

## Xingcheng Ancient City: Transferring Knowledge and Learning about Ancient Architecture through Digital Systems

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### ABSTRACT

The objectives of this study were to (i) examine the studies about history of development and the archaeological site of the ancient city of Xingcheng, and (ii) investigate students' learning of history of the archaeological site of Xingcheng using knowledge transfer via digital media. The data were collected from surveys, interviews, observations, group discussions, workshops, and also the examination of previous related documents. The data provided by 18 informants were analyzed based on the objectives, and the results were presented in a descriptive analytical manner. The research results showed: (i) The ancient city of Xingcheng was built about 600 years ago. Important architecture includes gates, city walls, main buildings, temples and bell towers. Its importance was to protect the city from wars. Despite encountering multiple wars, the city had gradually evolved its fortification and durability until the end of the Chinese Emperor's era. (ii) We used digital media to teach about the design of this ancient city, and we examined the learners' perceptions on this learning experience. Based on the data elicited from the students, they could obtain insightful information through the internet by scanning the QR code, which enabled them to study conveniently at any time. Using the developed digital media improved their learning. The developed teaching media could clearly convey historical and archaeological content to the students. In conclusion, this research study can be extended to the design of computer programs used in archaeological studies for storing data in digital systems for educational purposes. It can be used as a guideline for the production of appropriate teaching materials.

**Key words:** Digital learning, Xingcheng Ancient City, Culture, Transferring knowledge, architecture

### INTRODUCTION

Xingcheng Ancient City was founded in 1428 and has a history of 594 years. It is one of the fewest and best-preserved ancient cities in China. The city is an invaluable historical and cultural heritage which plays an important role in the area in which it is located. Historical and cultural importance of Xingcheng Ancient City lies upon its striking features, particularly its overall structure. From the analysis of building types, it can be seen that the roads in the ancient city are generally complete and continuous, representing its unique characteristics from other ancient cities (Luo & Zhang, 2019). Xingcheng City is located in the southwestern part of Liaoning Province on the western coast of Liaodong. The ancient city is square in shape with a city gate in the center and a tall semicircular fortress. Outside the gate, Guixing Tower is in the southeast corner. The city center has a bell tower among roads in the east, west, south and north. This ancient city is one of the four most complete cities of the Ming Dynasty.

The State Council declared the Xingcheng City Wall a cultural heritage site in 1983. Being in the preliminary

list of China's cultural heritage, it is under the care of the State Cultural Heritage Administration. The Cultural Relics Protection Unit has been approved as a provincial-level historical and cultural city. Since December 1990, the ancient city of Xingcheng, and since 2006, the Bell and Drum Towers Sushi Stone Square Xingcheng Confucius Temple and Xingcheng City Wall have become places of national importance. They had been combined with the ancient city of Xingcheng (Kroeber & Kluckhohn, 1952). In early 1980s, during the city's overall planning and construction, Xingcheng Ancient City carried out cultural relic protection, and a number of ancient buildings with historical and cultural value were identified as cultural relics. Through extensive sorting and restoration, the historical relics of outstanding value in the ancient city have been well protected. However, due to the limitations of protection awareness, the protection at that time only focused on these important cultural relics and buildings, and usually only static protection was implemented. Contemporary technology facilitates the effective presentation of information. The development of

Augmented Reality (AR) can be mainly divided into three periods. The reason why this research study was proposed in the earliest period was to improve Virtual Reality (VR), and its usage (Wang & Yang, 2018). This type of learning media will effectively facilitate the transfer of knowledge to students.

Society has evolved and embraced open space reformation. The rapid development, especially through the increase in construction of modern cities has caused great interference and damage to the protection of ancient cities, affecting the original form of each of the ancient cities, and leading to the dilution and gradual loss of the culture of the ancient cities. Therefore, the ancient city of Xingcheng should have protection for modern technology developed through research using technology programs to design areas and important places in the ancient city. Another part is to study the historical and cultural content so that insights into the meaning, beauty, and importance of the ancient city are yielded. The preservation of the ancient cities should require community participation and recognition of the importance of the cultural heritage. Tourists or those interested in visiting the ancient city can do so by using modern media, websites, etc. In terms of education, as the content is history and archaeology, the 3D design program can show details to students, enabling them to develop a better understanding of the ancient cities. Thus, the creation of online digital learning media should have high efficiency so that students have the opportunity to transfer knowledge quickly and effectively.

## RESEARCH OBJECTIVES

1. To examine the studies about history of development and the archaeological site of the ancient city of Xingcheng
2. To investigate students' perceptions on learning of history of development and the archaeological site of the ancient city of Xingcheng by using the developed digital media.

## RESEARCH METHODOLOGY

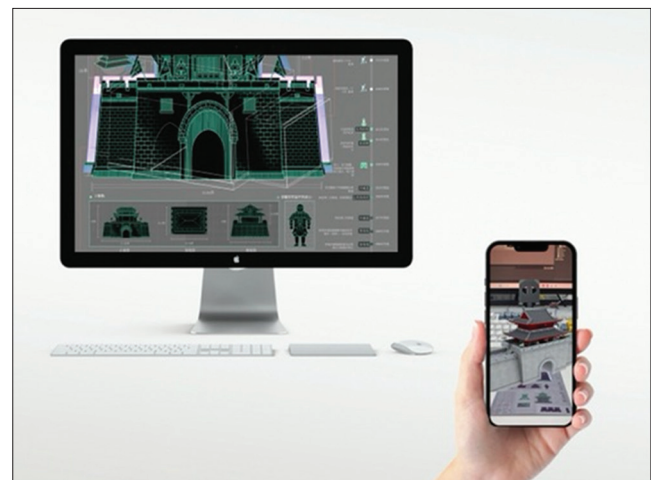
This study was designed as follows:

Step 1: The researchers studied the documents, concepts, theories regarding Xingcheng Ancient City to outline the study.

Step 2: The researchers examined research articles regarding cultural heritage such as buildings, arches, city walls, and important places in Xingcheng Ancient City in order to select the relevant information to create teaching materials.

Step 3: Research tools included surveys, interviews, observational forms, group discussion methods to collect the data. We employed a 3D computer program for designing the digital media, integrating the outcomes into a website interface, and enabling students to explore the ancient city with swift access to information (Figure 1).

Step 4: After the teaching materials had been created, they were distributed digitally to provide lessons for participants in the project. The content of the media focused



**Figure 1.** AR augmented reality interactive experience

Source: Sun Yijia

on the process of organizing ancient city knowledge for dissemination in online media. The participants were 56 students who received instruction in Digital Media Arts at School Lu Xun Academy of Fine Arts Teaching.

Step 5: To address the first research question, the related historical and archaeological documents were collected while to address the second research question, the students who had used the developed digital media were interviewed on their perceptions on this learning material.

Step 6: The researchers analyzed the data and organized their report.

## RESULTS AND DISCUSSION

This study reports, interprets, and discusses the findings.

### Students' Learning of the History of Development and the Archaeological Site of the Ancient City of Xingcheng

Students learned about the ancient city of Xingcheng, located in Xingcheng City Liaoning Province. It has a history of development of nearly 600 years and is one of the most complete ancient cities in China. The ancient city of Xingcheng was the acropolis of the Ming Dynasty war system Dusiweshuo system. It was an important node of the Guanning Defense Line and the Ningjin Defense Line in the late Ming Dynasty. It occupied an extremely important geographical location at the end of the Ming Dynasty. The urban layout and many important historical buildings of the city have been preserved well and are still relatively complete. It remained firm during a series of major historical events in the late Ming Dynasty. It was an important passage of the culture of the Western Liaoning Corridor, which fully embodied the cultural connotation of life and had extremely high historical and cultural value.

The ancient city has been repaired over the years and has effectively preserved a large number of traditional elements. Since the reformation and initiation of the city, the rapid development of modern urban construction has caused great interference and damage to the protection of ancient cities,

leading to the gradual dilution and loss of ancient city culture. At present, the protection of Xingcheng Ancient City has entered a new period of development, and protection research has also entered a new stage of exploration. The protection of Ancient City started early, as early as the early 1980. In the overall planning and construction of the city, a number of ancient buildings with historical and cultural value were identified as cultural relics. Through extensive classification and restoration, the historical relics with the high degree of value in the ancient city have been well protected. However, due to limitations in protection awareness, the protection at that time was only centered on these important cultural relics and buildings, and the implementation was static. At the same time, rapid development was accompanied by the dilution of local cultural identity and the lack of educational inheritance. Cultural heritage of the ancient city of Xingcheng is the national protection unit for important cultural relics, including the ancient city wall, Confucius Temple, Bell and Drum Tower, and the four buildings. Combined together, these places are ranked as a nationally important cultural relic conservation unit.

This study took Xingcheng Ancient City as the main research object, and deeply explored the history and development of the Ancient City. Using the concept of cultural genes, the ancient city's culture was sorted out based on the different expressive forms and identification of cultural genes in different dimensions. The cultural resources of the Ancient city were divided into dominant cultural genes and recessive cultural genes. Extract core cultural genes and effectively organize the internal cultural logical structure to construct a cultural gene genealogy diagram of Ancient City, thereby increasing the systematic academic data of cultural heritage and enriching the statistical information of cultural gene data. Core cultural genes were then extracted and the internal cultural logical structure was effectively organized to construct a cultural gene genealogy diagram of the Ancient City. As a result, the systematic academic data of cultural heritage was increased and the statistical information of cultural gene data was enriched. At the same time, digital means were used to design and develop digital websites, besides, information visualization means were used to translate historical and cultural information into a visual language which the audience was familiar with. More importantly, AR was used to conduct interactive experiments with the audience to enhance the attraction of ancient city culture and local cultural identity, and strengthen education. Therefore, the inheritances can protect and provide insights into the culture of the ancient city better.

### **Students' Learning of the History of Development and the Archaeological Site of the Ancient City of Xingcheng**

The development of digital systems for protection and transfer of knowledge about cultural heritage.

The research goal is based on basic knowledge from the analysis of artistic elements of the architecture of the ancient city of Xingcheng. The design of various building proportions using a ready-made program is partly based on the idea of protecting the cultural heritage. The researchers, therefore,

created a digital website. By designing a digital museum that shows the shape and space of architectural structures connected to a website, students can access it anytime, anywhere via the internet. The production of teaching media, which integrates the created digital media, can increase participation opinions from participants and achieve guidelines for media improvement. User-centric design caters to "sharing" and "creativity" combined with an innovative design style, because it is a multi-dimensional art design category. Website design is not only about designing web pages that satisfy traditional visual impact, but also requires the humane and user-centered art of remote communication, which is the new network art of web design. Students who use learning media can use their phones to learn all the time.

This remote communication, thus, could be regarded as the new network art of web design. Moreover, students who are acquainted with learning media can learn anytime via their devices.

The Xingcheng Ancient City Digital Website is a project to develop the ancient city's architectural cultural heritage based on digital technology. It visually translates the Xingcheng historical and cultural relics and its contextual genealogy map that were sorted out earlier, and achieves digitization through the construction of a digital website system.

At the same time, the developed digital systems are deemed promising to be used in museums, educational classrooms, communities and other places to conduct experimental research to ensure the continuation of culture and the inheritance of traditions, and to facilitate a deeper understanding of the learning styles and cultural interests of the new generation. Additionally, the digital systems convey cultural content in an attractive way and promote communication and dialogue between different cultures. The feasibility of this system is tested and analyzed to achieve better inheritance and protection.

Creative teaching media designed to understand ancient architectural art were used to transfer knowledge to students in the Lu Xun Academy of Fine Arts. The researcher developed the media using a workshop method. and brought Information Visualization Design to: students majoring in digital media arts: 32 first-year students, 10 second-year students, 9 third-year students, 9 fourth-year students 4 people. Learners can engage in this lesson through the use of mobile phone, which is a new, modern method.

### **DISCUSSION**

The results of this present study were based on the research objectives. It was found that the results were both corresponding to and different from the concepts, theories and the results of relevant previous research studies.

The body of knowledge which was found, the attitudes about the inheritance of and culture concerning the cultural heritage of Xingcheng Ancient City, and the knowledge transfer via digital media, is discussed as follows. Discussion on the history and development of Xingcheng Ancient City Xingcheng City was built under an anti-war situation because of its strong gates and walls. The city has been built and expanded over many periods and has evolved

a system of defense against enemies and a place for military settlements to protect the city, similar to the construction of the Great Wall of China during the Ming Dynasty, and the focus for the expansion Preventing the invasion of people from different kingdoms, the wall is firmly established. Later, it became important historical and archaeological evidence that people have learned until today. The content is closely aligned with the concept which proposes that from the perspective of changing the historical characteristics of the ancient city Focusing on the analysis of the impact of people living on the construction of a strong city for disaster prevention, it has developed a modern and diverse theory for analyzing historical development from the perspective of academics. They are different but have similar approaches that by altering the historical characteristics of the ancient city and focusing on analyzing the impact of people living in areas of the strong city for disaster prevention, a modern and diverse theory has emerged for examining historical development from an academic perspective. Although different, these approaches share similarities.

The ancient city of Xingcheng was built in the feudal era. The difference of this study is that it is a comprehensive study of the archaeological history since the founding of the city after the development in Kangxi's heyday. The ancient city went through a process of transformation, from a military stronghold to an ancient defense, and it ended with the advent of modern warfare technology. Starting from the time of the Republic of China, it was an era filled with war and change. After that, there was the founding of New China and the creation of Chinese socialism. Entering the era of reform and development and opening up of the country to the present, the community feels the need for protection of culture and heritage.

Beginning with the era of the Republic of China, marked by turmoil and conflict, the subsequent founding of the People's Republic of China ushered in the era of Chinese socialism. Since the country's reform and opening up, a period of reform and development has ensued, emphasizing the preservation of culture, heritage, and modernization up to the present day.

### **Digital Protection and Inheritance of Ancient City Cultural Heritage**

Ancient cities in the present era should have their cultural heritage protected. In addition, modern restoration processes should be developed in order to inherit the cultural heritage to the new generations. Consequently, they have the knowledge and understanding of the value of the wisdom of the people in the past. China attaches great importance to research studies using the theory and technology of digitizing cultural heritage preservation. Experts and academics have collaborated to carry out many research projects, which are aimed at promoting the digitalization of cultural heritage, and facilitating learning and obtaining information conveniently. Some of the important research projects undertaken have achieved interesting results by adopting digitalization, including Beijing's Digital Forbidden City (2004) and Digital Old Summer Palace (2006). Gansu's

Digital Dunhuang (2006) Dunhuang and Forbidden City is a pioneering study in the use of digital protection and navigation of China's archaeological history. Cultural landscapes with precious cultural heritage which have been restored and preserved appropriately, can be used as a database for those interested in conducting further research studies in this area.

In 2013, the team specially produced the English version of the app "Recreating the Old Summer Palace" at the event "Asian Research Annual Conference" held in the United States International. Academics were well aware of the value of research studies aiming to present Eastern architecture and culture. The following year, a domestic scientific research institute successfully restored the Old Summer Palace with the use of a virtual reality program, creating a database of 90%, mainly archiving, organizing documents in the form of drawing designs, and rehabilitating with the use of related research. Many important scenic spots and area units of the Old Summer Palace were designed with high-end information technology, such as virtual three-dimensional digital modeling.

The above study is in congruent with the study conducted by Li Yongqiang, who researched the application of digital technology in an investigation of the ruins of Ganquan Palace, a garden in the Han Dynasty. By carrying out a three-dimensional digital model of the Qiyun Pagoda of the White Horse Temple, it was proved that digital technology could be used to protect large-scale ancient architectural cultural relics and the architectural landscapes of Nanjing. When studying the protection issues of Tibetan Buddhist buildings in Inner Mongolia, data were collected and organized to establish a database which could later become the foundation for further digital protection.

Domestic and foreign scholars have conducted a large amount of applied research on digital technology in the field of cultural heritage protection. They have also received successful research results. While, cultural heritage covers a wide range, many scholars' research studies focused on the field of material cultural heritage in relation to its historical context, architectural style, and the art that decorated the architecture and surrounding areas of the building through design and development. With digital technology, the information was published on the website for convenient learning. This statement is consistent with the findings of Zhong (2011) who studied the application of digital technology in protecting cultural architectural heritage. Through digital research on Fengguo Temple, the created model could provide a preliminary interpretation. Traditional architectural design techniques are still unclear. Therefore, it is necessary to also apply other methods in related fields of study. With the combination of the methods, the creation of an appropriate conservation and development model for better development in the future can be practical.

National Important Cultural Relics Protection Unit of the Ancient City The analysis of the ancient city's history and development of infrastructure was carried out. By diagramming various proportions of the architecture, designing it with a 3D program, and creating a digital display of the website's information, people who are interested in the ancient cities can study the content of the places on the



online platform before visiting the actual places. It is considered a modern design. Along this idea, Liu (1988) studied the ancient Chinese philosophy and culture related to ancient cities using a social perspective to understand the development of ancient politics. He found that each city had a continuous evolution from the beginning to the end. The value of ancient architecture should include a system for protection and inheritance of cultural heritage. It should be designed with a digital data management system and widely publicized so that people can learn more about the ancient cities conveniently and effectively.

### Information Visualization

Tsinghua University established the Department of Information Arts Design in 2005. Under the chairmanship of Professor Lu Xiaobo, the department has carried out theoretical research studies and many practical explorations in the field of mobile service design. The department has also inspired people to use digital technology regarding access to cultural heritage sites. Accordingly, Tan et al. (2011) studied digital cultural heritage projects and found that a philosophy approach should be used as the main mindset in the management of several projects. Furthermore, data visualization is a design method that uses both information technology and a combination of design techniques to make presentations more interesting.

According to architecture, information can be integrated into software products. A few users commented on the software saying that “The data architecture of this software is very good,” but the data architecture makes the data easier to understand, and organize information in the most appropriate way. When the software is already convenient to utilize, users could benefit from the system in their best interest. This insight is in congruent with architectural findings proposed by Huang and Sun (2007). They conducted many studies on information architecture. Many scholars have given definitions and scope of information architecture. It involves not only creating a website but also designing its map, layout, and navigation menu, as well as generating a sitemap. To efficiently generate a website, a creator should concern key factors as follows:

1. The structural design of a shared information environment,
2. Integration of systems to organize information navigation,
3. The improvement of usability and understanding by Information Discrimination, and
4. Architectural principles of design and architecture in the digital realm.

Current research on information architecture by domestic and foreign scholars mainly focuses on introducing methods and principles for building information architecture. Computer design Software is necessary because knowledge systems and rapidly evolving systems can be disseminated on the internet. It meets the needs of users and the needs of products, which are becoming more increasingly diverse. Therefore, information architecture construction methods can be continuously studied and improved. This content is consistent with the study of Deaton (2003). Information

architecture was mainly used in websites in the early days. Hoekman and Spool (2009) mentioned in “User Experience Elements” that when building an information architecture, it is necessary to organize the information to be displayed to users and create a classification system based on the website goals and user needs. There are generally two methods of constructing a classification system: top-down and bottom-up. The advantages and limitations of the two methods are explained respectively. Also focusing on the information architecture of web pages, conducted research on the information architecture of web pages. Information architecture also focuses on the presentation of web pages. Conducting research on his book is designing usable interactions and providing guidance on how to use the framework system. Research conducted for this book involves designing interactive features that are user-friendly and offering guidance on effectively utilizing the framework system.

Tang (2020) proposed a formal method to represent the knowledge from the IA concept definition and a mechanism to transform this knowledge into analysis and design information for software engineers to process to develop interactive web applications. These interactive applications automatically convert the information architecture output by information architects into UML elements for analysis and design required by software engineers. They can also solve the problem of difficult information transmission between information architects and software engineers. Furthermore, the applications examines how web visitors from different cultures allocate their attention to the four main parts of information architecture (tags, organization, navigation and search) and explores how the cultural backgrounds of web visitors are related to the network components in different architectural information. Follow the association. Ultimately uncovering the topic of culture-specific information architecture within the global web community to aid in better web design and development.

Following this association leads to the uncovering of culture-specific architectural information within the global web community, ultimately contributing to enhanced web design and development practices.

Xingcheng Ancient City has used computer programs technology to design architecture in the city. The model was created to match the actual proportions, and improved with digital media and developed into a teaching tool. The developed teaching tool can convey historical and archaeological content as well as the development of the city. Students can access it via the internet network by scanning the QR code provided. This teaching media can be easily accessed and learned at any time. The developed media is therefore suitable for teaching in today’s era, which is consistent with the results of the study. Burcu (2024) suggests that Digital story is an instructional technology material created, the results of the study found that researcher was completed by taking expert opinion and delivered to the teachers via Google Forms. The data of the study were analyzed by content analysis method. In line with the information provided, positive results have been shed light on regarding the use of digital story. Music teachers were open to the use of digital story in lessons. In

conclusion, the digital teaching tool is deemed very useful, entertaining and motivating material for students, and important results were obtained such as their desire to receive training on digital story and their need for this training.

## CONCLUSION

In conclusion, the results of this study can be regarded as a model in developing a database to disseminate knowledge in an online system. Moreover, it can be applied to preserve ancient architecture as a model used in developing a database to disseminate knowledge in an online system. Most importantly, the Xingcheng Ancient City architectural model can be used as a learning tool for students in the areas of history, archaeology, and computer design.

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