

ARTIFICIAL INTELLIGENCE GUIDED FABRICATION OF GAS KILN BURNERS AND NATIONAL DEVELOPMENT

Amokaha, Gabriel Salemkaa, Olij, Charles & Anyin, Joseph Unimke

Fine and Applied Arts Department, Federal College of Education, Obudu, Cross River State.

Abstract

Technology continue to revolutionize thereby introducing new technological approaches which targets improving human existence. One of such technological evolutions is artificial intelligence. Artificial intelligence in all its ramifications is aim at aiding human activities. This is spreading to all facets of human endeavors such as education, agriculture, healthcare, industries and hospitality among others. This study brings to lime light the role of artificial intelligence in improving ceramic art as an agent of national development. The study presents artificial intelligence as an instructor that guides the fabrication of gas burners for ceramic kiln. The study indicates how Ceramic wares were successfully fired in a ceramic gas kiln using the artificial intelligence guided fabricated burners. With this level of success, the study viewed ceramics as having the potentials of generating employment and income for individuals, reducing unemployment, increasing the nation's gross domestic product, raising the standard of living of individuals and the society in general, thus contributing to national development. This study recommends that other areas of ceramic art and ceramic industry can integrates artificial intelligence for improved performance and higher contribution to national development.

Key words: Artificial intelligence, fabrication, burners, kiln, ceramics

Introduction

Growth is an increase in size or a rise in productivity of either an individual, industry, factory, state or a nation. Every nation either developed or developing seek to increase its gross domestic product periodically. The increase may include but not limited to education, health care services, agriculture, and finance with the aim of achieving better living conditions. The fourth industrial revolution is in full swing, bringing with it a wave of technological advancements that have the potential to reshape industries and economies across the globe. Artificial intelligence is at the forefront of this revolution, promising to transform various sectors and drive inclusive national development.

National development is the ability of a nation to provide qualitative life for her citizenry. Tolu and Abe (2011), asserts that national development is quality health care, quality agriculture, quality education and quality productive apparatus among others. National development is an issue that requires continuous pursuance. Nigeria as a developing nation, needs to continuously seek ways of increasing development at all times. Recently, Information and Communication Technology (ICT) has positively influenced every facet of human existence and is being greatly influenced by the use of technology. Technology has played a vital role in reshaping societal behaviours and is contributing tremendously in different spheres of man's engagements and development. Such engagements as industries, education, communication, agriculture, space exploration, creativity among others. Technological innovations have greatly influenced development in a number of nations. Nigeria needs to irresistibly embrace this wave of technology in order to ignite national development. Computer is one of such technologies that has revolutionized human activities particularly the emerging technology known as artificial intelligence. Going forward, it is appropriate to clarify the following concepts as used in this context.

Artificial intelligence

The term, Artificial Intelligence (AI) is a term used to refer to developed systems or computer algorithms endowed with intelligent processes characteristic of human beings such as the ability to reason, discover meanings, patterns and then generalize based on these past experiences. According to Britannica, (2024, as cited in Opie 2025), Artificial Intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. In agreement, the International Business Machine (2024), described Artificial Intelligence (AI) as a technology that enables computers and machines to simulate human learning, comprehension, problem-solving, decision making, creativity and autonomy.

Artificial intelligence is the act of equipping any device with computer software that will actively enable the device to reason intelligently, perform functions such as see and identify objects, understand and respond to human language and situations, analyze experiences and react to those experiences, obtain new information, analyse and make detailed recommendations like human beings. Artificial intelligence equipped devices can even act independently thereby ignoring the need for human interventions (Opie, 2025). Going forward, it is appropriate to clarify the following concepts as used in this context.

Fabrication

The making of a piece with which gas is burned into flames as it is introduced in the kiln through pipes (horse) from a gas cylinder (Lindstrom (2025). According to Nesean, (2022), the process of forming a terminal point in which gas comes in contact with fire is referred to as fabrication.

Burner

This fabricated piece is a terminal point at which gas is introduced in the kiln as flames to aid drying of art works. The process of forming by joining some pieces of corrugated pipes, joints and other accessories is what is referred to as fabrication. According to Owen (2025), when the forming, welding and firing of the necessary aspects is completed, the finished work is called burner.

Kiln

A kiln is an oven or furnace in which heat is applied to art works converting same to ceramics. Artworks made of clay become ceramics after appropriate heat is applied unto them. Bayo (2010) asserts that a kiln is a heat chamber use for firing clay works. It may be traditional (open) kiln or modern kiln. Modern kilns may be fueled by either electric, gas or wood. It is the gas kiln that is the focus of this study. In the study, burners have been constructed for the kiln. These burners are referred to as gas burners. These burners/furnace generates heat which dries both chemical and water of plasticity from clay works. This is an ancient art tradition which is as old as man. According to archeological evidence from south eastern Tiv land and Nok culture in northern Nigeria, the art of drying clay works dates back to the 14th century (Nomshan 2017). This art practice is only improved upon frequently to make its process easier and modernized.

Ceramics

Ceramic is an aspect of art that is concerned with the making of house hold utensils such as (tea cups, saucers, water pots, water jugs, mugs, and tea pots), sanitary wares and some electrical components among others. This aspect of art uses clay as a major material, applies heat to dry the wares and fix glazes to the products. Glazes are strength and colour given substance to clay wares. Xiang (2025) observed that ceramic art is an artistic treasure of fire and earth that has been in existence for over five hundred years. It is for this unit of art that burner is fabricated to aid firing of its products.

The fabrication of the burners was guided by artificial intelligence. Information was requested from artificial intelligence on the components that are required to form gas burner using ChatGPT? ChatGPT was able to generate visual components of various burners, namely, pipe, sucket, T

sucket, nipple, bull gate and Gas nostril. Artificial intelligence also served as instructor providing constructive visual guide on which component should be joined to which component to achieve the targeted object – gas burner. What then were the components that were used in the fabrication of the gas burners?

Components and procedure for fabrication of gas burners

Based on the visual guide of artificial intelligence, the following components were sources, procured and used in fabricating gas burners for ceramic kiln.

2" pipe, 4" sucket, 2" T sucket, 1½" nipple, 2" bull gate and Gas nostril. See figure 1, figure 2, figure 3, and figure 4 respectively as pictorial evidence of the components. Then the pictorial evidence of the fabrication in progress as seen in figure 5 and fabricated burners figure 6. Inserting the fabricated burners in a kiln is shown in figure 7 and using the fabricated burners to fire is shown in figure 8.



Fig. 1: 2" Pipe



Fig. 2: 4" Socket



Fig. 3: 2" T Socket



Fig. 4: 1 1/2" Nipple



Fig. 5: Fabrication in progress



Fig. 6: Fabricated burners



Fig. 7: Inserting the fabricated burners in a kiln



Fig. 8: Firing with the fabricated burners

Artificial Intelligence guided Fabrication of Gas Burners and National Development

Generally, education has become the basis for growth, political stability and social harmony (Unatu, 2008). Shehu as cited in Melaiye (2019) opined that the level of development of any society depends on its intellectual, scientific and technological achievements. Shehu in Melaiye further stressed that technology has become a critical factor of economic growth and social development as it is through their application that natural resources could be transformed into goods and services for better quality of life of the majority of the country's citizens. Unatu (2008), asserted that the ability to adopt training strategies that will ensure the creation of adequate technically skilled development is the backbone of development in a nation. It is clear that this type of education uses the acquired knowledge to transform the nation's environment, politically, socially, technologically and economically (Melaiye, 2019).

Ceramic products are of economic value to the individual, society as well as the nation. Knowledge and skills acquired through artificial intelligence has guided the fabrication of gas burners for ceramic kiln. Sowade (2006) opined that the hands required in the production process and in the marketing of the final products are a source of generating employment and income for those employed thereby raising the standard of living of the employees. Sawade also asserted that this process of providing jobs is a salvation for the unemployed, juvenile designates, criminals, unstable and unsatisfactory home among others.

In addition, the marketing of ceramic wares generates revenue for government thus raises gross domestic product of the nation. In agreement with these, Xiang (2025) asserts that ceramic art has a profound historical heritage, unique artistic and economic value.

From the above, it can be said that AI:

- provides guidance for research, development and improved production processes of new materials and tools particularly in ceramics for improved national productivity.
- as a technology can be used to repair and construct ceramic cultural relics. This improves the repair efficiency and accuracy. This repair and accuracy has an indirect positive effect on national development hence it facilitates quality production.
- as machine learning algorithms, can be used to predict and optimize the performance of ceramics particularly its materials and products. It's worth mentioning here that optimizing materials and products targets improved productivity. This also raises national domestic products of a nation.

Apart from the use made of artificial intelligence in this study, artificial intelligence can be useful in ceramics in areas such as material application, data simulation in research, deep learning, innovative design in shapes and forms of products, decoration and colour, actual production and feedback of design plans. These can be employed to achieve better plans, production and development.

Conclusion

It can be summed that artificial intelligence as an emerging technology provides new ideas and methods for the innovation of ceramics not just as an art tradition but also as a productive arm of the economy. Artificial intelligence can also provide design inspiration, reference solutions optimize colour matching, generation of innovative pattern designs and also optimize the production process to improve ceramic production. These can be achieve with the effective use of artificial intelligence functions such as image recognition, colour analysis, generation and design.

It is important to note however that the application of artificial intelligence technology can not completely replace the traditional handicrafts. But it can only serve as an auxiliary tool to aid the ceramists and artists generally to exert creativity and improve the artistic expression and productivity of their works. In the current era, the deep integration of ceramics and artificial intelligence technology will inject new vitality into information and development of ceramic art and promote it to perform better in modern society. This will positively affect national development.

References

- Bayo, O (2010). Fine and Applied Arts Foundation. Wider World Press, Ibadan.
- Dawa, N. (2019). Advanced ceramics materials: Fundamental to the future of AI. Retrived from: <https://www.newscietist.com/article/2205779-creating-an-a-can-befive-timesworse-for-the-planetthanacar> Retrival date, 03/03/2026.
- Lindstrom, V. (2025). *Fabrication in Engineering: A complete Guide*. Forgotten Books.
- Melaiye, O. Rufus, D. Amuchie A. A. and Glory J. K. (2019). The Role of Technical and Vocational Education in National Development. *Global Journals*, 19(5). ISSN: 2249-460X.
- Nesean, O. (2022). *A Guide to Understanding Fabrication work*. Forgotten Books.
- Nomshan, T. S. (2017). *Ethnoarchaeological study of pottery Tradition in Usambe, Ikyurav-ya, South Eastern Tiv Land*. *Journal of Tourism and Heritage studies*, 7(3), 232 - 243
- Opie, O.N (2025). **Language, Literature, Culture and Artificial Intelligence: a dialectical discourse.**
A Keynote Address Presented at the 10th Biennial National Conference of the School of Secondary Education Language Programmes, Federal College of Education, Obudu. June 23-27, 2025.
- Owen, M. (2025). *Gas Burners, Old and New*: Forgotten Books.
- Sallah, G.D. (2008). The need for Vocational and Appropriate Technology Education for Development in The Socio – Economic Growth. *Education Today*. Vol. 5(2). 10 – 16.
- Sowade, L.G. (2006). Provost Seeks Support for Technical Education. Daily Sun P17.
- Tolu, L. and Abe, O. (2011). National Development in Nigeria: Issues, Challenges and Prospects. *Journal of Public Administration and Policy Research*. 3(9). 237 – 241. ISSN:2141 - 2480
- Xiang, S. (2025). Application of Artificial Intelligence in Traditional Ceramic Art. Proceedings of the 2nd Guangdong-Hong Kong-Macao Greater Bay Area International Conference on Digital Economy and Artificial Intelligence. 1771 – 1777. Retrieved from: <https://doi.org/10.1145/3745238.3745515>
- Unatu, V. O. (2008). Industrialism of Nigerian society through creative skills acquisitions in Technical and Vocational Programme. A paper presented at the Faculty of Education International Conference, University of Nigeria Nsukka between 17th and 20th June.