COLONIAL EDUCATION LEGACY AND IMPLEMENTATION OF STEM EDUCATION:A COMPARATIVE ANALYSIS OF NIGERIA AND CHINA 2017-2025

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GOU/U22/IRE/585

DEPARTMENT OF POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

FACULTY OF MANAGEMENT AND SOCIAL SCIENCES

GODFREY OKOYE UNIVERSITY

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TITLE PAGE

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A RESEARCH PROJECT PRESENTED TO THE DEPARTMENT OF POLITICAL SCIENCE AND INTERNATIONAL RELATIONS, FACULTY OF MANAGEMENT AND SOCIAL SCIENCES, GODFREY OKOYE UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B. SC.), IN INTERNATIONAL RELATIONS.

SUPERVISOR: REV. DR. OGBUKA IKENNA

JULY, 2026

DECLARATION

I hereby, declare that the project entitled, “Colonial Education Legacy and Implementation of STEM Education:A comparative Analysis of Nigeria and China 2017-2025” presented by me to Godfrey Okoye University, Enugu State, in partial fulfillment of the requirements for the award of the degree (B. Sc.) in International Relations is a record of a bona fide project work carried out by me and has not been submitted anywhere for the purpose acquiring degrees in International Relations or any other program under the guidance and supervision of REV DR.OGBUKA IKENNA

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NGWU CHIZOBA STEPHANIE **DATE**

APPROVAL PAGE

This is to certify that this research project entitled "Colonial Education Legacy and Implementation of STEM Education:A comparative Analysis of Nigeria and China 2017-2025"submitted in partial fulfillment of the requirements for the award of Bachelor of Science (B.Sc.) in International Relations has been examined and approved by the Department of International Relations, Godfrey Okoye University.

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DEDICATION

This research work is dedicated to God Almighty for guiding me through out this process.

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ABSTRACT

This research examined how the shift from colonial education to STEM education has impacted industrial development as well as graduate employability in Nigeria and China from 2017 to 2025. The study was guided by two objectives: to look at the impact of the shift on industrial development and to judge whether the shift has improved graduate employability in both countries. Human Capital theory formed the theory frame. The study adopted document based as well as ex post facto study designs which relied on secondary data from official policy documents the World Bank World Development signs UNESCO Institute for statistics and the International Labour Organization. theme based as well as comparative trend analyses were used to analyse data presented in tables on STEM policy plans industrial value added STEM enrolment and graduate employment. The findings showed that China had a more mature as well as better-funded STEM frame supported by long range industrial planning while Nigeria introduced its STEM policy later which still faces infrastructure curriculum funding and industry-linkage constraints. China maintained stronger industrial value added as well as higher graduate employment results across the period while Nigeria recorded no lasting industrial output gain and declining tertiary educated youth employment despite modest STEM enrolment growth. The study concluded that STEM education improves industrial development as well as graduate employability only when it is supported by strong institutions, enough funding industry partnerships and curriculum change. It advised stronger university industry partnerships and better-funded STEM putting in place in Nigeria within the same study period.

Keywords: STEM education; colonial education legacy; industrial development; graduate employability; human capital development

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Education holds a place in guiding the path of national growth because it builds human skills, trains a work force and supports the growth of industries that push economic growth. Fomunyam (2020) states the point that education systems in growing countries hold the duty of making graduates who can meet the needs of growing economies, yet many after colonial states still work systems that were built for a different aim during the era of colonial rule. The case of Nigeria gives a clear example of this pattern because the British colonial government built a schooling system between 1861 and 1960 that was planned to serve colonial interests instead of building the long range work power of the Nigerian people.

The colonial education system in Nigeria put focus on book based training and office skills and the use of the English language as the main tool of teaching. Ukelina (2021) explains that British colonial schooling in Southern Nigeria was built to limit political scientific and economic growth by making workers who could serve the colonial government instead of building a free nation. The curriculum that came from this period shaped a preference for office work as well as certificate led employment over technical knowledge, scientific skills and practical training. This preference became a structural feature of the Nigerian education system that continued long after independence in 1960 and continues to shape education policy choices in the current day.

China gives a very different case of how a growing nation handled its link with education and industrial development. China built a national education system after 1949 that was shaped by political goals of the Communist Party, yet it later shifted toward a reform based model that put science technology engineering and mathematics at the centre of national growth planning. You et al. (2022) note that China carried out wide changes of its higher education and technical training sectors in the years after 1978 to build the skilled work force needed to support fast industrial growth. This way produced results that are now seen in China's place as the second largest economy and its lead in world manufacturing.

Science Technology Engineering and Mathematics education referred to as STEM has become a world change tool for governments that want to shift their economies away from resource reliance and toward industrial production and knowledge led growth. Chisom et al. (2024) hold that STEM education has the power to fill skill gaps, strengthen graduate employability as well as support industrial development when it is planned in a proper way and put in place with investment and policy paths. Both Nigeria and China identified this chance and moved toward national STEM education policies though they did so at different points in time as well as with very different levels of institutional preparation and money commitment.

China put in place a national STEM education policy plan in 2017 as part of a push to become a world leader in science and technology new ideas by 2049. An et al. (2020) explain that China built its STEM education way around a mix of new ideas, training maker education as well as links between universities and industry so that graduates could move from training into industrial roles. The results that followed this policy shift are seen in the China industrial output data which shows growth in manufacturing value added as well as a strong increase in the number of STEM graduates entering the work force each year between 2017 and 2025.

Nigeria brought in a national STEM education policy in 2021 as part of an effort to change a schooling system that had long been criticized for making graduates without the practical skills needed in the job market. Samuel and Danladi (2025) observe that Nigeria faces problems in putting its STEM policy in place because of weak infrastructure schools with poor funding, a shortage of qualified STEM teachers and lasting gaps in access to technology across the country. The contrast between Nigeria and China in their STEM policy results is sharp because it raises a question about what factors decide whether a STEM education change produces real gains in industrial development and graduate employability.

Graduate employability remains as one of the clearest measures of whether an education system is meeting the needs of a national economy. Badmus and Jita (2023) find that Nigerian undergraduates who choose STEM fields often face a job market that cannot take them because the industrial sector has not grown at a speed that matches the output of training programs. This situation points to a problem that goes beyond curriculum design as well as into the area of economic planning and industrial policy with the link between education change and the conditions needed for industrial growth to take place.

The comparison frame that this study uses is because it allows for a direct examination of how two countries with different historical paths, different levels of institution strength as well as different timelines for STEM policy adoption have achieved very different results in industrial development and graduate employability. Nalule et al. (2024) show in the Ugandan setting that integrating STEM education into higher education can encourage industrial growth only when governments also invest in the infrastructure partnerships and funding needed to change graduate skills into industrial output. This finding is relevant to both Nigeria and China, but the gap in results between the two countries between 2017 and 2025 makes the comparison in a special way useful for understanding what drives the difference.

1.2 Statement of the Problem

Both Nigeria and China recognized the limits of their existing education systems and both moved toward national policies on STEM education as a tool for driving industrial development and improving graduate employability. China rolled out its STEM education frame in 2017 and Nigeria followed with its own National policy on STEM education in 2021. Yet the industrial development results as well as graduate employment figures for the two countries between 2017 and 2025 show a wide and growing gap that policy adoption alone cannot explain. China maintained industrial output growth across the period while Nigeria struggled with declining manufacturing share to GDP, high levels of graduate unemployment as well as weak links between STEM training and the needs of industry. Olarewaju et al. (2021) find that human capital from schooling and training is linked to manufacturing output in Nigerian firms, yet the system as a whole has failed to produce this link at the national level because of deep problems that trace back to the colonial education legacy.

The issue this study addresses is the gap between STEM policy adoption as well as STEM policy results in the setting of Nigeria and China between 2017 and 2025. Nigeria adopted a STEM policy with intentions to shift its education system away from colonial age book based as well as office training toward practical and technical skills that support industrial growth. Yet Chisom et al. (2024) note that shortage of resources, gender gaps, poor infrastructure and weak teacher preparation continue to hold back STEM education growth in the Nigerian setting. China faced none of these constraints at the same scale because it had before this point invested decades of funding and institutional development into building the conditions needed for STEM change to succeed. Muogahlu and Ahmad (2023) argue that technical as well as vocational education in Nigeria needs curriculum change funding and real industry partnerships to produce graduates who can support lasting economic growth. The absence of these conditions in Nigeria points to a deep gap that explains why STEM policy has not yet produced industrial or employment gains matching those seen in China. Against this backdrop this study seeks to answer the following research questions.

How has the shift from colonial education to STEM education impacted industrial development in Nigeria and China from 2017 to 2025? Does the shift from colonial education to STEM education improve graduate employability in Nigeria and China from 2017 to 2025?

1.3 Research Questions

This research will be anchored on the following research questions:

1. How has the shift from colonial education to STEM education impacted industrial development in Nigeria and China from 2017 to 2025?
2. How has the shift from colonial education to STEM education improve graduate employability in Nigeria and China from 2017 to 2025?

1.4 Objectives of the Study

The broad objective of this study is to conduct a comparative study of the putting in place of STEM education as well as its impact on industrial development with graduate employability in Nigeria and China from 2017 to 2025.

The specific objectives of this study are to:

1. Look at how the shift from colonial education to STEM education has impacted industrial development in Nigeria and China from 2017 to 2025.
2. Judge whether the shift from colonial education to STEM education has improved graduate employability in Nigeria and China from 2017 to 2025.

1.5 Significance of the Study

The results of this study will be of value to several groups. First, academia will gain theoretical insight because this study adds to the body of knowledge on after colonial education changed comparative education policy and international relations study field on development. The study sets up a study based frame that future researchers can use to look at similar STEM policy gaps in other after colonial African and Asian states. Second education policymakers as well as government officials in Nigeria will gain practical evidence about why STEM policy adoption has not produced the industry with employment results seen in China as well as this evidence can support the design of stronger and better-funded change programs. Third, international growth organisations such as the World Bank as well as UNESCO will gain a clearer picture of the conditions that decide whether STEM education changes succeed or fail in growing country settings and this can improve the design of development assistance programs. Fourth industry bodies as well as private sector organisations in Nigeria will gain evidence that supports the case for deeper universities with industry partnerships which are necessary for converting STEM graduate output into real industrial and employment gains.

1.6 Scope of the Study

This research focuses on the comparative study of colonial education legacy as well as STEM education put in place in Nigeria and China from 2017 to 2025. The study looks at how the shift from colonial education to STEM education has impacted industrial development and graduate employability in both countries across this period. The people based scope covers STEM graduates, education policymakers, industrial workers as well as government bodies involved in education and industrial development in both countries. The place-based scope covers the Federal Republic of Nigeria as well as the People's Republic of China because these two countries offer a direct and meaningful comparison of STEM policy adoption at different stages of institutional development. The study uses a document based as well as ex post facto study design which fits the aim because the period under study has before this point passed with the relevant policy results can be examined through existing documents statistical reports and published secondary sources without the need for new primary data gathering. Human Capital theory provides the theory frame because it connects investment in education to economic results in a way that in a direct way addresses the research questions.

1.7 Limitations of the Study

During the course of this study the researcher faced several limits which were handled through structured strategies. First time limits created a main challenge because the researcher had to balance academic duties and data gathering within a fixed period, yet this was handled through a clear work plan that set time slots for each stage of the study. Second the availability of matching data for Nigeria and China created difficulty because Nigerian official education and industrial statistics are not always published in a format that allows direct comparison with Chinese data from the same period yet this limit was addressed through the use of international sources such as the UNESCO Institute for statistics the World Bank World Development signs and the International Labour Organization which provide standard data for both countries. Third money limits reduced access to some paid databases as well as specialist reports yet this was handled through the use of open access academic sources university library subscriptions with available at no cost official publications from government ministries and international organisations. Fourth the study was restricted to secondary sources available through university library systems as well as online databases which meant some primary government archive materials from Nigeria and China could not be accessed in a direct way yet this was handled through cross-referencing multiple secondary sources and relying on peer-reviewed studies that had themselves examined these primary materials.

1.8 Operational Definitions of Terms

colonial education: colonial education refers to the formal schooling system introduced in Nigeria by British colonial administrators from 1861 to 1960. Ukelina (2021) describes it as a system planned to limit scientific as well as economic growth by making clerks and administrators instead of skilled technical workers. Fasakin (2021) holds that colonial education was a tool of colonial power that shaped the governance and development choices of post-independence states. In this study, colonial education refers to the British-built curriculum shapes in Nigeria that put book based as well as office training above technical scientific with vocational skills and whose influence on Nigerian education policy persists into the current.

STEM education: STEM education refers to an integrated way to teach Science Technology Engineering and Mathematics in ways that build practical skills and support industry with economic growth. Chisom et al. (2024) define STEM education as a frame for building technical ability as well as closing skill gaps that hold back graduate employability and industrial growth. Samuel and Danladi (2025) add that STEM education in the Nigerian setting includes the formal policy tools introduced in 2021 to shift schooling away from colonial age book based training. In this study, STEM education refers to the official national policies introduced in Nigeria in 2021 as well as in China in 2017 to shift education systems toward science and technology-based skills that support industrial development.

industrial development: industrial development refers to the growth of the nation's manufacturing production as well as technology sectors and is measured through signs such as industrial value added as a share of GDP manufacturing output and the share of industry to national employment. Olarewaju et al. (2021) link industrial development to human capital investment and find that education quality shapes the work power of industrial firms. and Awoniyi (2025) hold that industrial education and school industry collaboration are necessary conditions for industrial development to take place in the Nigerian setting. In this study, industrial development refers to measurable changes in industrial output as well as manufacturing ability in Nigeria and China between 2017 and 2025 as captured in World Bank and official national statistics.

graduate employability: graduate employability refers to the ability of university and higher education graduates to find work that matches their level of training within a reasonable period after completing their studies. Badmus and Jita (2023) explain that graduate employability in Nigeria is shaped by the match between what education systems teach and what the job market needs. Kang and Mok (2022) challenge the belief that degrees by itself produce good employment results in the Chinese setting by showing that social embeddedness and job market conditions also matter. In this study, graduate employability refers to the proportion of STEM graduates in Nigeria and China who gain employment within two years of graduation as captured in International Labour Organization data between 2017 and 2025.

comparative study: comparative study in the setting of international relations research refers to the method of examining two or more countries or cases in a structured way to identify patterns, differences and lessons that cannot be seen by studying one case alone. Jonbekova et al. (2021) use this way to show how international education produces different employment results depending on the conditions of the host job market. In this study, comparative study refers to the structured examination of Nigeria and China across the same time period to understand why similar STEM education policy plans have produced very different industrial and employment results.

STEM policy: A STEM policy is a formal government plan that sets out how science technology engineering and mathematics will be integrated into national education at all levels to build the skills needed for industry with economic growth. Miao (2023) compares Chinese as well as

American STEM policy which shows that China policy success rests on strong state path clear industry links as well as deep investment in teacher training and infrastructure. In this study,the STEM policy refers to the China 2017 national STEM frame and Nigeria 2021 National policy on STEM education as the main policy instruments for comparison.

Human Capital: Human capital refers to the knowledge skills as well as abilities that people build through education and training and that they bring to useful work in the economy. Bachama et al. (2021) find that education and health expenditure are important predictors of economic growth in Nigeria. Eniekezimene et al. (2023) use econometric study to show that school enrolment and education investment add to GDP growth in the Nigerian setting. In this study, human capital refers to the stock of STEM skills as well as technical knowledge that graduates in Nigeria and China have built through their education systems between 2017 and 2025.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Colonial Education

Colonial education refers to the formal schooling system put in place by British administrators in Nigeria between 1861 and 1960 and is defined by its important aim of making workers who could serve the colonial government instead of supporting free national growth. Ukelina (2021) traces the roots of this system in Southern Nigeria and shows that British colonial schools were built to limit political sciencewith economic growth by training a narrow group of clerks, interpreters and low-level administrators. The system gave strong focus to British cultural values as well as used English as the main language of teaching while it pushed aside indigenous knowledge of local languages and the practical or technical skills that could have supported industrial growth.

The structural effects of colonial education extend well beyond the formal end of colonial rule because the institutions curriculum plans and prestige hierarchies that the British built did not disappear when Nigeria gained independence in 1960. Fasakin (2021) argues that colonial power relations continue to shape governance as well as development choices in Nigeria and holds that the education system is one of the clearest places where this colonial legacy is seen. The high status given to office work as well as certificate led employment over manual technical with vocational work is a direct product of colonial schooling as well as it continues to shape the career choices of Nigerian graduates and the policy priorities of government officials.

Agbaje (2023) calls for a fundamental redesign of African higher education curricula to address local needs and to build on indigenous knowledge instead of continuing to follow patterns set during the colonial period. This argument is important for understanding the challenge Nigeria faces in implementing STEM education because the colonial curriculum frame is still built into the structure of Nigerian schools, the training of Nigerian teachers and the expectations of Nigerian employers. Olaniyan and Martins (2025) add that Nigerian education can work to hide colonial history and limit the public debate about removal of colonial limits which makes it harder for reformers to build the political support needed to shift the system in a fundamental way.

The influence of colonial education on economic results is seen in the pattern of skill mismatch that researchers have documented across the Nigerian job market. Olarewaju et al. (2021) find that schooling as well as formal training are linked to manufacturing output in Nigerian firms, but that the overall system has failed to produce this link at scale because colonial age priorities for book based and office training left technical skills not well developed across the work force. and Awoniyi (2025) show that industrial education in Nigeria is held back by outdated curricula and poor school industry collaboration which are features that trace in a direct way to the colonial preference for separating education from practical work. The combined focus of these inherited patterns explains why Nigeria struggles to change education investment into industrial output even when new policies such as STEM education frames are introduced.

A careful look at the after colonial experiences of other African as well as Asian states shows that the colonial education legacy is not a complete barrier to change, but it does impose serious costs with delays on any government that tries to shift its education system toward more useful and technical orientations. Andira and Harber (2022) connect British colonial economic structures to Nigeria continuing reliance on oil and show that this resource reliance is in part a product of a colonial education system that never built the skilled technical work force needed for manufacturing-led variety. The lesson for this study is that understanding how colonial education shaped the starting conditions for STEM change in Nigeria is necessary for explaining why the results of STEM policy adoption in Nigeria between 2017 and 2025 have fallen so far short of what China achieved over the same period.

2.1.2 STEM Education

STEM education refers to a structured way to teachScience Technology Engineering and Mathematics in ways that build practical study based with technical skills that can be applied to real problems in industry, health technology and public life. Chisom et al. (2024) define STEM education in the African setting as a frame for building technical ability closing skill gaps as well as making graduates who can support industrial development and economic growth. The world rise of STEM education as a policy tool reflects a widespread recognition among governments that traditional academic curricula built around book based office as well as humanistic training are not sufficient to meet the demands of modern industrial economies that depend on new ideas engineering ability and scientific knowledge.

In the Nigerian setting STEM education has been discussed in academic and policy circles for many years, but the official national policy on STEM education was only introduced in 2021. Badmus and Jita (2023) study the factors that shape career choice among STEM undergraduates in Nigerian universities as well as find that career expectations, family pressure and the state of the job market all influence whether students pursue STEM fields. Ogunlade (2023) discusses early childhood STEM as well as STEAM strategies for African settings with points to the need for STEM education to begin in early years instead of waiting for secondary or higher education because building strong foundations in science and mathematics from an early age is necessary for making capable STEM graduates at the higher education level.

Samuel and Danladi (2025) provide the most recent study of STEM education in Nigeria and hold that artificial intelligence with digital tools offer a potential path for addressing some of the deep infrastructure and teacher quality gaps that have held back STEM change in the country. Yet they also note that these technology-based solutions cannot replace the need for structural investment in school buildings, laboratory equipment, teacher training and stable electricity supply which are basic conditions that many Nigerian schools still lack. Osuagwu (2023) looks at the gender dimension of STEM education in Nigeria as well as finds that women with girls are underrepresented in a large measure in STEM fields because of cultural barriers, school environment problems and the absence of female role models in science with engineering careers.

China's way of STEM education gives a different picture. An et al. (2020) explain that China built its STEM education model around new ideas, training maker education as well as strong partnerships between universities and industry. Li and Li (2023) provide a case study of a personalised as well as new idea centred way to general education at a Chinese STEM university with show how this model produces graduates who are ready to add to industrial and technological development. Miao (2023) compares Chinese as well as American STEM higher education and finds that China has invested in a big way toward building the institutional infrastructure needed for STEM to produce industrial results including research funding laboratory facilities as well as structured pathways from university to employment in technology and manufacturing firms.

The difference in STEM education results between Nigeria and China between 2017 and 2025 is not just a product of different levels of economic growth. It is also a product of different levels of policy commitment, institutionalpreparation and investment in the conditions needed for STEM change to work. Nalule et al. (2024) show that integrating STEM education into higher education can push industrial growth as well as economic growth when governments also invest in the infrastructure and industry partnerships needed to change graduate skills into useful output. This finding applies to both countries but the contrast in how well each government has met these conditions helps explain the very different results that the data from the study period reveals.

2.1.3 Industrial Development

Industrial development refers to the growth of the nation's manufacturing production as well as technology sectors and is measured through signs such as industrial value added as a share of gross domestic product, the growth of manufacturing output employment in the industrial sector as well as the technological complexity of what a country produces and exports. Rufus (2022) links human capital investment to industrial productivity in Nigeria as well as holds that education with health spending build the work power that industries need to grow and to create jobs at scale. Industrial development in the setting of this study is important because it is one of the two main results through which this research judges the usefulness of STEM education change in Nigeria and China between 2017 and 2025.

Nigeria 's industrial development has been held back by a mix of factors that include weak infrastructure over-reliance on oil revenues, not well developed manufacturing ability as well as a lasting skill mismatch between what the education system produces and what the industrial sector needs. Muogahlu and Ahmad (2023) argue that Nigeria's technical as well as vocational training system needs deep curriculum change alongside strong industry partnerships and better funding if it is to build the kind of skilled work force that industrial development requires. Willie et al. (2025) find at the state level in Akwa Ibom that outdated curricula as well as poor infrastructure weaken the link between technical education with industrial output and this pattern holds across the country as a whole. The result is that even when Nigeria has introduced new industrial policies and STEM education frames the deep conditions for converting graduate skills into industrial growth have not been in place.

The China industrial development path gives a strong contrast. The country used its national education change programme alongside targeted industrial policy as well as large infrastructure investment to build a manufacturing sector that grew from a base of low-cost assembly work in the 1980s to a place of lead in advanced manufacturing electronics and green technology by the 2020s. Liu and Postiglione (2024) show how China links universities to new ideas as well as regional industrial development through the Guangdong-Hong Kong-Macau Greater Bay area and argue that this model of integrating higher education with industry needs is a key driver of China's continued industrial growth. The World Bank (2024) data on industrial value added confirms that China maintained strong industrial output growth throughout the 2017 to 2025 period while Nigeria saw its industrial share of GDP decline across the same years.

2.1.4 Graduate Employability

Graduate employability refers to the ability of higher education graduates to secure employment that matches their level of training and to add to the economy in a useful way after completing their studies. Badmus and Jita (2023) find that Nigerian STEM undergraduates face a job market that cannot take in them because the industrial sector has not grown at a speed that matches the output of training programs. Kang and Mok (2022) challenge the belief that degrees by itself lead to good employment results in China and show that social connections, employer preferences and job market conditions also shape graduate employment even in a setting where the economy is growing. The gap between degree completion as well as useful employment is for this reason a problem in both countries though it takes different forms and has different magnitudes.

Within Nigeria graduate employability has long been weakened by the mismatch between what the education system teaches and what employers need. Olasupo et al. (2024) hold that university as well as industry partnerships are necessary to reduce graduate lack of employability in Nigeria and argue that without these partnerships STEM graduates leave university with theoretical knowledge but without the practical skills and workplace experience that employers look for. Onwusa (2021) reviews technical as well as vocational training in Nigeria and identifies this skill mismatch as one of the important problems facing the nation's job market. The introduction of the STEM policy in 2021 was in part intended to address this mismatch, but the scale of the deep problem means that policy change alone is not sufficient to produce fast improvements in graduate employment rates.

China's graduate employability picture across the 2017 to 2025 period reflects a more developed link between the education system and the job market. Jiang and Wang (2024) look at work focused undergraduate education in China as well as show how it was redesigned to connect digital skills and technical training to the specific needs of Chinese industry. Wang (2023) reviews the development of work focused undergraduate education in China and finds that policy growth across several decades has built a system where graduates can move from training into useful industrial employment at a much higher rate than in Nigeria. The International Labour Organization (2025) data shows that youth employment rates in China remained more stable across the study period than in Nigeria where graduate unemployment continued to rise even as the STEM policy was being introduced.

2.2 Thematic Review

2.2.1 Colonial Education Structures and Their Influence on Education Policies

The first main theme of this study looks at how colonial education structures shaped and continue to shape education policy choices in after colonial states with particular attention to Nigeria. Ukelina (2021) conducted a study of British colonial education policy in Southern Nigeria between 1900 as well as 1925 and found that the system was built to serve the administrative needs of the colonial state instead of the developmental needs of the Nigerian people. The study showed that colonial schooling limited in a deliberate way scientific as well as economic growth by training only the number and type of workers needed to run colonial government leaving the wider population without access to technical vocational or advanced academic training. The pattern established in this period set a template for Nigerian education policy that continued through independence and into the current.

Fasakin (2021) looks at the colonial power structure in after colonial Africa with a focus on Nigeria and argues that the relationships of power established during colonial rule did not end when formal colonialism ended but instead were absorbed into the institutions governance structures and cultural norms of free states. The study holds that Nigerian education policy continues to reflect colonial priorities because the Western-educated elite who took over governance at independence had been formed by the colonial system as well as had a direct interest in maintaining the structures that had given them their social and economic place. This study is supported by Olaniyan and Martins (2025) who argue that Nigerian education can hide colonial history and limit the scope of public debate about removal of colonial limits making it harder for change-minded governments to break from colonial patterns even when they introduce new policies such as STEM education frames.

Agbaje (2023) provides evidence from across African higher education that colonial curriculum shapes remain built into a deep way in university teaching even when new policies and frames are introduced. The study found that African universities continue to give strong focus to Euro-American academic traditions while pushing aside indigenous knowledge relevant to local needs curriculum material. This finding has direct value to the Nigeria STEM education change because it points to the fact that introducing a new policy plan is not sufficient to change the actual content as well as orientation of what is taught if the underlying institution culture and the training of teachers remain shaped by colonial age priorities. Adeogun (2021) finds a similar pattern in Nigerian university music education as well as shows how colonial academic traditions continue to dominate even in fields where local content would be more relevant and more useful for students.

Levy and Okoye (2023) look at colonial legacies in African social work education and argue that African knowledge systems developed for local use practice frames have been with a planned method left out from training curricula in favour of imported Euro-American models. This finding extends the colonial education study beyond the Nigerian case and shows that the deep problem of curriculum colonialism is widespread across the continent. Basu and Agbo (2024) take a different way as well as look at how colonial archives can be used as resources for against colonial limits practice arguing that the materials of the colonial period can be used again to support Nigerian cultural recovery with to build new frames that reflect African experience and knowledge. Together these studies point to the conclusion that the influence of colonial education on current policy is deep and hard to change through policy change alone.

2.2.2 STEM Education and Its Influence on Industrial Development

The second main theme looks at how STEM education shapes industrial development results with evidence drawn from both the Nigerian and Chinese settings. Olarewaju et al. (2021) conducted a small data survey of Nigerian firms as well as found that human capital from schooling and formal training is linked in a positive way to manufacturing output at the firm level. The study shows that firms where workers have stronger educational backgrounds as well as more formal training produce more output and are more useful than firms where the work force has lower levels of education or skill. This finding supports the important claim of Human Capital theory that investment in education produces gains in industrial productivity yet it also reveals a puzzle because Nigeria has continued to invest in education at the national level without making the total industrial growth that the firm-level evidence would predict.

Rufus (2022) builds on this finding by examining the link between human capital investment as well as industrial productivity at the national level in Nigeria which holds that education as well as health spending together build the work power that industries need to grow and to create employment at scale. The study finds that the link between human capital investment and industrial productivity is positive, but that its strength depends on the quality of investment instead of just the amount. This distinction matters for Nigeria-China comparison because China has invested not only more money in STEM education, but also more attention to quality teacher preparation as well as the alignment between training content and industry needs.

An et al. (2020) analyse China's way to STEM education for new ideas and show that the Chinese model builds the connection between STEM training with industrial development through a mix of maker education, new ideas hubs and structured university industry partnerships. Chen et al. (2024) identify the key elements of the China STEM education model as well as find that industry partnerships and practical training components are among the most important factors in determining whether STEM education produces graduates who can add to industrial growth. This study shows that the link between STEM education as well as industrial development is not automatic, but depends on how well the education system is connected to the needs of the industrial sector through policies, partnerships and practical training opportunities.

Nalule et al. (2024) provide evidence from the Ugandan setting that integrating STEM education into higher education can encourage industrial growth and lasting economic growth when governments invest in the right supporting conditions. The study argues that STEM education alone is not sufficient to push industrial development as well as that the wider environment of infrastructure funding and industry engagement must be in place for the connection to work. and Awoniyi (2025) reach a similar conclusion in the Nigerian setting as well as find that industrial education is held back by poor school industry collaboration outdated curricula with weak links between training institutions and the industries that would employ their graduates. The combined focus of these findings points to the fact that Nigeria 's STEM education policy faces deep obstacles that go beyond the content of the policy itself.

2.2.3 STEM Education and Its Influence on Graduate Employability

The third main theme looks at the link between STEM education as well as graduate employability in Nigeria and China. Kang and Mok (2022) challenge the straightforward belief that investing in STEM education by itself produces good employment results by examining the experience of graduate entrepreneurs in China. The study finds that social embeddedness in job market conditions and employer attitudes shape graduate employment results alongside the formal qualifications that graduates hold. This finding is important because it shows that even in China where STEM education has been well funded as well as well planned, thelink between training and employment is not automatic and depends on the wider setting in which graduates seek work.

Badmus and Jita (2023) study career choice among STEM undergraduates in Nigerian universities as well as find that career expectations with the state of the job market both influence whether students pursue STEM fields and whether they can find work in those fields after graduating. The study points to a gap between the expectations of STEM students and the reality of the Nigerian job market which does not yet have enough STEM-intensive firms to take in the graduates that training programs produce. Olasupo et al. (2024) hold that university industry partnerships are necessary to close this gap as well as that without them STEM graduates leave university with theoretical knowledge but without the practical experience that employers in Nigeria and China both value in their hiring decisions.

Jonbekova et al. (2021) look at the employment of international education graduates and find that education improves employability only when job markets can use the skills of graduates. This finding is in a direct way relevant to Nigeria-China comparison because it points to the fact that the difference in graduate employability results between the two countries is in part a product of the different states of industrial development in each country. China has a larger as well as more varied industrial with technology sector than Nigeria and this means that Chinese STEM graduates enter a job market that has more STEM-intensive roles available. TheNigeria STEM graduates face a much smaller and less varied industrial sector that cannot take in them at the same rate even when their training is of reasonable quality.

Decker-Lange et al. (2024) look at how business building education affects employability as well as find that education that builds practical problem-solving skills and business minded thinking improves graduate employment results beyond what technical training alone produces. This finding points to the importance of combining STEM training with wider employability skills and business minded education as part of any change that aims to improve graduate employment rates. Owojori and Bolaji (2025) look at technical as well as vocational training in Nigerian polytechnics and find that combining STEM business building as well as new ideas training gives a promising path for improving graduate employability and creating new industries instead of just filling existing roles. These findings point to the fact thatNigeria 's STEM education change may need to go beyond the existing policy plan to include stronger business building and practical training components if it is to produce meaningful improvements in graduate employment rates.

2.3 Theoretical Review

2.3.1 Human Capital Theory

Human Capital theory was developed by Theodore Schultz in 1961 and expanded by Gary Becker in 1964 and it holds that investment in education training as well as health builds the skills and work power of individuals in ways that produce economic gains for both individuals and society. The core idea of the theory is that people are not just workers, but are also bearers of human capital that can be built up through deliberate investment as well as that this capital produces gains in productivity income and economic growth when it is applied to useful work. Bachama et al. (2021) apply this frame to Nigeria as well as find that education and health expenditure are among the most important predictors of economic growth which supports the important claim of the theory in the Nigerian setting.

Eniekezimene et al. (2023) use an autoregressive distributed lag model to test the link between human capital investment as well as GDP growth in Nigeria and find that school enrolment and education spending add to economic growth over the long range. Peterson (2025) revisits the original human capital frame as well as discusses its continued value for understanding how education shapes employability with economic productivity in current business and education settings. Lopes and Hancock (2024) apply human capital as well as signalling theory to the study of doctoral graduate mobility with early job market results and find that higher levels of education investment are associated with better employment results in knowledge-intensive economies. Together these studies show that Human Capital theory remains a useful as well as tested frame for examining the link between education investment and economic results.

The theory has been subject to criticism. Kang and Mok (2022) challenge its important belief in the Chinese graduate setting by showing that social connections, institutionalprestige and job market conditions also shape employment results in ways that the theory does not fully account for. Chekol (2024) reviews the large economic value of education systems in Ethiopia as well as finds that skill gaps instead of the volume of education investment explain much of the gap between education spending and economic performance. These criticisms do not invalidate Human Capital theory, but they do show that its predictions are conditional on the quality as well as value of education investment with on the wider conditions of the job market and the economy. In this study,Human Capital theory is used as the primary theoretical lens because it in a direct way connects STEM education investment to industrial development and graduate employability which are the two important results this research looks at.

2.3.2 Dependency Theory

dependency theory was developed in the late 1950s as well as 1960s by scholars including Raul Prebisch Andre Gunder Frank with Theotonio dos Santos as well as it holds that the development of rich countries and the underdevelopment of poor countries are not separate phenomena, but are two sides of the same world economic system. The theory argues that colonial as well as after colonial economic relationships built structures of reliance in which growing countries supply raw materials with cheap labour to developed countries while remaining dependent on developed countries for manufactured goods technology and capital. Andira and Harber (2022) apply this frame to Nigeria and connect British colonial economic structures to Nigeria continuing reliance on oil showing that the colonial economy was structured in a deliberate way to prevent the kind of industrial variety that would have reduced this reliance.

dependency theory is relevant to this study because it helps explain why Nigeria has struggled to change STEM education policy into industrial development results in the way that China has. Nigeria's economy remains dependent to a large degree on oil revenues and this reliance is in part a product of colonial economic structures that prevented the development of a varied manufacturing sector. The colonial education system reinforced this reliance by training a work force for office as well as administrative roles instead of for technical and industrial work. Fasakin (2021) extends the dependency study to show that colonial power relations continue to shape governance and policy choices in Nigeria which helps explain why STEM education change has faced political and institutional resistance even when it is supported by government policy. The theory also helps explain China's success because China used in a deliberate way state power to break patterns of economic reliance through industrial policy technology investment and education change that built domestic work power instead of reinforcing external reliance.

Lefifi and Kiala (2021) look at China-Africa higher education cooperation through the Forum on China-Africa Cooperation and find that Chinese scholarships for African students can support human capital development, but that the benefits depend on whether African graduates can apply their skills in their home economies after returning. This finding is relevant to dependency theory because it shows that education cooperation between a strong economy and a weaker one can repeat dependency patterns if the deep conditions in the weaker economy have not been changed. For Nigeria, this means that STEM education change must be accompanied by industrial policy infrastructure investment and institutional change if it is to break the structural patterns that dependency theory identifies instead of just adding a new layer of change on top of unchanged colonial foundations.

2.3.3 Post-Colonial Theory

After colonial theory came from the work of scholars including Frantz Fanon Edward Said Homi Bhabha as well as others who examined the cultural mind based and political legacies of colonialism on societies that had in an official way gained independence. The theory holds that the end of formal colonial rule does not by itself produce the end of colonial patterns of thought, institutional design as well as economic organisation because these patterns are built into a deep way in the structures and cultures of after colonial states. Fasakin (2021) applies this frame to Nigeria and argues that the power relations of the colonial period were repeated in the institutions of the free state including the education system which continue to shape development choices and results in the current day.

Olaniyan and Martins (2025) develop this study further and argue that after colonial Nigerian education can function to hide colonial history and limit the scope of against colonial limits debate in ways that make it harder for change movements to build the political support needed to at the deep level change the system. Agbaje (2023) shows that even when African universities introduce new frames as well as policies they often continue to repeat colonial curriculum shapes in practice because the institution culture of the university and the training of its academics remain shaped by Western academic traditions. This finding is in a direct way relevant to the Nigeria STEM education change because it points to the fact that a new policy plan alone is not sufficient to change the actual content as well as orientation of what is taught in Nigerian schools and universities.

Baral and Karki (2020) use Wole Soyinka book based work to explore the colonial mentality that persists among post-independence Nigerian elites and argue that this mentality continues to shape cultural and educational choices in ways that reinforce colonial patterns. Basu and Agbo (2024) offer a more hopeful perspective by showing how colonial archives can be used as resources for against colonial cultural practices and argue that the materials of the colonial period can be used again to support recovery and renewal. In this study, after colonial theory is used alongside Human Capital theory as well as dependency theory to provide a complete picture of the structural setting in which the Nigeria STEM education change is taking place with to explain why change has been slower and less useful in Nigeria than in China which does not hold the same colonial education legacy.

2.4 Empirical Review

Olarewaju et al. (2021) conducted a small data survey of Nigerian manufacturing firms to look at the link between human capital investment and manufacturing output. The study used question form data from firm managers as well as regression study to test whether schooling, formal training and research investment predict higher manufacturing output. The findings confirmed that firms with more educated as well as better-trained workers produced higher output and were more useful. The study concluded that human capital investment is a necessary condition for industrial development in Nigeria,but that it must be combined with other structural investments to produce growth at the national level. This study is in a direct way relevant to the current research because it provides firm-level evidence for the Human Capital theory frame used here.

Rufus (2022) examined the link between human capital investment as well as industrial productivity in Nigeria using secondary national-level data and regression study. The study found that education as well as health spending together build work power that supports industrial growth and that the quality of human capital investment matters more than the amount alone. The study advised increased investment in technical focused education alongside health infrastructure to build the work force that Nigerian industry needs. This empirical finding supports the important argument of this study that STEM education change must be part of a wider package of investment if it is to produce industrial development gains.

Chisom et al. (2024) conducted a complete review of STEM education advancements in Nigeria and in the wider African setting. The study examined gender gaps, shortage of resources, teacher preparation problems as well as technology access problems across the continent and found that these deep barriers are holding back STEM education growth at all levels. The study advised targeted investment in teacher training laboratory infrastructure and digital access as the most important steps for improving STEM education results. The evidence from studies gathered in this review is in a direct way relevant to explaining why Nigeria has not, yet seen strong industrial and employment gains from its 2021 STEM education policy.

Badmus and Jita (2023) studied the factors that influence career choice among STEM undergraduates in Nigerian universities using a survey of students across several institutions. The study found that career expectations, familypressure as well as the state of the job market all influence whether students pursue STEM fields and that many students are drawn away from STEM careers by the perception that the Nigerian job market does not offer good STEM employment opportunities. This finding is important for the current study because it shows that the problem of STEM graduate employability in Nigeria goes beyond the supply of trained graduates and into the conditions of demand in the job market.

Kang and Mok (2022) examined graduate entrepreneurs and youth employment in China through a critical sociological lens. The study found that the promise of Human Capital theory does not always hold in practice because social embeddedness, employer networks and institutional prestige also shape employment results in ways that formal qualifications cannot in full explain. The study concluded that education change alone is not enough to guarantee good employment results as well as that wider job market and institutional changes are also necessary.

This critical perspective on Human Capital theory is important for this study because it tempers the optimism of the theory as well as adds necessary detail to the study of both Nigeria and China.

Nalule et al. (2024) examined the integration of STEM education in Ugandan higher education as well as its potential to push industrial growth and lasting economic growth. The study used document based study of policy documents as well as education statistics to judge the link between STEM enrolment and industrial output in Uganda. The findings showed that STEM education can encourage industrial growth when it is backed by strong institutions that support enough funding and real industry partnerships. The study advised that governments invest in these supporting conditions alongside STEM curriculum change. This finding from a sub-Saharan African setting provides comparative evidence that is relevant to the Nigerian case examined in this study.

Muogahlu and Ahmad (2023) studied the redesign of technical and vocational training in Nigeria for lasting economic growth. The study used document based as well as quality based study to look at the current state of TVET in Nigeria and to identify the changes needed to make it more useful. The findings showed that the Nigerian TVET system needs deep curriculum change alongside strong industry partnerships, better teacher training and more enough funding if it is to produce graduates who can support industrial development. The study advised a complete change of the TVET system as well as closer coordination between education authorities and industrial employers. This study provides an important empirical setting for understanding the structural problems that face the Nigeria STEM education change.

An et al. (2020) examined China's new ideas education model based on STEM principles as well as analysed how China has adapted its STEM education way to support talent development for industry and new ideas. The study used document based study and case studies of Chinese education institutions to look at how the model works in practice. The findings showed that the China STEM education success rests on a mix of new ideas, training maker education and structured university industry partnerships that create clear pathways from training to useful industrial employment. The study concluded that the China way gives lessons for other growing countries that want to build stronger links between education and industrial development.

Lefifi and Kiala (2021) examined how Forum on China-Africa Cooperation higher education scholarships affect African human capital development. The study used document based study and interviews with returned scholars to judge whether Chinese higher education was building the human capital needed for African industrial development. The findings showed that scholarships can support human capital development, but that the benefits depend on whether African graduates can apply their skills in their home economies as well as whether those economies have the deep conditions needed to take in and deploy trained technical skills workers. This study provides direct evidence from studies about the China-Africa education link that is relevant to the comparative study in this research.

Eniekezimene et al. (2023) used an autoregressive distributed lag model to look at the link between human capital development as well as economic growth in Nigeria using time-series data on education expenditure, schoolenrolment and GDP growth. The study found that both education spending as well as school enrolment add to economic growth in Nigeria over the long range but that the effects take time to materialise and depend on the quality of education investment instead of just the volume. The study advised lasting and quality-focused investment in human capital as the most reliable path for improving Nigeria economic growth performance. This empirical finding supports the Human Capital theory frame used in this study as well as provides number based evidence for the link between education investment and economic results in Nigeria.

2.5 Summary of Literature and Gap

The studies reviewed in this chapter shows that colonial education structures in Nigeria continue to shape education policy choices, skills development results as well as the link between training and industrial production in ways that limit the usefulness of new policy changes including STEM education frames. Human Capital theory dependency theory as well as after colonial theory together provide a strong conceptual basis for understanding these patterns and for explaining why Nigeria has not yet achieved the industrial and employment gains from STEM change that China has achieved since 2017. The empirical studies reviewed confirm that the link between STEM education as well as industrial development depends on institutional conditions, fundingquality and industry partnerships that are better developed in China than in Nigeria. Three research gaps are seen in the existing studies. First, no study in a direct way compares the industrial development as well as graduate employability results of STEM education policy in Nigeria and China across the same time period using standard international data. Second, the existing empirical work does not look at the 2017 to 2025 period as a unified comparative window which is the period when both countries had either introduced or were building toward formal STEM education frames. Third, therole of colonial education legacy as a structural constraint on STEM policy usefulness has not been examined in a comparison frame that includes China as a contrasting case. This study addresses all three gaps.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Theoretical Framework

This research is anchored on Human Capital theory because this theory in a direct way connects education investment to useful economic results including industrial development as well as graduate employability which are the two important results this research looks at in Nigeria and China from 2017 to 2025.

3.1.1 Human Capital Theory

Human Capital theory was proposed by Theodore Schultz in his 1961 presidential address to the American economic association and was later expanded and made official by Gary Becker in his 1964 book titled Human Capital. The theory holds that people are not passive inputs into economic production, but are active bearers of skills, knowledge as well as work power that can be built through deliberate investment in education, training and health. Schultz argued that investment in human beings produces gains that are matching to or greater than gains on physical capital as well as Becker extended this argument by growing a planned economic study of how individuals and governments make decisions about education investment based on expected future gains. Bachama et al. (2021) apply this frame to Nigeria as well as find that education and health expenditure are among the most important predictors of economic growth providing study evidence for the core claim of the theory in the Nigerian setting.

The tenets and beliefs of Human Capital theory rest on three main claims. First education as well as training increase the work power of individuals with this increased ability translates into higher wages for individuals as well as higher output for firms and economies. Second investment in human capital is a rational economic choice that individuals as well as governments make based on calculations of expected future gains and the level of investment will be higher when gains are expected to be higher. Third, the accumulation of human capital across an economy drives long range economic growth by enabling more useful uses of physical capital and natural resources. Eniekezimene et al. (2023) provide study evidence for this third claim in Nigeria by showing that school enrolment and education spending add to GDP growth over the long range. Peterson (2025) revisits the theory in a current business education setting as well as confirms its continued value for understanding the link between education investment and employability results.

Human Capital theory has been criticized on several grounds. Kang and Mok (2022) show in the Chinese setting that the predictions of the theory are not always borne out in practice because social connections, institutional prestige and job market conditions also shape employment results alongside formal qualifications. Chekol (2024) finds in the Ethiopian setting that skill gaps instead of the volume of education investment explain much of the gap between education spending as well as economic performance pointing to the importance of education quality and value instead of just amount. These criticisms have led to modifications of the original theory that incorporate the quality of education, thealignment between training as well as job market needs and the wider institutional environment as conditions that decide whether human capital investment produces the expected gains. For this study, Human Capital theory is applied with awareness of these modifications as well as limits with which it is used alongside dependency theory as well as after colonial theory to provide a more complete picture of why STEM education investment has produced different results in Nigeria and China.

3.1.2 Applicability of Human Capital Theory to This Study

Human Capital theory is the most suitable theory frame for this study because it in a direct way addresses the link between education investment and economic results that this research looks at. The theory predicts that investment in STEM education should produce gains in industrial development as well as graduate employability by building the technical skills that industries need and that graduates can bring to the job market. This prediction can be tested against the data on STEM education investment industrial output as well as graduate employment in Nigeria and China between 2017 and 2025. Where the data shows that investment has not produced the predicted gains as in Nigeria the theory also points to the conditions that must be in place for investment to work including education quality alignment with job market needs as well as institution support and these conditions can be examined to explain the gap in results between the two countries.

3.2 Hypotheses

The following alternative hypotheses are stated for testing in this study:

Ha1: The shift from colonial education to STEM education has had an important impact on industrial development in Nigeria and China from 2017 to 2025.

Ha2: The shift from colonial education to STEM education has in an important way improved graduate employability in Nigeria and China from 2017 to 2025.

3.3 Research Design

This research uses a document based and ex post facto study design. A study design is the overall plan that guides a study from its research questions to its methods of data gathering and study. It determines the structure of the evidence on which conclusions are based (Weber, 2017). A document based study design is appropriate for this study because the research questions can be answered through review of existing documents, official statistics and published reports without the need to collect new primary data from participants. An ex post facto design is further appropriate because the events policies as well as results under examination have before this point occurred across the 2017 to 2025 period and the researcher is examining these past events through their document based traces instead of stepping in or watching them as they happen. The main strength of this design is that it allows the study of real policy results in two large and complex countries using matching standard data at world level. The main limit is that it relies on the complete nature as well as correctness of published sources and cannot capture aspects of the STEM education experience that have not been recorded in official documents or academic publications.

3.4 Methods of Data Collection

data for this study was collected through planned document based review of official publications, internationalstatistical databases, government policy documents and peer-reviewed academic sources. The types of documents analysed include national STEM education policy documents from Nigeria and China annual statistical reports from the UNESCO Institute for statistics on education enrolment by field of study World Bank World Development signs on industrial value added with manufacturing output International Labour Organization reports on youth employment as well as graduate employment rates with academic journal articles that look at STEM education policy and results in both countries. Documents were selected based on three criteria: they must relate to the 2017 to 2025 study period, they must provide matching data for both Nigeria and China and they must be from official government sources or recognized at world level statistical organisations or peer-reviewed publications (Bowen, 2009). The process of obtaining documents involved planned searches of the UNESCO Institute for Statistics database, the World Bank Open data portal, the ILO ILOSTAT database, the Nigerian Federal Ministry of Education website, the Chinese Ministry of Education website as well as academic databases including Scopus and Web of science.

3.5 Methods of Data Analysis

This research uses theme based and comparative document based study as its main methods of data analysis. Data preparation involved organising the gathered documents as well as statistical datasets into categories that correspond to the two research questions and the four data tables planned for Chapter Four. theme based study was used to identify patterns, trends as well as relationships in the quality based policy documents with academic sources by coding content according to the main themes of colonial education legacy STEM policy adoption industrial development results and graduate employability results (Braun and Clarke, 2006). A comparative study was used to place the number based data from Nigeria and China side by side across the 2017 to 2025 period so that trends with gaps in results could be identified and explained. The interpretation plan follows a structure in which each table of data is presented with an opening as well as an explanation followed by a theme based discussion that connects the findings to the research questions and to the theory frame. Where data gaps exist in the Nigerian statistical record these are noted and addressed through cross-referencing of multiple secondary sources that have examined the same phenomena.

3.6 Logical Data Framework

THE LOGICAL DATA FRAMEWORK (LDF)

Research Question	Hypothesis	Major Variables of the Hypothesis: Independent (X) and Dependent (Y)	Empirical Indicators of Variables	Method of Data Collection	Source of Data	Method of Data Analysis
RQ1: How has the shift from colonial education to STEM education impacted industrial development in Nigeria and	Ha1: The shift from colonial education to STEM education has had a significant impact on industrial development in Nigeria and China from	X: Shift from colonial education to STEM education Y: Industrial development	Industrial value added (% of GDP); manufacturing output; STEM enrolment figures, 2017-2025	Documentary method	Nigerian Federal Ministry of Education; Chinese Ministry of Education; World Bank WDI; UNESCO UIS	Thematic analysis and comparative trend analysis

China from 2017 to 2025?	2017 to 2025.					
RQ2: Does the shift from colonial education to STEM education improve graduate employability in Nigeria and China from 2017 to 2025?	Ha2: The shift from colonial education to STEM education has in a significant way improved graduate employability in Nigeria and China from 2017 to 2025.	X: Shift from colonial education to STEM education Y: Graduate employability	Graduate employment rates by country; youth unemployment rates; STEM graduate employment indicators, 2017-2025	Documentary method	ILO ILOSTAT; World Bank; national labour statistics; graduate tracer studies	Thematic analysis and comparative trend analysis

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Preamble

This chapter presents analyses as well as discusses the findings of this study in response to the two research questions and their corresponding hypotheses. Research question One looks at how the shift from colonial education to STEM education has impacted industrial development in Nigeria and China from 2017 to 2025. Research question Two looks at whether this shift has improved graduate employability across the same period. The data presented in this chapter is drawn from official sources including the World Bank World Development signs, the UNESCO Institute for statistics and the International Labour Organization. Four tables are presented in sequence alongside opening introductions and post-table explanations. A discussion section follows each main heading. The chapter ends with the test of each hypothesis.

4.2 Research Question One: How Has the Shift from Colonial Education to STEM Education Impacted Industrial Development in Nigeria and China from 2017 to 2025?

4.2.1 The Shift from Colonial Education to STEM Education: Policy Frameworks in Nigeria and China

The opening step in answering Research question One is to show the formal policy instruments through which Nigeria and China have each shifted from colonial or traditional education models toward STEM-centred frames. Both countries have published official national policies on STEM education, yet the timing content and institution support of these policies differ in ways that are important for understanding the difference in their results. Table 1 presents a comparative overview of the official STEM education policies in both countries showing the policy name, the year of introduction, the lead government body and the key focus areas of each policy.

Table 1: Comparative Overview of Official STEM Education Policies in Nigeria and China

Country	Policy Name	Year	Lead Body	Key Focus Areas	Stated Goal	Source
Nigeria	National Policy on Science, Technology, Engineering and Mathematics (STEM) Education	2021	Federal Ministry of Education	Integration of STEM at all levels; gender inclusion; teacher capacity; industry linkage	Build a with technical skills skilled workforce to support industrialisation and reduce graduate unemployment	Federal Ministry of Education (2021); Chinese Ministry of Education (2017); An et al. (2020).
China	National Medium and Long-Term	2017 (active STEM reform phase)	Ministry of Education and Ministry of	Innovation education; maker culture;	Position China as a global leader in	

	Plan for Science and Technology Development 2006-2020 (renewed via 14th Five-Year Plan 2021-2025 with STEM innovation focus)		Science and Technology	university-industry partnerships; digital STEM; vocational reform	science, technology and innovation by 2049 through STEM-trained talent

Table 1 presents that both Nigeria and China have official national policy plans for STEM education, but that the two countries differ in the maturity depth and institution support of these frames in ways that matter for understanding their different results. Nigeria introduced its formal STEM policy in 2021 four years after China entered its active STEM change phase in 2017. China frame is supported by two main ministries as well as is built into a long range national growth plan that stretches to 2049 while Nigeria frame rests under a single ministry and is not yet linked to a wider long range industrial development plan of matching scope. An et al. (2020) show that China model combines new ideas training maker education as well as university industry partnerships into a system that has been built up over many years while Samuel and Danladi (2025) note that Nigeria policy faces deep infrastructure teacher quality and access problems that have slowed its putting in place from the start.

4.2.2 Industrial Output: Nigeria and China 2017 to 2025

The next step in answering Research question One is to look at the industrial development results produced by each country across the study period. Industrial development is measured here through industry value added as a percentage of gross domestic product which is the standard

World Bank measure of the share of the manufacturing, mining , utilitiesand construction sectors to total national output. Table 2 presents the annual industrial value added as a percentage of GDP for Nigeria and China from 2017 to 2025.

Table 2: Industry Value Added as Percentage of GDP: Nigeria and China 2017 to 2025

Year	Nigeria (% of GDP)	Nigeria Trend	China (% of GDP)	China Trend	Source
2017	25.1	Oil price recovery lifts industry share	40.5	Strong manufacturing and construction growth	World Bank (2024); International Monetary Fund (2024); UNESCO Institute for Statistics (2024).
2018	24.8	Marginal decline; oil dependency persists	40.7	Continued growth in high-tech manufacturing	
2019	26.0	Modest gain; manufacturing contribution weak	39.0	Slight contraction due to trade tensions	
2020	21.9	Sharp fall due to COVID-19	37.8	Decline then rapid recovery through	

		and oil price crash		Q3
2021	25.4	Recovery; Nigeria STEM policy introduced	39.4	Strong rebound; 14th Five-Year Plan launched
2022	25.8	Oil revenues lift headline figure; manufacturing flat	39.9	Growth in electric vehicles and green tech
2023	26.1	Marginal gain; structural manufacturing weak	38.3	Modest dip from global slowdown; recovery signals
2024	25.3	Currency crisis weighs on industrial output	38.8	Recovery; EV and tech exports rise
2025 (est.)	24.9	Stagnation; STEM policy yet to show output gains	39.2	Steady growth; STEM graduates entering industry

Table 2 presents a clear as well as lasting gap between Nigeria and China in industrial value added as a share of GDP across the entire 2017 to 2025 period. China maintained industrial value added between 40.5 as well as 39.2 percent of GDP throughout the period which reflects a stable largeindustrial base that has been built over decades of investment in manufacturing technology and STEM-trained human capital. Nigeria moved between 25.1 as well as 24.9 percent across the same period with a sharp fall in 2020 caused by the COVID-19 pandemic and the associated collapse in oil prices. The recovery of Nigeria's headline figure after 2020 is driven in large measure by oil revenues instead of by growth in manufacturing or technology-based industry.

Olarewaju et al. (2021) confirm this pattern at the firm level by showing that the manufacturing sector in Nigeria has not grown at a speed that matches its education investment and that the skills of graduates are not being changed into useful industrial output. The gap seen in Table 2 supports the place that STEM policy adoption in Nigeria has not, yet produced the industrial development gains that the theory of human capital would predict.

4.2.3 STEM Student Enrolment: Nigeria and China 2017 to 2025

The third part of the answer to Research question One concerns the pipeline of STEM-trained graduates that education change is making. If a STEM education policy is working it should show up first in rising enrolment in STEM fields at university and higher education level before the effects can appear in industrial output. Table 3 presents annual STEM enrolment figures for Nigeria and China from 2017 to 2025 expressed in thousands of students enrolled in science technology engineering and mathematics programs at the tertiary level.

Table 3: Tertiary STEM Enrolment in Nigeria and China 2017 to 2025 (Thousands of Students)

Year	Nigeria STEM Enrolment (000s)	Nigeria Change (%)	China STEM Enrolment (000s)	China Change (%)	Ratio China : Nigeria	Source
2017	412	Base year	5,840	Base year	14.2 : 1	UNESCO Institute for Statistics (2024); UNESCO (2022); 2025 figures are trend projections.
2018	428	+3.9%	6,110	+4.6%	14.3 : 1	

2019	445	+4.0%	6,390	+4.6%	14.4 : 1
2020	438	-1.6%	6,550	+2.5%	14.9 : 1
2021	461	+5.2%	6,820	+4.1%	14.8 : 1
2022	489	+6.1%	7,100	+4.1%	14.5 : 1
2023	514	+5.1%	7,390	+4.1%	14.4 : 1
2024	531	+3.3%	7,680	+3.9%	14.5 : 1
2025 (est.)	548	+3.2%	7,950	+3.5%	14.5 : 1

Table 3 presents that China enrols STEM students at a scale that is more than fourteen times larger than Nigeria throughout the study period and that this ratio has remained stable pointing to the point that Nigeria has not closed the enrolment gap despite introducing its STEM policy in 2021. Nigeria shows a positive growth trend in STEM enrolment from 2021 onward which is consistent with the introduction of the national STEM policy, yet the complete numbers remain very small relative to the size of the Nigerian economy and the scale of the industrial work force that would be needed to push manufacturing-led growth. The 2020 dip in Nigeria figures reflects the disruption of university operations during the COVID-19 period. The consistent upward trend in China across all years reflects the lasting institutional investment that the China STEM frame has produced. Chisom et al. (2024) find that STEM enrolment in Nigerian universities is held back by shortage of resources poor laboratory infrastructure and weak teacher preparation which explains why the growth in enrolment after 2021 has been modest instead of the sharp acceleration that a in full resourced STEM policy would be expected to produce.

4.2.4 Discussion of Findings: Industrial Development

The evidence in Tables 1, 2 as well as 3 together build a clear picture of why the shift from colonial education to STEM education has produced very different industrial development results in Nigeria and China between 2017 and 2025. China entered the study period with a mature as well as well funded STEM education frame that had been built over decades of lasting investment and was built into a wider national industrial and new ideas strategy. Nigeria entered the period without a formal STEM policy at all and introduced one only in 2021 four years into the study window. The gap in industrial value added between the two countries is for this reason not surprising given the difference in the scale, timingand institution support of their STEM education frames.

The evidence also shows that the Nigeria industrial value added as a share of GDP has not improved in a lasting way across the 2017 to 2025 period even after the introduction of the STEM policy. The headline figure is shaped in a large measure by oil revenues and does not reflect genuine growth in manufacturing or technology-based industrial output. An et al. (2020) hold that the China STEM education model works because it builds the connection between training as well as industrial output through structured university industry partnerships and practical new ideas training. Nigeria has not yet built these connections at scale as Muogahlu and Ahmad (2023) argue that this is because the TVET with STEM change programs in Nigeria are not, yet backed by the industry engagement funding and teacher training that would be needed to change graduate skills into useful industrial ability.

The colonial education legacy is a deep factor that helps explain this gap. The preference for book based office and certificate led education that the British colonial system built into Nigerian schooling did not disappear with the introduction of a new STEM policy in 2021. Fasakin (2021) holds that colonial power relations continue to shape governance as well as policy choices in Nigeria with this is seen in the persistence of curricula, teacher training programs and employer preferences that still favour the patterns established during the colonial period. Agbaje (2023) shows that African universities can introduce new policy plans without changing the actual content of what is taught when the institution culture of the university and the training of its academics remain shaped by older traditions. The STEM enrolment growth seen in Table 3 after 2021 shows that the policy is beginning to shift student choices, yet the absence of a corresponding improvement in industrial output in Table 2 confirms that enrolment growth alone is not sufficient to push industrial development without the deep conditions that China has built over a much longer period.

4.3 Research Question Two: Does the Shift from Colonial Education to STEM Education Improve Graduate Employability in Nigeria and China from 2017 to 2025?

4.3.1 Graduate Employment Data: Nigeria and China 2017 to 2025

The important question for this section is whether the shift toward STEM education has produced measurable improvements in the ability of graduates in Nigeria and China to find useful employment that matches their level of training. Table 4 presents annual data on the youth employment to population ratio for tertiary educated young people aged 15 to 29 in Nigeria and China from 2017 to 2025. This measure captures the proportion of tertiary educated young people who are in employment and is the most matching standard indicator available for both countries across the study period from the ILO ILOSTAT database.

Table 4: Youth Employment-to-Population Ratio for Tertiary Educated Youth (Ages 15 to 29): Nigeria and China 2017 to 2025 (%)

Year	Nigeria Employment Ratio (%)	Nigeria Change (pp)	China Employment Ratio (%)	China Change (pp)	Gap (China minus Nigeria)	Source
2017	44.3	Base year	68.1	Base year	23.8 pp	International Labour Organization (2025); World Bank (2024); 2025 figures are ILO trend projections.
2018	43.1	-1.2	68.9	+0.8	25.8 pp	
2019	42.6	-0.5	69.4	+0.5	26.8 pp	
2020	38.2	-4.4	65.3	-4.1	27.1 pp	
2021	39.8	+1.6	66.8	+1.5	27.0 pp	
2022	40.1	+0.3	67.5	+0.7	27.4 pp	
2023	39.4	-0.7	67.2	-0.3	27.8 pp	

2024	38.9	-0.5	67.8	+0.6	28.9 pp
2025 (est.)	38.5	-0.4	68.2	+0.4	29.7 pp

Table 4 presents that the employment gap between tertiary educated young people in Nigeria and China has grown wider across the entire study period. Nigeria began the period in 2017 with a youth employment ratio of 44.3 percent for tertiary educated young people and ended the period in 2025 with an estimated ratio of 38.5 percent, a fall of almost six percentage points across the eight-year window. China began the period at 68.1 percent and ended with an estimated 68.2 percent showing useful stability at a high level through the period with a dip during the COVID-19 disruption in 2020 from which it recovered in full by 2022. The gap between the two countries grew from 23.8 percentage points in 2017 to an estimated 29.7 percentage points in 2025. This means that the shift toward STEM education over this period has not yet produced any measurable improvement in graduate employability in Nigeria while China has maintained the high graduate employment rate that its more mature and better funded STEM system supports.

4.3.2 Discussion of Findings: Graduate Employability

The evidence in Table 4 shows that the shift toward STEM education has not improved graduate employability in Nigeria between 2017 and 2025 and has in point been accompanied by a decline in the employment ratio for tertiary educated young people across this period. This finding is not a verdict on the value of STEM education as a change tool, but it does point to the structural gap between introducing a policy and building the conditions needed for that policy to produce the expected results. Badmus and Jita (2023) find that Nigerian STEM undergraduates face a job market that cannot take in them because the industrial sector has not grown at a speed that matches the output of training programs and Table 4 provides total data that supports this finding at the national level.

The employment decline in Nigeria across the period is connected to the deep weaknesses in the job market that have before this point been discussed in relation to industrial development. When a country does not develop a large as well as varied industrial and technology sector it cannot create the STEM-intensive roles that STEM graduates need to find employment that matches their training. Jonbekova et al. (2021) find that education improves employability only when job markets can use the skills of graduates and this condition is not, yet met in Nigeria at scale. The industrial value added data in Table 2 shows that Nigeria has not built the industrial base needed to take in STEM graduates in large numbers and Table 4 confirms that the employment ratio has fallen as a result.

China maintains a high as well as stable graduate employment ratio across the period because it has built the industrial and technology sector that can take in STEM graduates in useful roles. Jiang and Wang (2024) show that China redesigned its work focused undergraduate education to connect technical skills to the specific needs of the digital as well as manufacturing economy with that this connection between training as well as industry has produced high and stable employment rates for graduates. Wang (2023) adds that China has built structured pathways from university to employment in technology as well as manufacturing firms through decades of policy development with these pathways mean that STEM graduates can find relevant work at a much higher rate than their counterparts in Nigeria who leave university with qualifications but without the practical experience and industry connections that China system builds into the training process. Kang and Mok (2022) do note that even in China the promise of STEM education is not always fulfilled for every graduate as well as that social connections and institutional prestige also shape results yet the total data in Table 4 confirms that China's system produces much better overall employment results than Nigeria's system across the study period.

The colonial education legacy shapes this outcome in Nigeria because the cultural preference for office work as well as certificate led employment over technical and vocational roles that the British colonial system built into Nigerian education has not been dislodged in a full way by the 2021 STEM policy. Olasupo et al. (2024) hold that university as well as industry partnerships are necessary to produce graduates with the practical skills and employer connections that change training into employment and Nigeria has not yet built these partnerships at scale. Owojori and Bolaji (2025) find that combining STEM business building and new ideas training gives a path for improving graduate employability beyond what technical training alone can produce yet this mix is not, yet a standard feature of the Nigeria STEM education frame as put in place. The result is that STEM graduates in Nigeria are being produced in growing numbers as Table 3 shows, yet they are entering a job market that cannot take in them as well as a training system that has not, yet connected them to the employers and industries where their skills would be useful.

4.4 Test of Hypothesis One

Research Question One: How has the shift from colonial education to STEM education impacted industrial development in Nigeria and China from 2017 to 2025?

Alternative Hypothesis One (Ha1): The shift from colonial education to STEM education has had a significant impact on industrial development in Nigeria and China from 2017 to 2025.

Using a theme based as well as comparative study of the data presented in Tables 1 2 with 3 there is evidence to support the alternative hypothesis (Ha1) in part and to qualify the support with care. The data shows that the shift toward STEM education has had an important positive impact on industrial development in China but has not, yet produced an important positive impact on industrial development in Nigeria across the 2017 to 2025 period. This is a differentiated finding instead of a simple confirmation across both countries and it reflects the core comparative argument of this study.

Within China Table 1 shows a mature as well as well funded STEM policy plan supported by two main ministries and built into a long range national growth plan. Table 2 shows that China maintained industrial value added between 37 as well as 41 percent of GDP throughout the study period, a high and stable level that reflects the work power built by decades of STEM-oriented human capital investment. Table 3 shows that China enrols STEM students at a scale fourteen times larger than Nigeria and that enrolment grew at a consistent rate of about four percent per year across the period. The mix of policy maturity, large enrollment scale as well as stable industrial output confirms that the STEM education shift in China has had an important impact on industrial development and the alternative hypothesis is supported for China.

Within Nigeria the picture is different. Table 1 shows a STEM policy that was only introduced in 2021 and that is not,yet built into a long range industrial development strategy of matching scope to China frame. Table 2 shows that the Nigeria industrial value added fluctuated between 21 as well as 26 percent of GDP across the period with no lasting upward trend and with the headline figure driven by oil revenues instead of by growth in manufacturing or technology-based industry. Table 3 shows positive growth in STEM enrolment from 2021 onward, but at a modest rate and from a very small base relative to the size of the economy. The data does not support the conclusion that the STEM education shift has, yet produced an important positive impact on industrial development in Nigeria. For Nigeria, the alternative hypothesis is not supported at this stage. Ha1 is for this reason supported for China and not supported for Nigeria based on the evidence presented. The overall conclusion is that the shift from colonial education to STEM education can produce important industrial development gains when it is backed by the right institutional conditions, funding and policy maturity,but that it has not yet produced these gains in Nigeria because those conditions are not in place.

4.5 Test of Hypothesis Two

Research Question Two: Does the shift from colonial education to STEM education improve graduate employability in Nigeria and China from 2017 to 2025?

Alternative Hypothesis Two (Ha2): The shift from colonial education to STEM education has in a significant way improved graduate employability in Nigeria and China from 2017 to 2025.

Using a theme based as well as comparative study of the data presented in Table 4 alongside the supporting data in Tables 2 with 3 there is evidence to support the alternative hypothesis (Ha2) for China and not to support it for Nigeria. As with hypothesis One this is a differentiated finding that reflects the different institutional and deep conditions in the two countries.

Within Nigeria Table 4 shows that the youth employment ratio for tertiary educated young people fell from 44.3 percent in 2017 to an estimated 38.5 percent in 2025 a decline of almost six percentage points across the study period. This decline occurred despite the introduction of the STEM policy in 2021 and despite the modest growth in STEM enrolment seen in Table 3. The job market has not absorbed STEM graduates at a higher rate because the industrial sector shown in Table 2 has not grown in a way that creates more STEM-intensive employment opportunities. The alternative hypothesis Ha2 is not supported for Nigeria. The shift toward STEM education has not improved in an important way graduate employability in Nigeria in the period under study.

Within China Table 4 shows that the youth employment ratio for tertiary educated young people remained stable at between 65 as well as 69 percent throughout the study period and recovered to near its pre-pandemic level by 2022. This stability at a high level reflects a job market that is large enough and varied enough to take in STEM graduates in useful roles at a steady rate.

The STEM education frame that China has built over many years produces graduates with practical skills and industry connections that enable them to find employment at a rate that Nigerian graduates cannot match. The alternative hypothesis Ha2 is supported for China. The shift toward STEM education has supported high and stable graduate employability in China across the 2017 to 2025 period. The overall conclusion from both hypotheses is that the shift from colonial education to STEM education produces important positive results for industrial development as well as graduate employability only when it is supported by the institutional conditions financial investment with structural change that China has built over decades and that Nigeria has not, yet achieved.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

Finding One: The shift from colonial education to STEM education has had an important positive impact on industrial development in China but has not, yet produced an important positive impact on industrial development in Nigeria from 2017 to 2025. China entered the study period with a mature STEM policy plan supported by two main ministries as well as built into a long range national growth plan with this foundation produced stable industrial value added of between 37 and 41 percent of GDP across the period alongside consistent growth in STEM enrolment at a scale fourteen times larger than Nigeria. Nigeria introduced its STEM policy only in 2021 and the industrial value added data shows no lasting upward trend across the period with the headline figure shaped by oil revenues instead of by genuine growth in manufacturing or technology-based industry. The colonial education legacy which shaped a deep preference for book based as well as office training over technical skills has not been dislodged by the new policy plan and the deep conditions needed to change STEM enrolment growth into industrial output gains are not yet in place.

Finding Two: The shift from colonial education to STEM education has supported high and stable graduate employability in China, but has not improved in an important way graduate employability in Nigeria from 2017 to 2025. The youth employment ratio for tertiary educated young people in Nigeria fell from 44.3 percent in 2017 to an estimated 38.5 percent in 2025 despite the introduction of the STEM policy because the Nigerian job market does not yet have enough

STEM-intensive roles to take in the growing number of STEM graduates being produced by the education system. China maintained a high as well as stable employment ratio of between 65 and 69 percent throughout the period because its large as well as varied industrial and technology sector provides structured pathways from STEM training to useful employment. The gap in graduate employability between the two countries grew from 23.8 percentage points in 2017 to an estimated 29.7 percentage points in 2025 showing that the distance between Nigeria and China in graduate employment results widened instead of narrowed across the study period.

5.2 Conclusion

This research set out to compare the impact of the shift from colonial education to STEM education on industrial development as well as graduate employability in Nigeria and China from 2017 to 2025. The findings confirm that STEM education change produces important positive results for industrial development as well as graduate employability only when it is supported by the institutional conditions, financialinvestment and structural change that China has built over decades. Nigeria has made a genuine start with the introduction of its STEM policy in 2021, yet the colonial education legacy weak industry-education links as well as the not well developed industrial sector continue to hold back the translation of STEM enrolment growth into useful industrial output and employment gains. Human Capital theory predicts in a correct way that investment in education produces economic gains yet the evidence from Nigeria confirms that the quality value and structural backing of that investment decide whether the predicted gains materialise in practice. The study supports the conclusion that colonial states cannot replicate the industrial and employment gains of STEM education without addressing at the same time the structural colonial legacies that prevent education change from connecting to industry with economic transformation.

5.3 Recommendations

The Federal Government of Nigeria should increase the budget allocation for STEM education from its current level to at least 15 percent of the total education budget by 2030 with clear ring-fenced funding for laboratory infrastructure digital access as well as STEM teacher training at the secondary and tertiary levels. This advice is grounded in the finding that the modest growth in STEM enrolment seen after the introduction of the 2021 policy has not been matched by improvements in industrial output or graduate employability as well as the evidence from Chisom et al. (2024) that shortage of resources poor infrastructure and weak teacher preparation are the main barriers holding back STEM education growth in Nigeria. Without this money commitment the STEM policy plan will remain a document without the institution support needed to produce real results.

The Federal Ministry of Education in collaboration with the Nigerian Investment Promotion Commission as well as the Manufacturers association of Nigeria should build an official national university industry STEM partnership programme that requires every university offering STEM degrees to maintain active relationships with at least five industrial employers who provide internship placements, co-plannedcurricula and graduate recruitment pathways. This advice responds to the finding that Nigerian STEM graduates are entering a job market that cannot take in them because the industrial sector has not grown in a way that creates enough STEM-intensive employment and because universities are not yet connecting graduates to the employers who could use their skills. China experience shows that structured university industry partnerships are among the most important factors in determining whether STEM education produces high graduate employment rates.

The Nigerian government should commission as well as fund a formal removal of colonial limits audit of the national curriculum at the secondary with tertiary levels to identify where colonial age priorities for book based as well as office training are still built into the content of what is taught the training of teachers with the expectations of the examination system as well as to produce a time-bound plan for replacing these with STEM-relevant grounded in local content and oriented toward practical work content. This advice is grounded in the finding that the colonial education legacy continues to shape institution culture as well as curriculum material in ways that resist the introduction of new policy plans that prevent STEM change from making the fundamental shift in skills and employer expectations that industrial development requires. Agbaje (2023) as well as Olaniyan and Martins (2025) provide evidence that African universities can adopt new policies without changing the substance of what they teach and this audit is the structural intervention needed to close that gap.

The Nigerian government should develop as well as publish a National STEM-industrial development Linkage Plan that maps in a clear way each STEM education output to a planned industrial development target sets measurable signs for the change of STEM graduate output into industrial employment with is reviewed each year against World Bank and ILO data to track growth. This advice responds to the core finding of this study that Nigeria has adopted a STEM education policy without embedding it in a wider industrial with economic growth strategy that could take in and use in a useful way the graduates that the policy produces. The evidence from Tables 2, 3 as well as 4 shows that enrollmentgrowth alone does not push industrial development or graduate employment gains with that a deliberate as well as monitored linkage between education output and industrial development targets is necessary to produce the results that the STEM policy is intended to achieve.

REFERENCES

Adeogun, A. (2021). Towards decolonising university music education in Nigeria. Music Education Research, 23(5), 466-483. https://doi.org/10.1080/14613808.2021.1951193

Agbaje, O. (2023). Curriculum reform in African higher education: Solving problems of society and meeting its needs. Curriculum Perspectives, 43(2), 141-149. https://doi.org/10.1007/s41297-023-00206-x

An, Z., Wang, N., Wan, W., and Fu, Q. (2020). The enlightenment of Chinese innovation education: STEM. Advances in Social Science, Education and Humanities Research. https://doi.org/10.2991/assehr.k.200801.021

Andira, A., and Harber, F. (2022). Colonial legacy and development: Reflection on Nigeria oil dependency and economic resilience amidst the COVID-19 pandemic. *Jurnal Sentris*, 3(2), 168-182. https://doi.org/10.26593/sentris.v3i2.6106.168-182

Awoniyi, B. K., and Awoniyi, A. (2025). Industrial education in Nigeria: Trends, challenges, and prospects for national development. *British Journal of Education*. https://doi.org/10.37745/bje.2013/vol13n1119

Bachama, Y., Hassan, A., and Ibrahim, B. A. (2021). The impact of human capital on Nigeria economic growth. *European Scientific Journal,* 17(15), 393. https://doi.org/10.19044/esj.2021.v17n15p393

Badmus, O., and Jita, L. (2023). Investigation of factors influencing career choice among STEM undergraduates in Nigeria universities. *Eurasia Journal of Mathematics, Science and Technology Education,* 19(3), em2239. https://doi.org/10.29333/ejmste/12838

Baral, R. K., and Karki, N. C. (2020). What is inside the mask: White or still Black? A post-colonial musing on Wole Soyinka The Interpreters. *International Journal of English Literature and Social Sciences*, 5(6), 2113-2123. https://doi.org/10.22161/ijels.56.43

Basu, P., and Agbo, G. (2024). Uli: The colonial archive as decolonial cultural resource. African Arts, 57, 8-25. https://doi.org/10.1162/afar_a_00770

Becker, G. S. (1964). Human capital: A theoretical and empirical analysis, with special reference to education. *University of Chicago Press.*

Bowen, G. A. (*2009). Document analysis as a qualitative research method.* Qualitative Research Journal, 9(2), 27-40. https://doi.org/10.3316/QRJ0902027

Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Chen, G., Qiao, Y., and Yang, Y. (2024). The constituent elements of STEM education and their respective effect on talent cultivation performance in the unique context of China: A two-stage study. *ASEE Annual Conference and Exposition Proceedings.* https://doi.org/10.18260/1-2--44065

Chekol, F. (2024). Reviewing the macroeconomic relevance of the education system in Ethiopia: The role of skill gap. Cogent Education, 11(1), Article 2365584. https://doi.org/10.1080/2331186x.2024.2365584

Chisom, O. N., Unachukwu, C., and Osawaru, B. (2024a). STEM education advancements in African contexts: A comprehensive review. *World Journal of Advanced Research and Reviews,* 21(1). https://doi.org/10.30574/wjarr.2024.21.1.2719

Chisom, O. N., Unachukwu, C. C., and Osawaru, B. (2024b). STEM education advancements in Nigeria: A comprehensive review. *International Journal of Applied Research in Social Sciences*, 5(10). https://doi.org/10.51594/ijarss.v5i10.724

Chinese Ministry of Education. (2017). STEM education reform guidelines. Ministry of Education of the People's Republic of China. http://www.moe.gov.cn

Decker-Lange, C., Lange, K., and Walmsley, A. (2024). How does entrepreneurship education affect employability? Insights from UK higher education. *International Journal of Entrepreneurial Behavior and Research*. https://doi.org/10.1108/ijebr-08-2023-0856

Eniekezimene, F., Wodu, E., and Anda-Owei, J. P. (2023). Human capital development and economic growth: Evidence from Nigeria. *Asian Journal of Economics, Business and Accounting,* 23(21). https://doi.org/10.9734/ajeba/2023/v23i211120

Fasakin, A. (2021). The coloniality of power in postcolonial Africa: Experiences from Nigeria. Third World Quarterly, 42(5), 902-921. https://doi.org/10.1080/01436597.2021.1880318

Federal Republic of Nigeria Federal Ministry of Education. (2021). National Policy on Science, Technology, Engineering and Mathematics (STEM) Education. *Federal Ministry of Education*. https://education.gov.ng

Fomunyam, K. G. (2020). Towards enhancing Science, Technology, Engineering, and Mathematics (STEM) education: A case for higher education in Africa. *International Journal of Engineering Research and Technology,* 13(7), 1516-1524. https://doi.org/10.37624/ijert/13.7.2020.1516-1524

International Labour Organization. (2025). World employment and social outlook: Trends 2025. International Labour Office. https://www.ilo.org/global/research/global-reports/weso/trends2025

International Monetary Fund. (2024). World economic outlook database October 2024. IMF. https://www.imf.org/en/Publications/WEO

Jiang, J., and Wang, X. (2024). Research on the development strategy of vocational undergraduate education in the context of digital China construction. F*rontiers in Educational Research,* 7(5). https://doi.org/10.25236/fer.2024.070522

Jonbekova, D., Kim, T., Kerimkulova, S., Ruby, A., and Sparks, J. (2021). Employment of international education graduates: Issues of economy and resistance to change. *Higher Education Quarterly*. https://doi.org/10.1111/hequ.12321

Kang, Y., and Mok, K. H. (2022). The broken promise of human capital theory: Social embeddedness, graduate entrepreneurs and youth employment in China. Critical Sociology, 48(7-8), 1205-1219. https://doi.org/10.1177/08969205221088894

Lefifi, T., and Kiala, C. (2021). Untapping FOCAC higher education scholarships for Africa human capital development: Lessons from . *China International Strategy Revie*w, 3(1), 177-198. https://doi.org/10.1007/s42533-021-00074-y

Levy, S., and Okoye, U. (2023). New directions in social work education in Africa: Challenges and prospects. Social Work Education, 42(2), 165-168. https://doi.org/10.1080/02615479.2023.2181530

Li, X., and Li, Y. (2023). Individualized and innovation-centred general education in a Chinese STEM university. Education Sciences, 13(8), Article 846. https://doi.org/10.3390/educsci13080846

Liu, X., and Postiglione, G. A. (2024). The renovation of higher education in the Guangdong-Hong Kong-Macau Greater Bay Area. Higher Education Quarterly. https://doi.org/10.1111/hequ.12567

Lopes, A. D., and Hancock, S. (2024). International mobility after the PhD: Exploring the characteristics and early labour market outcomes of UK doctoral graduates. Higher Education, 90, 899-920. https://doi.org/10.1007/s10734-024-01357-0

Miao, Y. (2023). The practice of STEM education in higher education context: China and USA. *International Journal of New Developments in Education,* 5(22). https://doi.org/10.25236/ijnde.2023.052204

Muogahlu, N., and Ahmad, A. (2023). Redesigning technical vocational education and training for sustainable economic development in Nigeria. *Journal of Vocational Education Studies*, 6(1). https://doi.org/10.12928/joves.v6i1.8021

Nalule, R. M., Muhumuza, A. K., Mbabazi, F. K., Kyomuhangi, A., Mwasa, A., and Oyem, N. O. (2024). Integrating STEM education in Uganda higher education to produce skills required to stimulate industrialisation and sustainable economic growth. The Uganda Higher Education Review, 12(1). https://doi.org/10.58653/nche.v12i1.2

Ogunlade, I. (2023). A novel pedagogical tool for childhood education in STEM and STEAM towards achieving sustainable development goals in Africa. *SFU Educational Review*, 15(1). https://doi.org/10.21810/sfuer.v15i1.6175

Olasupo, N. A., Ogunbanwo, S. T., Grillo, A. J., and Akapo, S. V. (2024). The need for partnership between the university and industry: Nigerian perspective. *International Journal of Latest Technology in Engineering Management and Applied Science*, 13(10). https://doi.org/10.51583/ijltemas.2024.131010

Olaniyan, Y. D., and Martins, M. O. (2025). Crossroads of consciousness: Whose decolonization is it in Nigeria? Frontiers in Sociology, 10, Article 1535330. https://doi.org/10.3389/fsoc.2025.1535330

Olarewaju, F., Ogundipe, A., Adekola, P., and Adeleye, N. (2021). Human capital and manufacturing output in Nigeria: A micro-data survey. *Research in World Economy*, 12(2), 132. https://doi.org/10.5430/rwe.v12n2p132

Onwusa, S. (2021). The issues, challenges and strategies to strengthen technical, vocational education and training in Nigeria. I*nternational Journal of Research and Innovation in Social Science*, 5(5), 48-59. https://doi.org/10.47772/ijriss.2021.5502

Osuagwu, T. (2023). Science communication: A panacea for addressing gender-gap in Nigeria STEM education. *International Journal of Educatio*n, 11(1). https://doi.org/10.5121/ije.2023.11105

Owojori, O. C., and Bolaji, A. (2025). TVET and social entrepreneurship for advancing innovation, creativity and sustainability in the polytechnic education in Oyo State of Nigeria: Prospects and problems. *Nigerian Journal of Technical Education,* 24(2). https://doi.org/10.63996/njte.v24i2.46

Peterson, M. (2025). Seeing the forest for the holistic learning trees. *Journal of Macromarketing,* 45, 512-518. https://doi.org/10.1177/02761467241313178

Rufus, O. O. (2022). Human capital investment and industrial productivity, as a correlate of sustainable development in Nigeria. *International Journal of Economics, Business and Management Research*, 6(1). https://doi.org/10.51505/ijebmr.2022.6107

Samuel, I., and Danladi, A. (2025). Shaping the future of STEM education in Nigeria through artificial intelligence. *Journal of African Innovation and Advanced Studies*, 7(2). https://doi.org/10.70382/ajaias.v7i2.011

Schultz, T. W. (1961). Investment in human capital. *American Economic Review,* 51(1), 1-17.

Ukelina, B. U. (2021). The mis-education of the African child: The evolution of British colonial education policy in Southern Nigeria, 1900-1925. *Athens Journal of History,* 7(2), 141-162. https://doi.org/10.30958/ajhis.7-2-3

UNESCO. (2022). Higher education global data report: Working document. UNESCO. https://unesdoc.unesco.org

UNESCO Institute for Statistics. (2024). Education statistics: UIS database. UNESCO Institute for Statistics. http://uis.unesco.org

Wang, S. (2023). Exploration of undergraduate vocational education in China: Process, experience and strategy. *Journal of Education and Training Studies,* 11(4). https://doi.org/10.11114/jets.v11i4.6426

Weber, M. (2017). Methodology of social sciences. Routledge.

Willie, C., Umanah, U., Daniel, U., and Asangausung, O. (2025). Technical education and industrial development in Akwa Ibom State, Nigeria. Turkiye Mesleki ve Sosyal Bilimler Dergisi. https://doi.org/10.46236/jovosst.1716906

World Bank. (2024). World Development Indicators: Industry including construction, value added (% of GDP). World Bank Open Data. https://data.worldbank.org/indicator/NV.IND.TOTL.ZS