Emerging Trends in Education [Vol. XII - No. 1 & 2. February & August 2025. pp 19-27]

Architectural Wonders of India: Understanding Ancient Indian Knowledge of Science and Technology in Absence of Formal Education System

*Arati Upadhyay**

*Dr. Yogendra Pandey***

Abstract

The big challenges for the young architects in the developing country like India are to express a cultural identity of their local qualities in their cities. Globalization increases the limit of cultural borders, customs and earthly differences. Although, the current curriculum is in much more scanned format yet does not promise a positive response for the conflict. Although we have well educated civil engineers and trained architects today, yet we witness hazards due to collapsing of buildings, bridges, flyovers and shocking piercing of roads.

Since as an Indian we have Rich Knowledge of Mathematics, Science and technology from ancient era and the proof is our splendid and marvelous heritage in the form of sculptures, structures and architectural benchmarks. This architectural knowledge would help a lot to young architects to universalize the architectural repertoire valid for all without much regard to any identical hurdles.

This paper draw and examines the development and knowledge of ancient India about science and technology of architecture and its influences also sketch the relevance to draw attention of modern man to the need for look back to learn how can we live and make harmony with nature. This would lead us to live a sustainable, bright, happy, healthy and safe future to our forthcoming generations.

1. INTRODUCTION

We are living in twenty first century where everything is possible. We have all the modern scientific theories, knowledge, and technologies. There is never being a strange if we will be successful to find out the God Particle in upcoming years. Still, when we walkout on the roads, used to face unavoidable traffic jam, despite of having all the modern machinery and techniques people die due to collapsing

* Assistant Professor, Deptt. of Education, L.K.C. Government P.G. College, Gangoh, Saharanpur, U.P.

** Associate Professor, Faculty of Education, Banaras Hindu University, U.P.

of under construction as well as constructed over bridges and buildings. Streets are full of overflowing savage waters. Although we have well educated civil engineers as well government authority yet there is no town planning. In fact, we are living in a very haphazard way.

According to an old saying food, clothes, and shelter are the most prominent basic need of mankind and shelter is one of them most basic physiological need. The journey of men go from the dwelling in the caves to carving out temples in mountains, they have modified shelter with every passing era. Indian architecture is really a fascinating fusion of both art and science. It has crossed the limits of engineering and design from strategically placed astronomy towers to impressive and awe inspiring tombs. And the most important thing is that all these happened without the aid of modern machinery and machines.

So, take a break and stop, just move U-turn towards the past and know its ability to do what we cannot even do with modern tools and technologies. Just have a look on few architectural wonders of ancient India : Breihadeswara temple of Tamilnadu, Khazuraho group of monuments, Ruins of Hampi, Veerupaksha and Lepakshi temples in Karnataka, Konark's Sun temple , Odisa Stupas (specially Sanchi), Mahabodhi Temple, Monolithic wonder statue of Gomateshwar, Iron pillar of Delhi, Champaner-Pavagarh archaeological Parks, Bhimbetaka, Kailashnath Temple, Kanheri, Ajanta, Ellora and Elephanta caves, Mahabalipuram, Rani KaVav and of course the first of firstest Harappa And MoahanjodaroTown planning and drainage system.

2. Research Method

It is a qualitative research. The study has the chief characteristics of document based analytical research. Researcher collected the information through comprehensive literature review and content analysis of the published works about ancient Indian knowledge: Mathematics, science and technology.

3. Brief Discussion about Science and Architecture of few Structures

So, let's analyze the splendid and incredible town planning and drainage system of the Harappa civilization. Today we are 'So Called' most civilized generation on the earth, most technosevy and innovative mind holder species. Intellectual Property Rights and Patent culture are the focus of current era yet we are suffering with invalid, unreliable and non-sustainable infrastructures. Just think how the benchmark town planning and infrastructure possible even before five thousand years ago approximately. Is it not fascinating that the cities of Harappa and Mohenjo-Daro were distinguished by the orientation of streets and buildings

according to the cordial direction at that time: east-west and north-south and fortification all around? There were large gateways at various entry points of the cities; the most outstanding feature of the civilization is well laid out streets and side lanes.

Source of Picture: Google Images

At present time it is too common to see people campaigning to make others understand assimilate civic sense but civic sense of Harappan people were really adorable, no encroachment on the street was to be seen even the width of these street were in a set ratio.

The second ancient wonder is Vijaystambh and Brihadeswara temple. It is the place where walls sing and sculptures dance. These were not built by the stone merely but the pride of the people. Vijaystambha is 112 feet high and could be collapse by self load. But it is still stand just because it was designed as central chamber and outer gallery and joint through sty case. Who thought that science could be took such an inspiring and beautiful shape!

The thousands years old temple of lord Shiva that is Brihadeswara located in Thanzavur, Tamilnadu. It is fine example of the Dravadian architecture built by Raja RajaChola I. It is Two hundred and sixteen feet high and more than one hundred and thirty thousand tones of granite is said to have been used to build it. The surprising thing is that there is neither a mountain nor a rocky hill for approximately 60 kilometer around Thanzavur. The architecture of this place is

based on interlocking technique also known as puzzle technique. It means placing one stone with the one just to lock it without using cement stucco plaster and any adhesive. There is nothing between two stones.

Source of Picture: Google Images

It has been seen that many monuments like London's Bigben, Italy's Leaning Tower are tilting with time but even after thousands of years this temple is absolutely straight. This is because it's Puzzle or interlocking technique. The other reason is that the base of the temple is so wide that has kept it straight. The other specialty of the temple is that it was built without digging the earth means on a plain land. It is such a superb architecture.

The stone placed at the top of the temple also known as Kumbham weigh around 81 tones which are carved out of a single rock. Its wonder! how they would have placed this single stone at the top. Those days when they had no cranes to lift their stone, they made a ramp of around 6 km long. Elephants, horses, buffaloes and laborer together carried the stone to the top of the temple.

The next wonder is Kailashnath temple. It is the high point of the Hindutemples undoubtedly. There are columned galleries, three storey high large sculpted panels and alcoves containing enormous sculptures. In attempting to recreate this version of paradise the ancient craftsman and artist of Ellora came up with something of an architectural marvel. It is the largest monolithic structure in the world carved at a single rock. Wherever normal temples built from base to upward The Kailash temple was Top to downward.

Source of Picture: Google Images

Further Ajanta Caves are of course the splendid paragon of ancient Buddhist civilization, Filled with paramount tranquility. These exemplify the unsurpassed imaginative power and engineering excellence of the bygone era. The architects of these projects were so proficient that someone of the caves they excavated reaches almost hundred feet into the rock. The Khazuraho groups of monuments are a vast complex of Jain and Hindu temple. It is a UNESCO world heritage site and blending of art and science can see here.

The pride of Odisa Konark Sun Temple is also a wonder where even stones speak up in prayers. You cannot yourself from the fascinating architecture and erotic sculpture of the Konark Sun temple. Elaborately carve wheels, walls and pillars of the sun Chariot styled temple is main attraction.

Source of Picture: Google Images

There are 24 carved wheels each of them three meters in diameter pulled by seven horses. And the wonder of the temple is none other than the Sun dials. A beautiful blending of science, architecture and devotion can calculate time to exact minute even today. Is it not amazing! The wonder architects and engineers continue to baffle by its architecture and engineering.

Now come to the ruins of Hampi, the lasting testament to the grandeur of the Vijaynagar Empire. It is also UNESCO world heritage site. It has mainly speculating temple like Vithala, Veerupakshi, Lepakshi temples, Grand Lotus mahal and Ganesha temple. One of the gems of Hampi is the Veerupakshi temple.

Source of Picture: Google Images

The attraction of it is nine tiered eastern gateway, which is at 50 meters, well-proportioned and incorporates some earlier structures. Gateway has a brick superstructures and a stone base. Veerupaksha temple looks like geometric expression. Fractals are the foundation of this expression (repetition across different scales called fractals). Is not that beautiful!

A timeless story carves in rock of the Elephanta caves. These stunning archaeological remains of the elephant caves echo the story of rich dynasties that ruled that place at that time. This is beautiful blending of sculpture, art and aesthetic beauty. Sprawling from the entrance to the back colossal cave one measure to an elegant height of thirty nine meter and it is enough to drench one in the splendid and vast world of rocks and architecture. The ancient Indian has the great sense of water harvesting. Rani kiVav, Pandav and Kanheri caves are few examples of the rich knowledge of those people.

Source of Picture: Google Images

A temple turned upside down to worship water in Rani kiVav. To worship hallowed water of Saraswati River, this was built by Rani Udaymati in Eleventh century AD. It is 64 m long, 20 m wide and 27 m deep and runs downwards up to a length of seven stories and also a beautiful example of subterranean architecture. With the central theme the ten incarnation of lord Vishnu, this entire story is came up with 800 structures. All of which represent human, nymphs, god and the kings in varying form of skill. It is astonishing fact that in those times it acted as natural coolant. Just think about the level of scientific and architectural prowess it would have taken to conjure up a monument an inverted temple of the impeccable style.

Source of Picture: Google Images

3. Result and Discussion

It is very common feeling of happiness on seeing the beauty of buildings but very few person think about the ancient science and technology used. Sculptures and

architecture of past time, huge water harvesting system or skyscrapers buildings and unique rock-cut structures had been made without any modern technology or machinery. Such architecture has their own interesting stories. Just imagine how scientific and brilliant those minds who thought all these at that time were! So, the question is, the shadow of science of that era is more impressive than the picture of today!

High-tech equipment's and tools are the necessity of current era in building construction. This is why we see the modern marvel like Burj Khalifa of Dubai and Tokyo's Skytree. But when the advance equipment like cranes and transportation technology were not present there, even then shocking architectural structures were constructed in India. We have discussed few of them earlier. Here at this stage let's discuss the implications of this study.

The relationship between the architecture and mathematics is so deep, so that could not recognized as two different subjects for many decades. The knowledge of Mathematics and Architecture in India was so progressive and hence we can see there were different principles and mathematics behind each different architecture. There is enormous and marvel architecture of ancient time give us message of civic sense and secondly the human values like cooperation, coordination, foresightedness, energy, courage and of course sustainable living with nature. We used to travel these places just for fun and refreshing ourselves during holidays and do not listen their silent voice generally.

We are organizing conferences on Climate change and Global Warming like COP, Earth Summit and many more. Used to take oath to control the increasing level of temperature, level of GHGs into environment etc, but not ready to compromise with unscientific and unsustainable use of technology for development.

- If those people were aware about water harvesting and natural cooling system before four to five thousands year ago, why cannot we?
- If they could carve the rock without using dynamite, why cannot we?
- If they could construct marvel of town planning without a bit of encroachment, why cannot we?

These were few gems from the architectural mine of ancient India. It is a long list of such examples from ancient to modern India till eighteenth century. We need to learn from them to attain the **SDG 2030**. There is no other way to live sustainably without leaving our monotonous attitude about development like : Apna to kaamchalrhahaina!

4. Conclusion

The paper concluded that we cannot escape the pride that we feel whenever

someone mention the India, wherever we go , whoever we are and whatever we are doing. And yes, we would be the richest country if the culture, heritage, mathematics, science and technology were a currency.

We have faced countless invasions and wars, conquest and peace keeping eras. These metamorphosed our society, polity and as well geography. But through all of these the one and only things that has still remained constant is the architectural and artistic prowess of the masters. Their sheer genius and beauty of architecture and science has not dimmed hitherto.

Among the many wonder of the world it is the phenomenon of cutting to sheer, solid natural rock preparing remarkable architect structure and sculpture. Though this is found in the many part of the world but nowhere else to be found abundance and variety of rock cut structure that been found in India. From the beginning of recorded history, it is fascinating to see how closely man has worked with nature. He looked for solace and support and found spiritual contentment in the sun and the sky, in fire and water. Man replicated the beauty of nature on materials we found in nature, coloring it with his own emotion and feeling and thus was born art. The art became sustainable through the use of brain.

The need of present time is to learn from our past and apply their knowledge in present for giving our forthcoming generations a bright, happy, healthy, safe and sustainable future. It is time to understand how the ancient sustainable architectures can give base to the new urbanism, new classical architecture and eco cities. Such knowledge will contribute, much to the education of new and young aspiring minds in globalization.

References

- Agrawal, Vasudevsharan. (1960)*Bharatiyakala*.Prithivi publication Varanasi.
- *Ancient India*. Text book for class XI and XII published by NCERT.
- Bajapai, Krishna Dutta.(1972), *BharatiyavastukalaakItihas*. Uttar Pradesh Hindi sansthan.Lucknow .
- BBC 4 shows.
- History TV 18 shows, *OMG! Ye mera India.*
- *Rahasya,* The news 24 channel TV show.
- *"Sanrachana*," Epic channel TV show.
- Shows on You tube channel *"The Madras Documentary Company".*
- Singhaniya, Nitin.*Indian* (2016) *Art and Culture*.McGraw Hill publication New Delhi.
- *Themesin IndianHistory.* Part II textbook in History for Class XII
- www.thrillophilia,com
- www.wikipedia.org.