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Site Visit vs Mental Visualization on Lanna Architecture: A Study on Working Memory in Young Adult

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Abstract
The rise of modern architecture styles has strongly impacted the younger generation globally in the current century. This research is designed to study the performance of working memory on understanding Lanna architecture with young adults at a large university in northern Thailand, that of Mae Fah Luang University in Chiang Rai Province, Thailand. In this study, the research focuses on studying the effectiveness of young adults' working memory to discern Lanna architecture through site visits and mental visualization. The outcomes of this research can help improve architecture pedagogy in the future. For the methodology, questionnaires were used by collecting data from 412 university students from a university in northern Thailand. The data then were analyzed using mean, standard deviation, and p-value. This study concludes that the performance of working memory on the comprehension of Lanna architecture through site visits and mental visualization for young adults was positive.

Keywords*: working memory, Lanna architecture, site visit, mental visualization*

Kunjungan Situs vs Visualisasi Mental pada Arsitektur Lanna: Studi tentang Memori Kerja pada Anak Muda
Abstrak
Kemunculan gaya arsitektur modern memberi pengaruh kuat pada generasi muda di penjuru duina pada abad ini. Penelitian ini dirancang untuk mempelajari kinerja Memori kerja saat memahami arsitektur Lanna di kalangan anak muda pada sebuah universitas besar di Thailand utara, yaitu Universitas Mae Fah Luang di Provinsi Chiang Rai, Thailand. Dalam studi ini, penelitian berfokus pada bagaimana mempelajari efektivitas memori kerja anak muda untuk membedakan arsitektur Lanna melalui kunjungan situs dan visualisasi mental. Hasil dari penelitian ini dapat membantu meningkatkan pedagogi arsitektur di masa depan. Untuk metodologinya, kuesioner dikumpulkan dari 412 mahasiswa dari sebuah universitas di Thailand utara. Data kemudian dianalisis melalui rata-rata, standar deviasi, dan p-value. Penelitian ini menyimpulkan bahwa kinerja Memori kerja pada pemahaman arsitektur Lanna melalui kunjungan situs dan visualisasi mental pada anak muda memberi hasil yang positif.

Kata kunci: *memori kerja, arsitektur Lanna, kunjungan situs, visualisasi mental*

INTRODUCTION

The rise of modern architectural styles has had a strong impact upon the younger generation globally in the current century, especially young adults born since 2001. Hamed Niroumand et al. (2012) asserts that modern architectural styles emerged all over the world from the end of the second world war, based on functional designs

rather than historical designs. As a result, young adults worldwide have been mainly familiar with modern architectural styles since they grew up. This research presented working memory performance on young adults at a large university in northern Thailand, Mae Fah Luang University in Chiang Rai province, Thailand, as the focus setting for this research.

Literature Review

Working Memory

Gathercole, S.E. & Alloway, T.P. (2008) pointout that working memory is important in the late teens. The range of age for young adults falls in between nineteen years old and the early twenties. Gathercole, S.E. & Alloway, T.P.(2008) also highlight that working memory consists of three subcomponents of working memory, namely, verbal short-term memory, visuospatial short-term memory, and the control executive. They describe working memory as a system of interconnected memory factors that are situated in different elements of the brain. More specifically, verbal short-term memory involves spoken language in numbers, words and sentences, visuospatial short-term memory handles images, pictures and data about places, and central executive facilitates with other subcomponents of working memory

As a result, the age of young adults plays an important role in this study. This study predicts that collaboration between working memory and the age of young adults can achieve the ability to identify Lanna architecture through different settings, site visits and mental visualization. Therefore, the age of young adults will provide proof regarding their ability to identify their understanding of Lanna architecture through words, images, sounds, etc. In addition, Freitas, M. I. d'Ávila et al. (2007) assert that the three subcomponents of working memory have a significant role in controlling attention and coordinating activity in young adults. Moreover, this current study involves different activities set out to test the ability of young adults as concerns their knowledge of Lanna architecture.

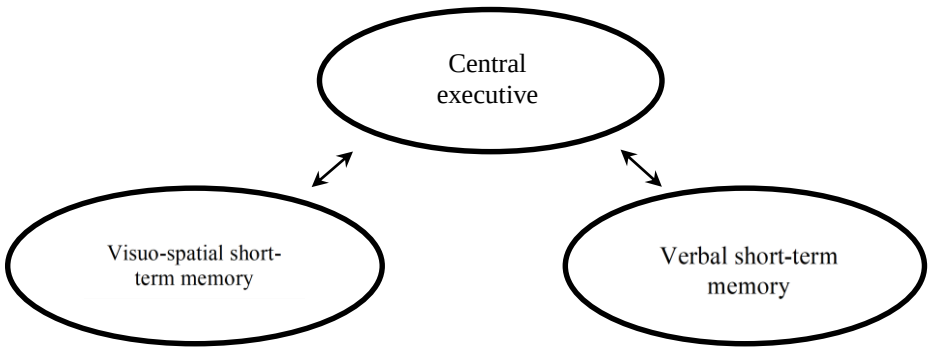

Figure 1. A model summarising the main components of working memory by Gathercole, S.E. and Alloway, T. P. (2008)

Young Adult

A young adult or a late adolescent is defined as a person who is in his or her late teenage years or early twenties, which is 18 - 24 years old. (Teipel, K., 2013).

Lanna Culture

Current evidence suggests that nearly a thousand years ago, the first Thai descendants appeared in the far north of present-day Thailand. Some of them settled on fertile valleys along rivers that flowed through the rugged, misty mountains, forming small principalities, which slowly grew in both population and power. By the mid 13th century, there were enough principalities to unite under an ambitious ruler known as Mangrai who formed the kingdom known as Lanna, which extended to Laos and the Shan states of Burma with Chiang Mai as its capital city. The royal family with its own traditions was more or less sealed off by a range of lofty mountains that prevented easy access by outsiders (Amranand, P. & Warren, W., 2000). Therefore, Lanna culture persists in everyday life of people in the north of Thailand.

Lanna Architecture

Lan Thong Chaloem Phra Kiat Vihara at Mae Fah Luang University in Chiang Rai province in Thailand is shown in Figure 2. It is the Lanna architecture style used in this study, with the vihara form having been built according to the Lanna architectural style. It resembles an open temple. Designed in the style of Vihara at the Viharn of Wat Pong Yang Khok in Hang Chat District, shown in Figure 3, Viharn, Wat Lai Hin in Koh Kha District shown in Figure 4, and Wat Phra That Lampang Luang in Lampang Province in Figure 5. Also, the form of Wat Xieng Thong, Luang Prabang in Figure 6 was a prototype in construction.

Figure 2. Lan Thong Chaloem Phra Kiat Vihara
Mae Fah Luang University, Chiang Rai, Thailand

Figure 3. Wat Pong Yang Khok, Hang Chat District, Lampang, Thailand (Retrieved from https://www.chiangmainews.co.th/page/archives/783941/ on December 16, 2020)

Figure 4. Wat Lai Hin, Koh Kha District Lampang, Thailand (Retrieved from https://travel.thaiza.com/guide/177634/ on December 16, 2020)

Figure 5. Wat Phra That Lampang Luang, Lampang,Thailand (Retrieved from http://thailandforvisitors.com/north/lampang/luang/index.html on December 16, 2020)

Figure 6**.** Wat Xieng Thong, Luang Prabang, Laos (Retrieved from https://iloveasiatour.com/luang-prabang-pagodas/ on December 16, 2020)

Site Visit

Site visits are an important part of architecture and civil engineering pedagogy. Faculty of Engineering, University of Strathclyde (2021) defines "Site visit" as visiting an actual construction enterprise or design firms to let students flourish knowledge on design and construction's theory into a real experience.

Mental Visualization

The Stanford Encyclopedia of Philosophy (SEP) (2014) explains that the term mental visualization derives from mental imagery which means "seeing in the mind's eye", "hearing in the head", "imaging the feel of", among others. Indeed, the images appear in one's head. This phenomenon is a quasi-perceptual experience. That is, it contains perceptual experience, but sometimes it happens without any external stimuli. This experience causes the human brain to project the images or something in the mind, soul, or brain.

Mental visualization is also called mental imagery. Mental rehearsal is explained as a memory that resembles perceptual memories but can occur in the lack of the right stimuli for the specific perception. In addition, Dörnyei, Z. and Kubanyiova, M. (2014) refer to Shakespeare's articulate term in Hamlet to depict the mental visualization as seeing in the mind's eye.

Social Learning Theory

People learn through observing others' behaviours, attitudes, and the outcomes of those behaviours. According to Bandura, "Most human behaviour is learned observationally through modelling: from observing others, one forms an idea of how new behaviours are performed, and on later occasions, this coded information serves as a guide for action." (Bandura, 1997). Social learning theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences.

Tool of Measurement

The participant's responses were measured by scales adapted from Bucholtz and Smith (1991). The nine-point differential scale asks participants to rate whether Lanna architecture and Lanna culture categories are closer to one or the other of two bipolar attributes. Our measurements included twelve attributes using a Likert scale ranging from 1 (very disagree) to 9 (very agree). In addition, twelve attributes were put into three categories which are aesthetics, architecture and apprehension.

Procedures

To test the hypothesis, information was gathered by questionnaire with the approval of the student. To ensure instrument reliability and to prevent respondent sensitization, respondents were instructed to answer the questionnaire with conditions of Lanna culture and Lanna architecture in a site visit and mental visualization.

METHODOLOGY

Participants: Subjects were recruited from various undergraduate level classes at a large university in the northern province of Thailand. They were given extra credits for participation. The instructor told the students that this was a study analyzing people's working memory in various settings, particularly Lanna architecture.
For site visits, the researcher invited the Buddhist monk, Phra Danai Thawaro, who is a specialist in Lanna temples to address the university students while they visited Lan Thong Chaloem Phra Kiat Vihara situated at Mae Fah Luang University.

For mental visualization concerning Lanna architecture this deals with the individual perception of visualizing the image of Lanna architecture to answer the questionnaire. There are examples of images of Lanna architecture that are similar to Lan Thong Chaloem Phra Kiat Vihara. The first image is a 3D model of Wat Phra That Lampang Luang made from wood and other materials. The second image is a 3D visualization of Wat Phra That Lampang Luang, Lampang province, which was created by the Faculty of Architecture at Silpakorn University in Thailand.

Figure 7. Site visit (Buddhist monk, Phra Danai Thawaro gave a lecture to Mae Fah Luang University students)

Figure 8. Mental visualization in 3D

A model of Wat Phra That Lampang Luang, Lampang province made from wood and other materials (Retrieved from https://www.indraoutlet.com/lampang-most-attractions/ on December 16, 2020)

A model of Wat Phra That Lampang Luang, Lampang province made from 3D visualization (Image by Faculty of Architecture, Silpakorn University, Thailand, excerpted from Architecture of Lanna by Nithi Sthapitanonda, p.65)

RESULTS

Participants and measurements: 412 students participated in the study. Of which, 39.5 percent were male and 60.5 percent were female. The average age was 21.22 years old. In terms of academic year, 57.6 percent were freshmen, and 20.1 percent sophomores, 13.3 percent juniors, 6.3 percent seniors and 1.9 percent master students. Business-Chinese majors made up the highest number of students at 34.6 percent.

Hypotheses

H-0: All three classes of adjectives between the site visit and mental visualization were related in the working memory of the young adults from Mae Fah Luang University related.

H-1: All three classes of adjectives between site visit and mental visualization were not related in the working memory of the young adults from Mae Fah Luang University related.

$H\text{-}0 = \mu 0 = \mu 1$

$H\text{-}1 = \mu 0 \neq \mu 1$

To test H-0, p-values were computed between:

1) The paired t-test on the class of aesthetics adjectives with a site visit and mental visualization.
2) The paired t-test on the class of architecture adjectives with a site visit and mental visualization.
3) The paired t-test on the class of apprehension adjectives with a site visit and mental visualization.

Test of Hypothesis

To test the hypothesis, p-value analyses were used to estimate the relationships between the comprehension of Lanna architecture and culture among young adults at a large university in the north of Thailand. This study tests the comprehension of Lanna architecture and culture among young adults by comparing site visit and mental visualization through the three classes of adjectives of aesthetics, architecture, and apprehension.

The Class of Aesthetic Adjectives

- Beautiful
- Attractive
- Noble
- Appreciative

Table 1. Aesthetics Paired t-test

	M	**std**				**Confidence level 95%**	
Site Visit	7.9125	0.4608	**t**	**df**	**p-value**	**Lower**	**Upper**
Mental Visualization	7.7650	0.0915	0.6013	3	0.5900	-0.6332	0.9282

A paired-samples t-test was conducted to compare site visit and mental visualization on the class of aesthetics adjectives. There was a significant difference in the scores for site visits (M=7.9125, SD=0.4608) and on mental visualization (M=7.7650, SD=0.0915), condition (t(0.6013), p=(0.5900). P-values less than 0.05 are statistically significant. In this study, young adults from Mae Fah Luang University answered the question on the class of aesthetics adjectives, with the p-value at 0.5900, which is not statistically significant. Therefore, the p-value rejects H-0.

The Class of Architecture Adjectives

- Lanna architecture
- Lanna culture
- Siam architecture
- Original

Table 2. Architecture Paired t-test

	M	**std**				**Confidence level 95%**	
Site Visit	7.7100	0.3832	**t**	**df**	**p-value**	**Lower**	**Upper**
Mental Visualization	7.4225	0.3285	7.1735	3	0.0056	0.1600	0.4150

A paired-samples t-test was conducted to compare site visit and mental visualization on the class of architecture adjectives. There was a significant difference in the scores for site visit (M=7.71, SD=0.3832) and on mental visualization (M=7.4225, SD=0.3285), condition (t(7.1735), p=(0.0056). According to the p-value being less than 0.05, this is statistically significant. In this study, young adults from Mae Fah Luang University answered the question on the class of architecture adjectives, with the p-value at 0.0056, which is statistically significant. Therefore, the p-value accepts H-0.

The Class of Apprehension Adjectives

- Believable
- Likeable
- Persuasive
- Trustworthy

Table 3. Apprehension Paired t-test

	M	**std**				**Confidence level 95%**	
Site Visit	7.2600	0.8650	**t**	**df**	**p-value**	**Lower**	**Upper**
Mental Visualization	7.1100	0.4609	0.5952	3	0.5936	-0.6521	0.9521

A paired-samples t-test was conducted to compare site visit and mental visualization on the class of apprehension adjectives. There was a significant difference in the scores for Site Visit (M=7.260, SD=0.865) and on Mental Visualization (M=7.1100, SD=0.4609), condition (t(0.5952), p=(0.5936). According to the p-value being less than 0.05, this is statistically significant. In this study, young adults from Mae Fah Luang university answered the question on the class of apprehension adjectives, with the p-value at 0.5936, which is not statistically significant. Therefore, the p-value rejects H-0.

DISCUSSION

The result supports the mentioned hypothesis. This study concludes that the comprehension of Lanna architecture and culture among young adults at a large university in the north of Thailand is positive. This especially relates to their positive perception of Lanna architecture. Bandura's social learning theory (1977) suggests that pertaining representations, sometimes referred to as visual imagery, involves drawing a mental picture of the observed act and storing that picture in the memory.

Visual imagery is, of course, quite a common process. We have a "picture in our heads" of people we know or have known; of experiences, sad and happy; of beautiful vacation scenes; and so on. Likewise, a person who has seen Lanna architecture on a site visit and with mental visualization representations can recall

positive images of the objects and develop positive attitudes towards Lanna culture and architecture in general.

In addition, the working memory towards the perception of these three classes of adjectives, for aesthetics adjectives and apprehension adjectives, did not affect the site visit and mental visualization. This means young adults did not agree to both methods in the aesthetics and apprehension's context. In contrast, the results reported that our respondents agreed that architecture adjectives affect the site visit and mental visualization, which means young adults agreed to both methods in architecture's context significantly.

In conclusion, this study confirms that site visits and mental visualization are significantly effective approaches to understand Lanna architecture via the working memory in young adults at a large university in the north of Thailand. In addition, the working memory does not only involve visual imagery but also words, among others. Furthermore, the selected ages of the subjects in this study are between nineteen and the early twenties, representative of the age of most university students in Thailand in general. As a result, with the results from our research, we also can integrate the findings with further study in the area of architecture pedagogy at the university level, not limited solely to Lanna architecture as in this study.

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