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# The Value, Principle and Implementation Path of Zigong Salt Culture into Kindergarten Science Education

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**Abstract:** Zigong's salt culture is a treasure trove of scientific knowledge, offering a wide array of fascinating elements such as the geological processes involved in salt formation, the innovative techniques used in salt well drilling, and the mechanical principles that govern the operation of traditional winches. These resources are not only of cultural significance but also provide a unique and valuable opportunity to enhance early childhood science education. By incorporating Zigong's salt culture into the kindergarten curriculum, we can both preserve and promote this invaluable cultural heritage while simultaneously broadening the scope of science education for young learners. Integrating these elements into science teaching offers numerous benefits: it stimulates children's curiosity, encourages hands-on exploration, and fosters a deeper understanding of natural processes and mechanical systems. In addition, it strengthens children's scientific literacy by providing real-world examples of scientific principles in action, promoting critical thinking, problem-solving, and inquiry-based learning. To ensure the effectiveness of this integration, kindergartens should prioritize principles of age-appropriateness, active exploration, and practical application. A well-rounded approach that combines research, interactive activities, and experiential learning will allow children to engage with the salt culture in meaningful ways. For instance, through sensory exploration of salt, hands-on experiments, and storytelling around the rich history of Zigong's salt industry, children can gain a holistic understanding of science, culture, and innovation. In this way, the fusion of Zigong's salt culture with early childhood education not only preserves an important cultural legacy but also enriches children's scientific knowledge, fostering a generation that values both heritage and discovery.

**Keywords:** salt cultural resources; kindergarten; science education

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## 1. Introduction

Salt, an essential substance in human life, is not only a fundamental component of our daily existence but also a rich repository of scientific knowledge and cultural heritage. Zigong, a city historically renowned for its salt production, boasts a distinctive salt culture that embodies both scientific principles and profound cultural significance. Over the centuries, Zigong's salt industry has shaped the region's economy, society, and identity, creating a unique cultural legacy that is deeply intertwined with the natural sciences. Despite its importance, much of the research on Zigong's salt culture has focused primarily on its sociological and historical aspects, with relatively limited attention given to its potential applications in science education [1].

The theory of interactionism, introduced by American sociologist George Herbert Mead, posits that meaning is not inherent in objects themselves but is instead constructed through social interactions. In this framework, the understanding of phenomena is shaped by how individuals engage with and interpret their surroundings. Building on this idea,

the present study seeks to explore the integration of Zigong's salt culture into kindergarten science education. By examining the scientific principles embedded within the region's salt-related practices-such as the geological formation of salt, the engineering of salt wells, and the mechanics of traditional salt production tools-this paper aims to open new avenues for enhancing children's scientific literacy.

The goal is not only to preserve and celebrate Zigong's cultural heritage but also to leverage these rich resources as tools for fostering young learners' curiosity, critical thinking, and problem-solving abilities. Through this exploration, we hope to provide fresh insights into the intersection of culture and science education, offering innovative pathways for developing children's understanding of the world around them.

## **2. Overview of Zigong Salt Culture**

### *2.1. The Development History of Zigong Salt Industry*

Zigong's development is inextricably linked to its salt industry, which has flourished for over two thousand years, shaping the city's economy, society, and culture. The story of Zigong's salt industry dates back to the Eastern Han Dynasty, where early brine extraction techniques marked the beginning of a long tradition. However, it was during the Ming and Qing Dynasties that Zigong's salt industry reached its peak, becoming a global leader in well salt production. This era saw Zigong's salt trade expand across China and beyond, cementing its place in the annals of history as a vital hub for salt production and commerce [2].

Over the centuries, the city's salt industry experienced numerous transformations, evolving from rudimentary extraction methods to more sophisticated and innovative technologies. The modern revival of the salt industry in Zigong continues to reflect the city's enduring legacy of scientific and technological advancement. The ingenuity and pioneering spirit of Zigong's salt workers are showcased in their groundbreaking inventions, such as the percussion (donut) well drilling technique, thin-layer rock salt water dissolution interconnection mining technology, and basin gas extraction methods. These innovations have not only shaped the development of the salt industry but have also made significant contributions to the advancement of global science and technology, marking Zigong as a center of technical brilliance. These historical milestones provide a wealth of scientific knowledge and serve as invaluable teaching resources for today's educational efforts, offering rich material for cultivating young minds and encouraging scientific exploration.

### *2.2. The Composition of Zigong Salt Cultural Resources*

Zigong's salt culture is a multifaceted heritage that blends material culture, spiritual culture, and institutional culture, creating a comprehensive and rich legacy that spans both tangible and intangible dimensions [3]. The material culture of Zigong's salt industry is composed of physical artifacts such as salt wells, hoisting cranes, salt storage facilities, and various salt-related tools. These tangible elements offer vivid, hands-on opportunities for children to engage with the scientific principles behind salt production. For instance, examining the intricate designs of traditional salt wells or studying the operation of the hoisting cranes provides a tangible connection to the technology and innovation of the past, making science more accessible and engaging for young learners [4].

Beyond the material aspects, Zigong's salt culture is also deeply embedded in spiritual culture-the values, beliefs, and practices passed down through generations of salt workers. The ingenuity, diligence, and innovative spirit of these workers are central to the city's cultural identity and play a crucial role in shaping the character and scientific curiosity of future generations. The stories of these hardworking individuals, their struggles, and their triumphs offer profound lessons in perseverance, creativity, and problem-solving, all of which are essential components of developing scientific literacy in children.

Additionally, Zigong's salt culture embodies institutional culture through the structured systems and technologies that have evolved over time. Key innovations such as deep-well drilling, salt purification techniques, and brine transportation systems represent not only technological advancements but also the systematic knowledge that has been passed down and refined over centuries. These innovations provide rich materials for science education, offering real-world examples of physics, engineering, and chemistry at work. The sophisticated processes involved in salt production and purification present opportunities for young learners to explore the scientific concepts of filtration, chemical reactions, and energy transfer in a hands-on and meaningful way [5].

Together, these diverse cultural resources-both tangible and intangible-offer a wealth of educational possibilities. By integrating Zigong's salt culture into the classroom, educators can help children connect the scientific principles they learn with real-world applications, fostering both a deeper understanding of science and an appreciation for the cultural heritage that shaped these innovations.

### **3. The Value of Integrating Salt Cultural Resources into Kindergarten Science Education**

#### *3.1. Promoting the Inheritance and Development of Salt Culture*

Early childhood is a formative period for cultural identity, and exposure to distinctive regional cultures during this phase plays a crucial role in shaping a child's sense of self [6]. By introducing Zigong's salt culture in the kindergarten setting, we can nurture a deeper understanding and appreciation of local heritage. Salt culture, with its rich historical and scientific layers, offers an engaging way to foster cultural self-awareness in young children. Through interactive methods such as storytelling, hands-on activities, and gamification-such as simulating "well-drilling brine extraction" or conducting "salt crystallization" experiments-salt culture can be transformed from abstract cultural symbols into tangible, experiential learning opportunities. This approach not only lowers the threshold for cultural comprehension but also engages children through playful, multisensory learning experiences that bring the culture to life.

By integrating culture and science, the "culture-science" model reframes traditional educational methods. Instead of static museum displays, salt culture becomes a dynamic, living entity embedded in children's everyday experiences. Over time, this cultural immersion creates a sense of emotional attachment and value recognition in young learners, helping them develop a connection to their heritage. More importantly, it establishes a foundational understanding of cultural continuity, ensuring that the salt culture is not merely preserved but thrives through future generations. This "start from childhood" strategy plays a key role in fostering authentic cultural inheritance, empowering children to carry forward the traditions that define their region.

#### *3.2. Enrich the Curriculum Resources of Kindergarten Science Education*

Zigong's salt culture offers a wealth of resources that can significantly enhance the science curriculum in kindergartens. The unique intersection of geology, physics, chemistry, and engineering within the salt industry provides a rich base for developing locally relevant educational content. For instance, teachers can create interdisciplinary courses centered on the question "Where Does Salt Come From?" that explore scientific principles such as salt formation, social aspects like the lives of salt workers, and even artistic elements like the creation of salt crystal art [7]. By combining science, technology, engineering, arts, and mathematics (STEAM) with cultural insights, educators can create a holistic "STEAM + Culture" framework that enriches the curriculum and offers children a broad, multidimensional learning experience.

The multi-faceted nature of Zigong's salt culture allows for a variety of presentation formats, making learning more engaging and dynamic. Tangible elements, such as models of hoists, salt industry contracts, and brine samples, alongside visual aids and storytelling,

offer diverse ways to present this knowledge. These materials not only serve as interactive teaching tools but also enhance sensory engagement, stimulating children's curiosity and cognitive development. The hands-on nature of these activities deepens children's understanding by encouraging them to explore and interact with the content in meaningful ways, making abstract scientific concepts more accessible and exciting.

### *3.3. Improve Children Scientific Literacy and Inquiry Ability*

Scientific literacy extends far beyond rote memorization of facts; it is about fostering the mindset and skills needed to think critically and inquire like scientists. Zigong's salt culture resources provide a natural setting for such inquiry-driven learning. Many phenomena related to salt-such as the process of salt crystallization or the behavior of salt in drying experiments-serve as excellent starting points for sparking curiosity and encouraging children to ask questions. For example, when observing the evaporation of seawater, children might wonder, "Why does salt remain after seawater dries?" or "Can salt turn back into water?" These types of questions naturally provoke cognitive conflicts and drive inquiry [8].

By guiding children through the full inquiry cycle-observation, hypothesis, experiment, data recording, and interpretation-teachers can introduce them to the fundamental principles of the scientific method. This hands-on approach helps children experience firsthand the processes of discovery and critical thinking, cultivating their ability to reason scientifically.

In addition to fostering inquiry skills, Zigong's salt culture also provides opportunities to explore engineering thinking. For example, the percussion well drilling technique-one of the many remarkable inventions in Zigong's salt industry-serves as a perfect case study for introducing children to the iterative nature of engineering. Through simplified, child-friendly versions of these technical processes, children can learn the basic engineering principles of problem-solving, design, and optimization. By engaging in activities like building simple models or testing their own "drilling" methods, children can learn to approach challenges systematically, enhancing both their logical thinking and creative problem-solving skills [9].

Ultimately, integrating Zigong's salt culture into science education allows children to not only acquire scientific knowledge but also develop the cognitive and emotional tools necessary to approach the world with curiosity, critical thinking, and innovation. These early experiences with science and culture lay a strong foundation for lifelong learning and problem-solving skills.

## **4. Principles of integrating salt cultural resources into kindergarten science education**

### *4.1. Principle of Suitability*

When selecting and utilizing Zigong's salt cultural resources for science education, it is essential to consider the developmental characteristics, cognitive abilities, and life experiences of young children. Teaching materials and activities should be age-appropriate, engaging, and cognitively accessible, allowing children to connect easily with the concepts being presented [10]. Teachers should choose salt culture resources that are not only scientifically relevant but also intriguing and enjoyable for exploration, sparking curiosity and fostering a natural desire to learn.

For instance, while explaining salt formation or the process of salt crystallization, teachers should present the information in a way that resonates with children's everyday experiences-using simple language, visual aids, and interactive demonstrations. These resources should be framed within the context of children's prior knowledge and interests, ensuring that the learning experience is not only meaningful but also effective. By aligning salt culture with children's lived experiences, educators can create a bridge between abstract scientific concepts and the concrete world they inhabit, making learning more relatable and impactful.

#### *4.2. The Principle of Inquiry*

At the heart of science education lies the development of investigative skills and scientific literacy. To cultivate a child's natural curiosity and scientific mindset, it is crucial that science education is rooted in inquiry-based learning. Integrating salt culture resources into kindergarten science programs provides a rich opportunity to guide young learners through the process of discovery.

Educators should encourage children to observe natural phenomena, ask open-ended questions, form hypotheses, conduct simple experiments, and document their findings. For example, children could be invited to observe the process of salt crystallization or participate in an activity where they simulate the process of brine extraction, prompting them to inquire, "Why does salt form in this way?" or "How does salt behave under different conditions?" This approach allows children to actively engage with the content and develop a deeper understanding of scientific principles through direct experience.

Through this inquiry-based approach, children are not just passive recipients of information but active participants in the learning process. By fostering an environment where questioning, exploration, and critical thinking are encouraged, educators can help children cultivate an investigative mindset that will serve them throughout their educational journey and beyond.

#### *4.3. The Principle of Practice*

Science education is most effective when it integrates both theoretical knowledge and practical experience. While the transmission of scientific concepts is important, children's understanding is deepened when they are given the opportunity to engage in hands-on, experiential learning. Integrating salt culture resources into kindergarten science education should include practical activities that allow children to experience the concepts firsthand.

Teachers should encourage children to explore the salt industry through activities such as visiting salt wells, participating in salt crystal-making experiments, or recreating traditional salt extraction techniques. These practical activities not only bring the science behind salt culture to life but also help children develop important skills such as observation, experimentation, and problem-solving. Through hands-on experiences, children can witness the "magic" of science and feel a sense of wonder and excitement, making abstract scientific ideas more tangible and accessible.

Incorporating such experiential learning into the curriculum also provides opportunities for children to engage with their local culture and history in a personal, meaningful way. By participating in activities that are connected to their community's heritage, children not only gain a greater appreciation for science but also begin to understand the cultural significance of the salt industry in Zigong. This hands-on, integrated approach allows for a richer, more holistic understanding of the world around them.

### **5. The Path of Integrating Salt Cultural Resources into Kindergarten Science Education**

#### *5.1. Integrating Research – to Enhance Teachers Understanding of the Scientific Value of Salt Culture*

Teachers play a central role as both designers and implementers of science education activities. To effectively integrate salt culture resources into kindergarten science education, it is essential for teachers to first deepen their understanding of the scientific and cultural value of salt culture. This can be achieved through a variety of methods, such as literature reviews, field visits, and hands-on exploration. By immersing themselves in the historical, scientific, and cultural dimensions of salt culture, teachers can gain a comprehensive perspective, which will provide a strong foundation for designing engaging and insightful science education activities.

The "Fusion Research" initiative aims to transform teachers from passive "observers" of salt culture into active "curriculum partners." This approach fosters collaboration and ensures that teachers are not just receivers of information but contributors to the creation of a dynamic, interactive curriculum. The initiative follows a dual-cycle methodology, combining "lesson case studies" with "design-oriented research" to engage teachers in an ongoing process of inquiry and development.

Initially, kindergartens will organize teachers into collaborative groups, where they will conduct literature reviews and field investigations at key cultural sites such as Shenhai Well and Tianche. These experiences allow teachers to gather firsthand knowledge and insights, enhancing their understanding of salt culture's scientific connotations and its potential for fostering scientific inquiry. Following this, teachers will participate in a series of three rounds of "micro-intervention experiments" within real classroom settings, where they will apply their findings in practical ways, iterating on lesson plans and activities to refine their approach.

Throughout the process, a "conceptual development trajectory map of salt culture" will be created to trace the evolution of salt-related educational concepts over time, helping teachers chart their progress and identify key learning milestones. Additionally, a "1+N" mentorship model will be established, pairing experienced educators with newer teachers to provide ongoing support and guidance.

To further enhance the research process, a dynamic resource repository will be created where teachers can upload field photos, children's oral accounts, and parent interviews. Leveraging cloud technology, the system will use AI to automatically tag "scientific concepts" and "safety tips," making the research process more visual, shareable, and easily accessible. This digital repository not only enhances collaboration among educators but also facilitates the sharing of insights, materials, and best practices across schools and districts. Furthermore, the initiative is linked to professional title evaluations, ensuring that the research process contributes to teachers' career development and recognition.

By breaking the traditional barrier of "research without implementation," this innovative approach bridges the gap between theory and practice, empowering teachers to actively shape and refine the integration of salt culture into the kindergarten science curriculum.

### *5.2. Integrating Activities – Designing Scientific Education Activities with Exploratory Features*

Kindergarten science education should prioritize inquiry-based, hands-on learning to foster curiosity and critical thinking. Teachers can design exploratory activities tailored to the cognitive development of children at different age levels. The "Three-Dimensional Four-Stage" inquiry model is an ideal framework for integrating scientific concepts, practical applications, and cultural engagement into early childhood education.

Take the activity "Salt Crystallization Art" as an example. This activity follows a structured four-stage progression: AR story engagement → multivariable experiments → microscopic observation → public donation of salt crystal greeting cards. This approach seamlessly integrates the full learning journey from saturated solution to crystallization, while also incorporating a sense of social responsibility. By the end of the activity, children will not only understand the science of salt crystallization but also gain a deeper appreciation for its cultural significance and how it connects to community values.

To cater to different developmental stages, differentiated scaffolding is applied across age groups. For instance, 3-year-olds engage in "salt identification through smell," helping them connect their sensory experiences to scientific exploration. Meanwhile, 6-year-olds dive into more complex activities, such as conducting "electrical conductivity experiments using saline solutions," which allows them to understand the relationship between salt and electricity.

Further enriching this learning journey, activities like the "Children's Science Journal" and "Red-Blue Team Debate" are introduced to foster inquiry-based learning. These tools

encourage children to reflect on their observations and engage in critical discussions, ensuring that their scientific exploration is both age-appropriate and intellectually stimulating.

Additionally, field trips to salt wells and crane sites provide invaluable real-world experiences. These excursions allow children to directly observe the process of salt crystal formation and engage in hands-on experiments. By seeing firsthand how salt is produced and crystallized, children gain practical insights that reinforce their classroom learning.

Through these immersive, inquiry-driven activities, children not only satisfy their natural curiosity but also acquire essential scientific knowledge. The integration of cultural elements and community engagement further enriches their understanding of science in the real world. Ultimately, this approach enhances children's scientific literacy while fostering a sense of responsibility and connection to the world around them.

### *5.3. Practice – Encourage Children to Apply Scientific Knowledge in Daily Life*

The ultimate goal of science education is to enable young children to apply their knowledge in daily life. Teachers should encourage children to explore the scientific aspects of salt culture in everyday settings, such as observing the origins of household salt, understanding its uses, and learning about preservation methods. Educators can also guide children to apply scientific knowledge by solving practical problems, such as creating simple salt-based crafts. These hands-on activities not only reinforce their scientific learning but also foster practical skills and innovative thinking.

The "Practice Integration" initiative bridges home, school, and community through digital integration, creating a connection between "Salt Culture Science" and daily life. At home, families can participate in activities like "A Salt Bags Journey" and the "Salt-Preserved Egg" challenge. In communities, children can serve as "Little Salt Explainers" and create "Salt Reduction" data posters. Digitally, the "AI Salt Spirit" platform facilitates online Q&A, offline experiments, and virtual sharing. Supporting features like the "Salt Value Bank" and "Salt Culture Science Young Academicians Wall" use redeemable "Salt Value Coins" and multi-dimensional incentives to help children apply scientific knowledge to real-world contexts, nurturing them into curious, explanatory, and responsible "Little Scientists of Salt City."

This paper explores the value, principles, and implementation pathways of integrating Zigong salt culture resources into kindergarten science education. It highlights that Zigong salt culture contains rich scientific elements, such as salt formation, salt well drilling techniques, and crane principles, which hold significant educational value. Incorporating these elements into kindergarten science education not only helps preserve local culture and enrich curriculum resources but also enhances children's scientific literacy and inquiry skills.

The implementation of this initiative should follow three guiding principles-suitability, exploratory nature, and practicality. By adopting the "three integration approaches" of research integration, activity integration, and practice integration, we can support teachers' professional development, design inquiry-based activities, and encourage children to apply scientific knowledge in daily life, achieving the organic integration of cultural and scientific education.

## **6. Conclusion**

Integrating Zigong's salt culture into kindergarten science education presents a valuable opportunity to enrich young learners' understanding of both local culture and scientific concepts. The unique scientific elements embedded in the salt culture-such as salt formation, well drilling techniques, and crane operations-serve as accessible and engaging entry points for children to explore fundamental scientific principles in an interactive,

hands-on manner. This approach not only preserves and promotes the region's rich cultural heritage but also strengthens the scientific literacy and inquiry abilities of young learners.

By adhering to the principles of suitability, inquiry, and practice, educators can design effective learning experiences that stimulate children's curiosity and foster critical thinking. The application of the "three integration approaches"-research, activity, and practice-ensures a holistic and sustainable model for integrating cultural resources into the science curriculum. These methods encourage teachers to actively engage in professional development, develop inquiry-based activities, and create real-world learning experiences that link science with daily life.

Ultimately, integrating Zigong salt culture into science education nurtures children into responsible, inquisitive, and innovative thinkers, capable of applying scientific knowledge to solve practical problems in their communities. As the children of today become the cultural stewards and scientists of tomorrow, this initiative ensures that the scientific and cultural legacies of Zigong will continue to thrive, providing a solid foundation for future generations.

The potential of this integration model extends beyond Zigong, offering a blueprint for other regions to incorporate local culture and science into early childhood education. This approach underscores the importance of contextualized, experiential learning that connects children with both their heritage and the scientific world around them, setting the stage for a more culturally enriched and scientifically literate society.

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