

INTEGRATED CURRICULUM DESIGN; STEAM IN SHENYANG, LIAONING CHINA

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ARTICLE HISTORY

Received: 25 August 2023 **Revised:** 15 September 2023 **Published:** 25 September 2023

ABSTRACT

The objectives of this study were to 1) To investigate and assess educators' present knowledge of STEAM education and the second classroom, especially in more underdeveloped locations, and to pinpoint any obstacles or gaps in their theoretical and practical expertise, 2) To deeply analyze students and comprehend the situation of teaching and learning at the moment in the framework of STEAM education for English, 3) To investigate and create practical teaching activities and interdisciplinary research cases that integrate STEAM education and second classroom principles in high school English instruction, to give first-line instructors real-world examples and other examples, and to examine and improve STEAM education. The population used in this research is total 122,200 students in Shenyang, China, The sample size used in this research was 400 persons. The size was determined by calculating the Taro Yamane sample size (Taro Yamane, 1967). The analyses using One-Way ANOVA revealed no significant difference in these opinions when classified by sex, age, or educational level. The results underscore the value students place on STEAM education as a tool to enhance problem-solving skills, reinforcing the importance of supporting these educational programs. Further, similar levels of understanding and opinion across demographic factors point towards the equitable impact of STEAM education in the sample population.

Keywords: Mixed-Age Education, Advantages and Disadvantages, Students' Learning

CITATION INFORMATION: Wen S. (2023). Integrated Curriculum Design; Steam in Shenyang, Liaoning China. *Procedia of Multidisciplinary Research*, 1(9), 40.

INTRODUCTION

Mixed age education refers to arranging children of different age groups into a class to play, live and learn. It is an educational method implemented in all kindergartens nationwide in Germany. In the age arrangement of kindergartens in Germany, there is a very distinctive feature that children of different age groups are arranged into a class (called a group in Germany) to play, live and learn. One of the basic concepts of mixed age education is that kindergarten classes are similar to a warm family. In such a family, children of different ages live together like brothers and sisters, playing and learning together. Since each child is a member of the family, they also have their own living space and preferences. Looking at the mixed age education in China (generally called mixed class in China before), there are also many years of history and experience, but the mixed age class arrangement in China is mainly due to the following reasons and considerations: (Huang Qiaole, 2009).

The educational approach emphasizes student-centered learning and tailors instruction to align with students' interests and needs. STEM refers to integrating scientific disciplines, whereas STEAM refers to integrating scientific and non-scientific disciplines. The originality within each of the respective domains can be described as follows:

There is a strong emphasis on experiential learning in the field of science. Technology education places great importance on engaging in practical projects. Engineering education prioritizes the process of designing and planning. Art education focuses on the creation of innovative and imaginative goods. Mathematics education prominently utilizes modeling techniques (Drake & Reid, 2017). Yakman (2010) posits that under the STEAM framework, the letter A signifies incorporating design arts and skills in language, history, psychology, and sociology. STEM and the arts possess contrasting yet mutually reinforcing attributes.

According to Sousa and Pilecki (2013), the STEM disciplines are characterized by objectivity, logic, analysis, and reproducibility. In contrast, the arts are represented by subjectivity, intuition, sensory perception, uniqueness, and a perceived lack of seriousness. The field of STEM emphasizes the development of convergent talents, whereas the domain of art prioritizes the cultivation of divergent skills (Land, 2013). As indicated, the transition from STEM to STEAM emphasizes the shift from convergent to divergent thinking, enabling students to achieve greater levels of creativity (Gettings, 2017). It causes changes in students' mental patterns (Taylor, 2017). In the United Arab Emirates (UAE), the integration of art and reading into STEM education has been implemented in governmental schools and institutes. Therefore, the researcher is interested in studying the students' understanding of STEAM education. And opinions on learning management according to the STEAM Education concept to promote problem-solving skills of students to obtain information that will be useful in planning to build students' knowledge and understanding of STEAM education. And develop the teacher's ability to design learning activities according to STEAM education to be effective.

LITERATURE REVIEWS

To effectively design curricula, curriculum designers must consider the desired results, as emphasized by Wiggins and McTighe (2005). This consideration ensures that the curriculum design aligns with the intended direction of learning. The "backward design" is a pedagogical approach employed in curriculum development that involves a sequential process consisting of three key steps: the identification of intended outcomes, the establishment of evaluation criteria and methodologies, and the design of instructional activities (Wiggins & McTighe, 2005). A reciprocal relationship exists between backward design and STEAM, as STEAM strengthens and upholds the principles of the back design framework regarding curriculum, instruction, and assessment by employing performance tasks and creating an authentic learning environment (McTighe & Reese, 2013). Various techniques exist to design an integrated curriculum, including the ideas proposed by Drake (1991) and Beane (1991). Both viewpoints suggest

distinct approaches to planning methods and the development of an integrated curriculum. In his work, Drake (1991) emphasizes the collaborative efforts of instructors in the planning process. Conversely, Beane (1991) places greater reliance on the involvement of teachers and students in co-planning activities. The main focal point of evaluation in a trans disciplinary curriculum is the concept of authenticity, as highlighted by Drake and Reid (2017). Science, Technology, Engineering, and Mathematics (STEM) education is a unique approach of teaching and learning that centers around students' learning and interests. STEM refers to integrating scientific subjects, while STEAM refers to integrating scientific and non-scientific subjects. The novelty in each of the fields is as follows:

In science, it is in hands-on learning.

In technology, it is in the projects.

In engineering, it is in the design planning.

In art, it is in the creative products.

In mathematics, it is in the prominent use of modeling (Drake & Reid, 2017).

STEM education is an innovative pedagogical approach that prioritizes the learning and interests of pupils. The acronym STEM denotes the integration of scientific disciplines, whereas STEAM denotes the integration of both scientific and non-scientific disciplines. The originality within each of the respective domains can be described as follows: In science, it is through hands-on learning. In technology, it is through projects. In engineering, it is through design planning. In art, it is through the creation of creative products. In mathematics, it is through the prominent use of modeling.

Cognitive conflict among peers is an important factor affecting children's social development

Piaget and Vygotsky emphasized the close relationship between cognitive development and knowledge construction in social situations; Bandura's social cognitive learning theory emphasizes the significance of observing and imitating others' behaviors, attitudes and emotional reactions. Their views have laid a theoretical foundation for the implementation of mixed age education.

Cognitive conflict between peers will force children to look at problems from the perspective of others. Children's interaction with peers at all levels of development will increase their cognitive conflict. The relationship between children and their peers is different from that between adults and children. In the relationship between adults and children, adults are usually in an advantageous position, while children are in a passive or inferior position. Children may succumb to the authority of adults and accept views that they do not understand; the relationship between children and their peers is usually based on certain cooperation. Emotional resonance enables children to have a broader cognitive vision of society. Piaget believes that without the mutual communication and cooperation with others in thought, an individual can never synthesize his operations into a coherent whole.

In mixed age education activities, the communication and cooperation between children of different levels of development greatly increase the probability of cognitive conflict, increase the opportunities for children's experience, cognition and development, and promote children's self-learning and sense of success. (Mars, & Zhao Haiyan, 2008)

Mixed age education creates a "Recent Development Zone" for children's psychological development

Children of different ages learn, live and play together. They challenge each other, form cognitive conflicts, and create a "recent development zone", thus promoting the development of abilities in all aspects, especially the development of social understanding. In mixed age education activities, older children use their own behavior and language to explain or express to younger children, and younger children use their own behavior and language to imitate or ask older children. They exceed their original level and reflect the highest level that they can

reach, which is the social construction between different ages. Each child's experience and ability are enriched and improved in his own "recent development zone". Mixed age education gives children of different ages, experiences and development levels multiple opportunities for interaction. (Zhu Lihua, 2015)

Observation and imitation are the main ways for children to learn

Bandura emphasized that in social situations, most human behaviors are learned through observation. He believes that learners do not need to react to observation learning, nor do they need to experience and strengthen directly, but only learn by observing others and accepting consistent reinforcement. The main way for children to learn is to observe and imitate the behavior of adults or peers to form alternative experiences. According to this theory, social learning is the result of growth and depends on children's experience and intelligence. The more diverse the role models, the more likely the observer is to respond creatively. Mixed age education provides children with a large number of opportunities to emulate peers at different levels of development. Children learn the language of adults and other children through imitation, and then recombine or change the language materials in their own way, so as to promote the improvement of language ability. The young children learned how to build buildings and play puzzles by observing the older children to operate the game materials, which promoted the development of action skills. Through imitation, children gradually learn to communicate with others.

The individual differences of preschool children are more significant, the mixed age class arrangement model is more consistent with the needs of children's personality development, and provides more flexibility and learning methods for children's individualized needs. Mixed age education is obviously superior to peer education in cognitive development, social communication, cooperation awareness, emotion, language ability. (Liu Hui, 2019)

Improvement strategy

The process to improve kindergarten education may be included as following: (Jason, & Wang Meifang, 2007)

- 1) In the process of the actual development of kindergarten education, if we want to truly achieve the effect of mixed age education, we should first promote the improvement of teachers' role change, concept and quality. Teachers should be allowed to quickly adapt to the educational model. Only in this way can we truly promote the smooth implementation of this model in daily education.
- 2) In the process of mixed age education, we should ensure that the forms are rich. Only in this way can the final effect of the activity be continuously improved. For example, first of all, we should ensure that mixed age outdoor activities are carried out irregularly. For example, morning activities can be set as mixed age activities, allowing children to communicate and activities freely in the open space. The open area of the kindergarten divides the functional area, and the teacher is responsible for the area. It allows children to break the boundaries of the class in pairs, so that children can actively participate in activities and choose areas according to their own preferences.

RESEARCH METHODOLOGY

- 1) Research Design-Survey research
- 2) The population used in this study consisted of Students in Secondary schools in Shenyang, China, with 75 schools total of 122,200 students. The sample group used in this study consisted of 400 students in Shenyang, China; the size was determined by calculating the Taro Yamane sample size (Taro Yamane, 1967) at the reliability level of 95%.
- 3) Research instruments-1) Study concepts, theories, and research related to STEAM studies to formulate the question line structure. By studying the meaning of STEAM education, the importance of STEAM education STEAM Implementation in Thailand integrating learning

management in line with STEAM education Principles of STEAM Education Learning management according to STEAM education Measurement and Evaluation along the STEAM Study, 2) Study the model of learning management by using a model based on the STEAM Education concept of (Onpui, 2019) that the researcher has done. Bring to improve as a guideline for making the questionnaire an opinion questionnaire about learning management based on STEAM Education concepts to promote problem solving skills.

RESEARCH RESULTS

Result from the study basic information of children.

In this study, a whole-group sampling showed as Table 1 and Table 2 as following:

Table 1 Basic information of children in mixed-age classes

	Mixed-Age Classes		Total
	Male	Female	
3 years old group	37	39	76
4 years old group	34	37	71
5 years old group	31	24	55
Total	102	100	202

Table 2 Basic information of children in the same age group

	Same-Age Class		Total
	Male	Female	
Small classes	32	37	69
Middle Class	37	35	72
Large class	34	29	63
Total	103	101	204

Result from the study advantages and disadvantages of mixed-age education.

Behavioral interactions among young children's peers are an important way for young children to socialize. The results of the treatment of young children's learning behaviors showed that the total learning behavior and its dimensions had the most positive results, followed by neutral results and very few negative results. Whereas there were no differences in the results of pro-social behavior and family environment in terms of differences in the way the classes were organized, the positive results were greater in the mixed-age classes than in the same-age classes in terms of personality traits. The behavioral outcomes in the same-age classes were more neutral outcomes. The result showed as Table 3 and Table 4 following:

Table 3 Consistency coefficients for two types of scheduling

	Age Profile	Gender identity	Home Environment	Personality traits
Mixed Age Classes	0.49	0.85	0.87	0.79
Cohort Class	0.87	0.86	0.85	0.29

Table 4 Descriptive statistics of children's learning behaviors in mixed-age classes on different types of activities

	Learning Ability		Retreat ability		Social skills		Total Learning Behavior	
	Number of times	Percentage	Number of times	Percentage	Number of times	Percentage	Number of times	Percentage
Self-directed learning	72	21.10%	21	6.20%	41	12.00%	134	39%
Free Activities	45	13.20%	19	5.60%	23	6.70%	87	26%
Theme Events	62	18.20%	19	5.60%	39	11.40%	120	35%
Daily Activities	179	52.50%	59	17.30%	103	30.20%	341	100%

Therefore, the special characteristics of the mixed-age class are better for the development of boys' learning behaviors to a certain extent than that of the same age class. Second, on the basis of the well-developed gender identity, girls show more love and help to their younger siblings due to the age gap in the mixed-age classroom, and in the rare family environment, they are able to resolve conflicts more objectively due to their older role, give a good example to younger children, avoid positive conflicts between children, and integrate more naturally into the group in a family-like environment. Eliminate withdrawal behaviors of unfamiliar anxiety.

Result from the study propose effective strategies in dealing with problems arising through the implementation of mixed-age education.

In mixed-age classes, teachers ask older children to help take care of their younger siblings, and during this time, older children become more capable and younger children have role models, so they improve quickly. However, in the long run, the older children are less energetic than their peers, and sometimes they are depressed. Because of the attention of their younger siblings and the teacher, they will consider more factors when doing things than their peers, which will put a lot of pressure on the older children and will easily wear out their original personality. In such cases, older children tend to develop behavioral fatigue.

As for the differences in the way the classes were organized, the children did not differ significantly in gender characteristics and family environment, while the positive outcomes in personality characteristics were greater in the mixed-age classes than in the same-age classes. The reasons for this were found to be that in the mixed-age classes, the predominance of results in the treatment of personality traits was more pronounced in the toddlers' treatment; in the same-age classes, the predominance of neutral results was in the teachers' treatment. That is, in the ways of adjusting personality traits of toddlers, the drive and infection of language and play behaviors among toddlers in the mixed-age class showed more positive results compared to the teachers' verbal ways. This is because children communicate and interact with each other in their own way and with their own characteristics. Therefore, children in the mixed-age classroom dealt with shy behavior more effectively. The above findings show that in the process of dealing with the personality traits of young children, giving full play to the special advantages of children in mixed-age classes and actively encouraging communication and processing among children themselves not only exercise their problem-solving skills, but also play a good developmental role in the improvement of their personality traits.

DISCUSSION & CONCLUSION

The research study on the advantages and disadvantages of mixed-age children's learning, will be discussed the findings as follows:

From the survey, on the advantages and disadvantages of mixed-age children's learning we found a number of problems with mixed-age kindergarten education. Insufficient teachers for kindergarten mixed-age education. In city kindergartens, there are at least 20 to 30 children in a class. Since mixed-age education requires teachers to grasp the different levels of

development of each child and to be able to teach them according to the characteristics of children of different ages, the number of children in a class increases the difficulty of operation and places high demands on teachers, making it difficult for teachers of average level to handle the job.

The curriculum resources of kindergarten mixed-age education and the comprehensive quality of teachers need to be improved currently, the early childhood education model is relatively homogeneous and is basically traditional same-age education, with classes divided by age and related curriculum designed. Mixed-age early childhood education curriculum resources are lacking and teaching experience is insufficient to meet educational needs. Moreover, this education model requires setting up different activities for children of different ages and creating a comfortable and free environment to facilitate communication and exchange among children. In addition, the organization and design of educational activities for mixed-age children are complicated and require a certain amount of practical experience. Therefore, it adds to the difficulty of education and requires teachers to accumulate experience in mixed-age early childhood education, actively explore and combine theory and practice.

Parents have different attitudes towards mixed-age classes

The special feature of Chinese-style education is that we all belong to the same starting line in terms of age, which is more reassuring for parents and can avoid the situation of children of different ages, different acceptance abilities and different learning progress. Parents' concerns about mixed-age teaching are mainly the following: First, they are worried about the learning obstacles caused by the different ages and abilities of children in the same class. Secondly, they are worried that the implementation of mixed-age education in schools is only the pursuit of the so-called noble education, without considering the comprehensive development of the child, and that a single mixed-age teaching will not help the child's growth. Third, they worry that their children will have a low self-esteem if they interact with children who are slightly older than them.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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