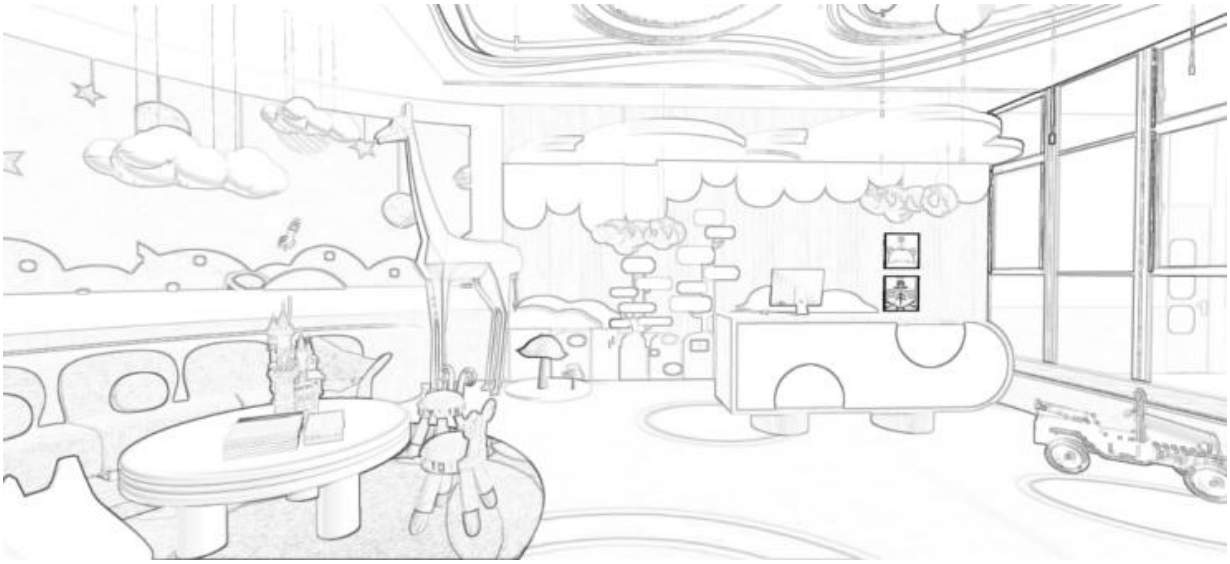


6.Flexible Adjustment and Reflection Area





7.Office Area





8.Reception





