

Examining the potential of Rural Education in China—— Exploration on the Localization of STEAM Education based on Farming Culture

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ABSTRACT. At present, China's rural education generally shows the tendency of "leaving the countryside", which fails to develop curriculum based on the advantages of rural education resources, resulting in the lack of cultural self-confidence and warm-earth feelings of rural students. As a new educational paradigm of cultivating innovative talents with more and more international influence, STEAM education still has a lot of problems in the process of localization. Few studies focus on the integration of STEAM education and rural education. In fact, STEAM education, with interdisciplinary vision and problem-oriented learning based on real situation as the core, is the ideal mode to exert the potential of rural education, and mining farming culture is the best way to realize the localization reform and innovation of STEAM education. While running through the concept of sustainable ecology, we should transform farming culture into interdisciplinary curriculum resources, carry out PBL teaching based on rural education field, cultivate innovative talents with cultural self-confidence through farming civilization, finally realize the localized STEAM education based on farming culture and the reverse integration of rural education

KEYWORDS: STEAM education, rural education, farming culture

STEAM education has been fully explored and practiced in China, but few people currently associate this "advanced" global education concept with "backward" rural education. On the one hand, because in the current urban-oriented curriculum system, rural education is in decline or become a replica of urban education, then when urban education has not yet generally realized STEAM education, who will pay attention to rural education? On the other hand, local values are obscured and can only be regarded as bottom-level and complementary values, thus showing marginalization as a whole,[1] and few people examine the value and potential of rural education. But in fact, the rural educational resources represented by farming culture have the possibility of realizing or even surpassing STEAM education, and farming civilization, as a national gene, is an effective way to realize localized STEAM education with "roots". This paper will start with the analysis of the connotation and core characteristics of STEAM education, combined with the current situation of rural education and the existing problems of localized STEAM education, examine the advantages and potential of rural education represented by farming culture, and discuss the necessity and possibility of localized STEAM education based on farming culture, so as to empower the practice and transcendence of localization STEAM education and realize the reverse integration of rural education.

1. Introduction of STEAM education

STEAM education is an interdisciplinary integrated education based on mathematics, which explains science and technology through engineering and art, takes "problems or projects" as the foothold, takes real problem solving as the Task-driven, and trains students' problem-solving ability, compound thinking and innovative thinking through learning by doing.

1.1 Core features of STEAM education

1.1.1 Interdisciplinary nature

The essence of STEAM education is to discover the internal relationship between subject knowledge, break down the barriers between mathematics, science, technology, engineering and art, and adopt integrated teaching methods in an interdisciplinary perspective to solve problems in the real situation.[3]

The idea of interdisciplinary curriculum integration is intended to solve the problems such as the fragmentation of disciplinary knowledge and the separation of knowledge from practice, and usually integrates disciplinary knowledge into thematic inquiry based on real problems, naturally generates understanding of subject knowledge needed to solve problems in the process of exerting students' subjectivity, constructs integrated subject knowledge structure, and develops students' metacognitive ability. Students' participation in STEAM learning is not to obtain literacy in a single field, but to have general literacy, to comprehensively use knowledge of various disciplines from an interdisciplinary perspective, to solve problems creatively, and to become lifelong learners with the ability to adapt to the global society.

1.1.2 Cultivates students' ability to solve practical problems

STEAM education takes PBL (Project/Problem Based Learning) as its main implementation path. On the one hand, PBL can be understood as project-based learning; on the other hand, PBL can be understood as problem-based learning oriented by Task-driven, which emphasizes learning abstract knowledge concepts by solving practical problems in real life situations. "Learning by doing" can be regarded as an important theoretical basis of STEAM education, which encourages students to design, practice and cooperate with each other, guides students to connect theoretical knowledge with real life, and realizes the reorganization and transformation of experience. C. Quigley et al. put forward the conceptual model of STEAM teaching practice through research, pointing out that the content of STEAM curriculum should be rooted in students' real life, related to students' living environment and culture, and the problems that students need to solve should be unstructured, that is, there is no unique answer. [4]

1.2 Problems in localization practice of STEAM education

First of all, many schools directly choose the Chinese translation of foreign STEAM textbooks, which makes the whole course still in the western logical discourse system. Not only are students acclimatized, but most teachers are also difficult to grasp the idea of curriculum design and can only imitate it mechanically. Secondly, the practice of STEAM education often evolves into a simple activity curriculum, students in the face of novel and advanced tools, busy with a variety of experiences, but always stay on the surface understanding of knowledge. Formal activities can't make students really think deeply. On the whole, STEAM education is lack of systematicness and coherent theme in China, and most of them are isolated "imported" cases, let alone based on the life world of Chinese students. Such STEAM education fails to grasp the core concepts such as interdisciplinary, problem-oriented, learning by doing, and cultivating the spirit of innovation, but in vain. Therefore, what we need to do now is to absorb the core of STEAM education, base on the advantages of rural education, implant the genes of the Chinese nation into STEAM education, and cultivate new young people who are "hot land", have national self-confidence, and can creatively inherit and creatively transform traditional culture.

2. The advantages and potential of Rural Education

We should pay attention to the things owned by the countryside itself, instead of giving them what is recognized by the "urban civilization", resulting in the neglect of the local culture. And don't throw away the valuable educational resources that truly belong to the Chinese nation because of our superior "care and help". Rural education has experienced the exploration of theory and practice, such as new curriculum reform and local curriculum. However most of them copy urban curriculum, lack of creativity, and ignore the valuable educational resources in rural areas. It has always failed to develop the curriculum based on local culture so as to realize the revitalization of rural education

When the author investigated in Huatian Village, the traditional ecological rice farming base in Youyang, the deep feelings of the local farmers who insisted on traditional farming for this land made me see another possibility of rural education, a way of existence based on the rural land and creating rich life values. The respect and love for land is not only unique to the rural society, but also belongs to the whole modern society and is the foundation of the Chinese nation. At the same time, it is also the cultural self-confidence that we expect to cultivate; Walking into their daily farming, you will find that the agricultural wisdom contained in it is a valuable educational resource full of interdisciplinary knowledge; Standing on this hot land, we see a learning mode and way of life that combines ploughing and reading, harmonious symbiosis between man and nature, and the integration of life and knowledge. Green water and green mountains are the real world in which they live and the best field of educational practice.

2.1 Cultivate cultural self-confidence with farming civilization

The farmers in Huatian Village who insist on traditional farming respect for the land, their love for local culture, and the persistence and inheritance of farming civilization are exactly what the current "leaving soil" education needs. This profound fervent feeling is exactly the humanistic care and cultural implication needed by education, and the cultivation of cultural self-confidence with national genes is our goal of education. As the source and foundation of Chinese traditional culture, farming civilization is an important educational resource to cultivate the cultural self-confidence of the Chinese nation. Specifically:

First, the Chinese ancestors created a Chinese farming model of intensive cultivation [5], in which the concept of "timely, appropriate, code and harmony", which has been cultivated for a long time, has become the spiritual resource of the core values of traditional culture. Second, "the real farmer must be a philosopher!" Bill Whitaker points out that both farmers and philosophers are the centers of highly complex civilizations; both farmers and philosophers have the energy to create systems and categories; both farmers and philosophers have the ability to change the world.[6]

This means that real farmers are full of wisdom, especially those under the intensive farming mode of the Chinese nation have the ability to understand the internal relationship of things, they know their position in the universe, understand the evolution of the four seasons, Twenty-four solar terms is the best example, they can live in harmony with nature, because they are aware of the relationship between man and nature, so they have the wisdom to comply with the trend.

Reflecting on the present, we use policies and take various incentive measures to make urban educational resources flow to the countryside, but no rural students are willing to return and build their hometown. Due to the import of a large number of foreign cultures, rural children even begin to question the land under their feet and deviate from their hometown, which leads to the further marginalization of rural education and become a replica of urban education. What is even more sad is that the people in this land have lost hope and confidence. Thornberry once said, "if we don't know the place and don't love it, we'll end up destroying it vaguely." [7] It is undoubtedly bad if rural education can not correctly guide farmers to understand the civilization they have inherited and created. Therefore, inheriting agricultural civilization should be the original intention and mission of rural education. Rural education should let children truly experience the greatness of agricultural civilization and the unique charm of rural culture, so as to cultivate their beautiful feelings of loving native land and nature.

2.2 Interdisciplinary Curriculum Resources in Farming Culture

Ecologist Xu Jianchu pointed out: when we feel traditional knowledge attentively, it is not difficult to find that it covers a wide range of fields, such as multicultural agronomy, taxonomy, natural resource management, livestock breeding, meteorology, nutrition, mathematics, architecture, social and public opinion management systems and ecology. This kind of integration is not purely "technical", it emphasizes the integrity, situational perception, understanding and innovation of China's humanistic tradition, ecology, biology, astronomy and geography, contains the experience crystallization of Chinese people's adaptation and transformation of the natural process, and can provide rich and specific localized interdisciplinary curriculum resources for STEAM education.[8]

Farming culture is the crystallization of experience formed by the ancients in the process of adapting to nature, transforming the real world and living in harmony with nature. it is a wisdom resource for generation after generation of people to survive and develop. When we walk into the countryside, we will find that almost every step under the farming mode, such as sifting grain with windmill, threshing grain by hand, keeping seeds, hiding in winter, and so on, contains interdisciplinary knowledge. It's just that no one has tried to establish a connection between direct experience and indirect experience, knowledge of various disciplines, to combine valuable farming experience with systematic scientific knowledge, and to focus interdisciplinary knowledge on the theme of farming culture, so as to help rural students to learn by doing and to achieve interdisciplinary learning.

The hand-blown grain windmill is the most exquisite wooden farm tool in China. From the technical point of view, the traditional wood craft collides with modern materials, explores the best shaking speed and position through engineering design, and encourages students to integrate modern technologies such as modeling, programming, 3D printing and so on; From the scientific principle, it includes the knowledge of classical mechanics, fluid mechanics, rotational speed, solid geometry, biochemistry and so on. The extended riddles, poems and historical development are also full of artistic flavor and humanistic feelings.

As can be seen from the above examples, it is not that rural education does not have curriculum resources, but because our attention and reform of rural education are always based on the perspective of distinction and exclusion, and it imitates urban education from top to bottom, but never really approach the countryside to excavate the rich interdisciplinary knowledge in farming wisdom. If we always fail to integrate rural education with its endogenous wisdom, and only borrow and add urban education content, the urbanization and elite orientation of basic education curriculum can never be changed. It will even deceive and simplify our deep thinking about rural education.

2.3 Rural education field is rooted in the real life

The countryside is an embryonic form of social life full of art, history and scientific spirit, and its traditional farming mode and traditional handicraft are the starting point for understanding the history of human development and promoting scientific discovery. therefore, it not only imparts abstract knowledge related to the distant future life, but also is the habitat for students. Rural children live in the truest nature, the way to school, the home between mountains and rivers, the playground, and the scene of doing farm work with their parents are all in nature. Natural science and humanities originally come from nature and social life rather than laboratories and classrooms. In fact, nature and the real life is the best educational field to establish an effective relationship between knowledge and life so as to realize the transformation and reorganization of experience.

We should not neglect their abundant direct experience, the opportunity to observe the real world and get in close contact with nature, but to seal them in the classroom. When urban primary and secondary schools walk into the countryside in order to create practical opportunities, learn about nature through videos, and even build a farm in schools, they live in nature and live in the educational field that urban people have racked their brains to build.

2.4 Ecological Education under the guidance of Sustainable concept

"Farmers for four thousand years" generalizes the ecological wisdom of Chinese farmers in terms of sustainability, and realizes sustainable development based on the principle of intensive cultivation and "timely and appropriate". Slash-and-burn cultivation and rice cultivation culture have fully highlighted the ecological wisdom contained in China's agricultural civilization. Only in close contact with nature will the next generation not lose the respect and love for nature, and will not lose the wisdom and spirit that human beings should have acquired from nature. For example, the ecological model of symbiosis of rice, fish and duck not only contains a lot of knowledge such as biochemistry and the opportunity of close contact and practice with the land, but also runs through the sustainable ecological concept of harmonious coexistence and equal dialogue with nature.

Ecological education is a "hot land" education that enables children to love land, establish contact with the world and respect nature. The purpose of ecological education is to cultivate students' sense of responsibility and belonging. Farming is not only a science, but also an art. What's more, it is the unity of knowledge and practice [9]. Under the guidance of the ecological wisdom of farming, the content and process of education are "ecological", because the means of learning serve the real purpose, and the learning process is beneficial to the growth of life. The experience of learning is continuous and can produce interaction.

3 Excavate the farming culture and realize the local reform and innovation of STEAM education

The basic form of the development of Chinese social civilization is the local civilization. The understanding of the local value and the recognition of the rural society are undoubtedly the important contents of the national identity of every citizen and the important dimension to make up for the inherent lack of modernization.[10] At the same time, we should deal with the relationship between self-preservation and renewal of education. One of the basic functions of education is to transfer knowledge and self-preservation, but at the same time, the localization of education should also be dynamic and open, which can renew itself and realize the unity of the creative process. The combination of farming culture full of national genes and STEAM education is the innovation and reform pursued by STEAM education.

First, we should dig deep into the rich educational resources contained in the countryside from the perspective of curriculum development, so as to re-establish cultural self-confidence. Second, the interdisciplinary and practice-oriented STEAM education is the educational model that can maximize the potential of rural education. Third, as a national gene, farming civilization will be endowed with the practice and transcendence of the localization of STEAM education.

3.1 Curriculum objective: cultivate innovative talents with cultural self-confidence

At present, our attention to the goal of rural education stays on the guarantee of basic compulsory education, which is of course not unimportant, but not enough. At present, the rural teenagers are tired of school or play truant, poor in spirit, and have an increasingly prominent tendency of "leaving the countryside". The educational tendency of "leaving agriculture" is an education with the goal of leaving the countryside and entering the urban life instead of returning native land and building hometown. Therefore, we need to cultivate the cultural self-confidence and warm-earth feelings of rural students. First of all, we need to let the rural youth re-understand the land under their feet, activate the internal motive force of farming culture for the development of rural teenagers, cultivate their respect for nature, and deepen the internal connection between individual and national history. STEAM education forms multiple interactive practical learning with interdisciplinary integration, breaking the traditional single-disciplinary split and the talent training thinking oriented by examination-oriented education. In the era of Educational Informatization 2.0, on the one hand, it is necessary to reconstruct the learning style and educational field, on the other hand, it is necessary to shape innovative talents who adapt to the development of the times and have national competitiveness.

The curriculum objective of localized STEAM education based on agricultural culture is to establish the connection between direct experience and indirect experience through real situation and problem-oriented collaborative learning at the level of knowledge and ability, and to improve its ability to learn abstract concepts, problem thinking, interdisciplinary comprehensive ability and collaborative ability; In terms of emotional values, through the excavation of farming culture, we can promote the harmonious interaction between individuals and villages, cultivates the cultural self-confidence and emotional foundation of rural teenagers, and establishes the ecological view of "sustainability" and equal dialogue and harmonious coexistence with nature; In terms of innovative literacy, rural students are encouraged to inherit agricultural civilization while giving full play to creativity and better innovative transformation of farming culture based on their understanding of agricultural civilization and modern science and technology.

3.2 Excavate farming culture and transform it into localized STEAM Curriculum Resources

Localization emphasizes the renewal and integration, transmission and innovation of traditional culture under the new social and historical conditions. In view of many existing problems in STEAM education, it is not new to take the localization of STEAM education as a countermeasure, but most of them lack practical themes and only require the combination of STEAM education and national curriculum. In fact, the curriculum obtained from the current new curriculum reform is influenced by the western logic system, and the curriculum structure and design are mostly imported many years ago. If localization cannot be combined with China's unique traditional culture and the foundation of civilization, it is nothing but empty talk. At the same time, Professor Liu Tiefang pointed out: "Rural teenagers are exposed to education, but they can't touch the deep nourishment of local values, and they are increasingly alienated. Therefore, returning to the native land has become a necessary theme in the curriculum design of rural education. And it needs to be pointed out that returning to the native land is not the same as "retro" or simply beautifying and praising the local land, but keeping it open, avoiding its rigidity and closure, firmly recognizing that rural education has its own advantages, firmly believing that the farming culture containing national genes is the precious educational resources for the localization of STEAM education, and finally looking forward to the organic integration of the two. Only by deeply understanding the traditional farming culture, excavating the farming wisdom and transforming it into curriculum resources, can we find the road of revival suitable for rural education and the bright future of localized STEAM education.

Therefore, based on the advantages of rural education, we should fully tap a series of Chinese traditional culture and wisdom represented by farming culture, and transform it into curriculum resources that are interdisciplinary, problem-oriented and based on the real situation. And maintain the necessary tension between modernization and traditional culture, urban and rural areas, absorb and activate the internal driving force of rural education reform, and realize the endogenous transformation of rural education. Inject a great deal of energy into the localized STEAM education.

3.3 Based on the field of rural education, carry out PBL teaching

Modern urban education is away from life and nature. We fail to show students the unique unity of life, and students don't know how to integrate curriculum with life. The fatal separation between discipline and life has strangled the vitality of modern curriculum. Project-based learning (PBL), as the main way to realize STEAM education, requires students to "learn by doing", take solving practical problems as the orientation, promote the

combination of knowledge and life, and emphasize that STEAM curriculum content needs to be closely connected with students' life. The countryside is such an educational field full of rich direct experience and practical opportunities and based on the life world and nature.

We should encourage rural students to cooperate and base on real life, while understanding and loving farming culture, to discover, think about and strive to solve the practical problems faced by the countryside. And innovatively inherit and creatively transform the traditional agricultural civilization with a modern vision while learning by doing. Based on the life world means that our curriculum content, problems and solutions all come from the life, and finally belong to the life world. In this process, the real situation, problem-oriented, collaborative learning and student-centered are also the core ideas of PBL-STEAM education.

4. Conclusion

Only by paying close attention to the rural world, facing the advanced educational concept of modernization and facing the rural life at the same time, looking for the advantages of the rural education itself, and always maintaining the consciousness of pursuing the ideal rural education, can our research become what rural education needs, and the localized STEAM education is rooted.

The localized STEAM education based on farming culture indicates that rural education based on rural resources can also enter the overall framework of modern education, and is a localized education path full of national genes. Among them, farming culture contains rich interdisciplinary curriculum resources; Every piece of agricultural tools is not only the crystallization of ancient wisdom and creation from scratch, but also the real core of agricultural modernization and science and technology; Put yourself in it and feel the most authentic natural beauty and the harmony between man and everything; The rural life in nature is the best field of educational practice; Many problems, such as how to develop rural areas and how to inherit traditional culture innovatively, are valuable resources for STEAM education; The unique intensive farming mode and sustainable ecological concept of the Chinese nation will activate the internal vitality of STEAM education.

At the same time, the localized STEAM curriculum based on farming culture will attract urban students to the countryside, so rural students, as the "inferior group" in people's eyes, will no longer have to deliberately and diligently integrate into the urban student group, but to achieve "reverse integration".

That is to say, urban students will take the initiative to communicate with rural teenagers in the study of STEAM education course, and urban students can use 3D printing, programming and other technologies from a broader perspective to better inherit and innovate with modern technology while feeling the greatness of farming culture, so as to achieve equal dialogue and deep integration between the two groups.

Therefore, the author thinks that the connotation of localized STEAM education based on agricultural wisdom can be initially enriched into "Science & Technology interpreted through the Engineering & Ecological & Arts, all based in Mathematical & Farming Culture" That is, localized STEAM education will be based on Chinese traditional farming wisdom, learning by doing based on the real problems in the rural life world, helping rural students to better understand science and technology, and running through the sustainable ecological concept. Carry out interdisciplinary education under the natural aesthetic experience, and finally realize the reverse integration of rural education.

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