

## Zimbabwe Education Burden in the Post-Colonial Science, Technology and Innovation Era

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**Abstract:** The development of technology and innovation depends on effective investment in all levels of education. In most cases Africa is found wanting in adequate funding of educational needs. Africa has no choice but to contribute into techno-scientific driven cultures of the 21<sup>st</sup> century world and beyond, if it is to grow sustainably, improve its economies, address social challenges of growth and development, to reduce extreme poverty and above all reduce consumption and dependency on Western technologies, inventions and epistemologies. This is a major concern that ought to be mitigated by postcolonial African education systems. Research indicates most African education systems still hinge on colonial discriminatory science educational practices, especially in the provision of access to science education which was and still is a privilege of a few. A qualitative literature review study was conducted to synthesize available published textual information complemented by observed evidence to better understand the burden of postcolonial Zimbabwe education's responsibilities in addressing historical and contemporary science education misconceptions. Data collection and analysis took place simultaneously. 'Constant comparison' model was used for data analysis-involving four steps; observing, note taking, coding and themes development. Sources of literature were selected through 'maximum variation' purposive sampling techniques. Research findings suggested that the current Zimbabwe education techno-scientific advancement is hindered by historical, institutional, policy, teacher capacity and incorrect value systems and mentality controlled by both power-politics and a conservative educational ideology. This study concluded by arguing for African education systems to be anti-exceptionalist and triumphalist. The study recommended inclusive science education, resuscitation, construction of appropriate and effective institutions that cultivate, groom, support development and sustainability of a science culture at all levels of schooling, especially with a focus on providing adequate faculties and facilities.

**Keywords:** Zimbabwe education; Burden; Postcolonial; Science; Technology and Innovation.

## INTRODUCTION

Most developing countries' education systems occur in most cases within imperial pedagogical tradition patterns of organisation and curricula materials derived from discriminatory Western educational ideologies who colonised them. Education in Africa and in Zimbabwe is historical, political, economic and socially interwoven and intricate to serve a straight forward, non-controversial utility. When Zimbabwe came to independence, it inherited deepening social, economic and political challenges that could be linked partly to colonial policies, promoted through the colonial education system and now perpetuated by colonial mentality and failure to be rational. To worsen the predicament of the independent Zimbabwe power-knowledge nexus, Zimbabweans were not historically

groomed and exposed to critical thinking, provocative education to enable them in the near future to creatively understand and be active engineers of a productive, self-reliant economy.

It is, but part of the major argument in this research that Zimbabwe's education and economy never sustainably developed since independence. The focus is how current Zimbabwe education system at all levels of learning (Holistic Approach), could make education a key institute for economic, social and political pragmatic development, also as an epistemological platform to challenge colonial mentality discourse since educational ideology is a notion that cannot be examined without circumspection. In other words, the role of universities inclusive of research, producing

human capital, technical expertise, functional literacy/useable skills, invention of technologies and other dynamics pivoted on sciences, can never be effectively achieved without these prerequisite developmental skills initiated from the early stages of learning. There is a need for access and inclusive science education to be synchronized at all school levels to be in tandem with practical, life-long-skills and knowledge especially techno-digital invention and functional literacy in the current Zimbabwe education

system, if not in the whole of Africa. The pedagogical paradigm shifts from repairing and appreciating technology currently promoted in the Zimbabwe education system, to technology designing and invention education orientation will cure Africa's dependency syndrome from foreign technological and epistemological consumption. This trajectory can only be achieved by a well-planned and adequately funded curriculum, reflective competent teachers and synchronized consistent education ideologies.

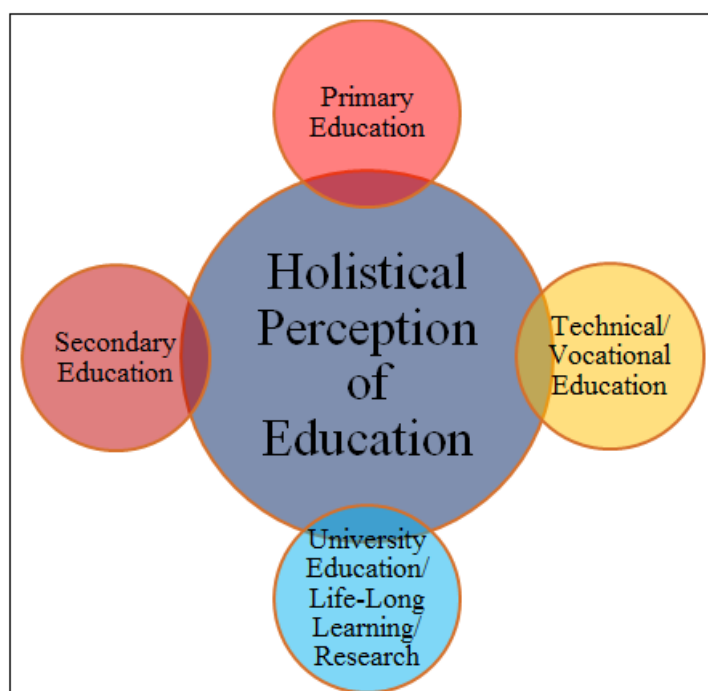


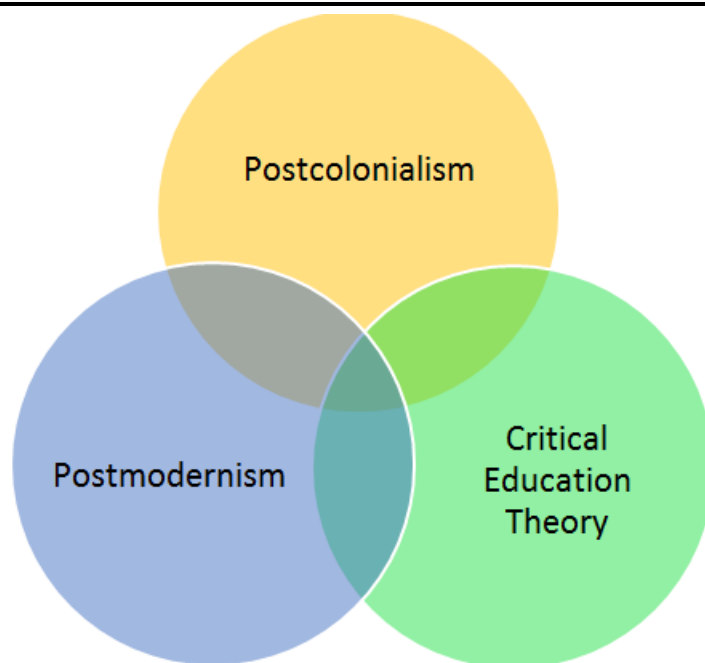
Fig-1: Holistical Perception of Sustainable Education

Colonial mentality with its origins from colonial education ideologies had many and still has perpetual challenges, especially distorting indigenous knowledge systems approaches to teaching sciences. It is not the objective of this study to dive into greater detail on colonial education challenges, but it is the objective of this study to research on contemporary African education systems and show how they have addressed colonially born education challenges like increasing access to subjects formally a preserve of colour. However, one cannot turn a blind eye on the historical influences to the current Zimbabwe education system. Historical developments are key determinants of the present and future influences of the Zimbabwe education system. Implications and after effects cannot be swept under the carpet, especially when it comes to tracing where current education challenges began and to understand whether the current Zimbabwe education system has reformed to mitigate historical distortions, indoctrinations and power-knowledge politics in the postcolonial education system. The research also needs

to come up with possible solutions to investigate challenges and rising matters concerning the research focus in postcolonial education, science and technology.

#### Theoretical Framework

The major theoretical framework guiding this study is the postcolonial theory espoused by Joseph Ernest Renan in 1871, furthered by Frantz Fanon in 1961 and other contemporary scholars [1-5]. Post colonialism is an academic discipline that analyses, explains and responds to the cultural legacy of colonialism and imperialism [6-9]. This research drawing from postmodernism and critical education schools of thought will view post colonialism as an analysis of the politics of knowledge where the colonizer/western claimed to be more intelligent than the 'other' colonised and therefore, invented and internationalised a dualised discriminatory education culture system that offered science and technology subjects according to race and intellectual capacities.



**Fig-2: Theoretical Framework**

This research is also of the theoretical opinion that colonialism is not in the past, not only physical, social, economic and political oppression by a foreign force as maintained in the traditional sense but its consequential replications have disappeared in its traditional originality and camouflaged in new diverse forms of electronic, neo-colonial forms, the ‘haves oppressing the have nots’, those with political-power making and dictating decisions for all. These modern forms of colonialism may be in some ways more insidious than pre-existence colonialism, also perpetuated and officiated in social institutions including schooling. In science education, contemporary colonialism in this research will be seen as intellectual, income and socio-political episteme-axiological discourse.

Even though mostly dominating discourse in the 1880s, post colonialism and education discrimination representations of the enslaved, colonised and oppressed as ‘inferior, stagnant and degenerate’ can be traced from Greek and Latin authors like Lysias, 440-380; Isocrates 436-338 BC; Cicero, 106-43 BC and Sallust, 86-34 BC. Particularly of interest to post colonialism and its implications to postcolonial African education systems is Michael Foucault’s thoughts on colonial discourse as “where

power and knowledge become intertwined” [10, 11]. The power that Foucault is referring to is not restricted to race, but according to Foucault “Power is everywhere, not because it embraces everything, but because it comes from everywhere”, including education. Meaning, anyone in authority has power and wishes to exercise authority as power to control those without so as to remain powerful. In the context of this research power-politics could imply, Africans in the colonial era and today are being controlled and given indoctrinated, restricted and censored inferior education with many bottle necks and limited to science and technology disciplines in some cases.

Today, poor Africans mainly in rural areas and high density suburbs are still given limited access to quality education, limited science subjects’ curriculum, and inferior infrastructure compared to private schools and some urban schools where there is better infrastructure, a wide spectrum of sciences for all, and technology and design subjects. It is of particular interest that those in power will always want to remain in power through accessing effective education that will reserve their status quo and also create social institutes that will make their fore springs maintain the acquired power status.

**Table-1: Colonial Education Politics**

Colonised Subjects/Colonial Mentality	Non-Colonised Subjects
Physics	History
Chemistry	English
Biology	Mathematics
Art and Design	Geography
Technology and Design	Literature
Technical Graphics	General Science
Engineering	Others (Divinity, Commercials, FF, etc.)

The role that education played in the colonial era and still plays today is not as functionalists or as mainstreamers maintain, bringing enlightenment and equal opportunities to more and more members of downtrodden classes of society. There are cultural and ideological mechanisms within the inferior order of schooling and curriculum organisation and out again to the contested conflicted world deeply stratified and striated by dynamic relations and structuring principles of race, greed, class and gender. There are hidden relations in the political, economic and cultural fields of schooling.

**Data Collection and Analysis**

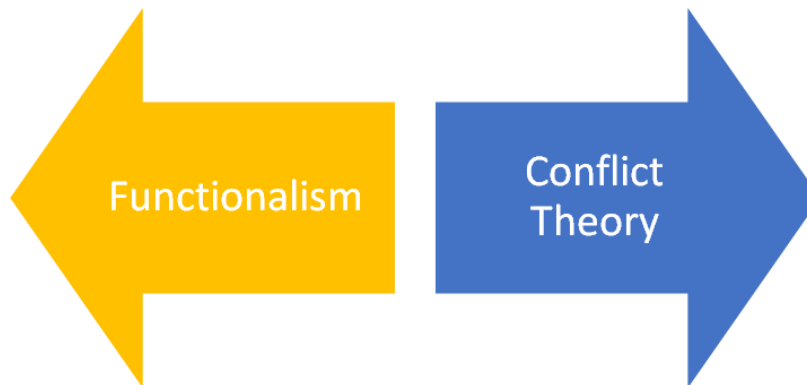
**Developmental Theory of Schooling and Society**

Schooling as a catalyst for economic, social and political development originated from the alchemist traditional theory of schooling and the liberal ideology of education theory based on the democratic-liberal functions of schooling, further outlined by

functionalists, institutional theorists, based on the widely held view that Western education/formal schooling brings people out of their ‘ignorance and underdevelopment’ into a condition of ‘enlightenment and civilisation’ literacy [12-15]. These theories argue for a number of related themes in the development of worldwide educational systems with its formal roots in the West. These themes include the worldwide success of mass schooling and sees schooling as an institution and sees development as only brought by educational change and institutional change [16]. They also argue that mass schooling is a universal right, all children should be schooled, that nations should invest on schooling, education functions for personal, social and economic development. True may it be from a generalised point of opinion, but a question could suffice on whether formal education or schooling brings social, economic and political sanity, stability at national level?



**Fig-3: Alchemist View of Education**



**Fig-4: Two Major Conflicting Views on Schooling and Development**

Postmodernism and critical theory developed out of a profound dissatisfaction with the alchemist and democratic-liberal modernist project of enlightenment and reason [17-19], questioned education’s thought of being capable of redressing social inequalities. According to the conflict lenses, even though schooling brings people out of the traditional hierarchy, it also brings them into a capitalist or whoever is in power hierarchy. While the process of education has elements of liberation it includes elements of dependence and alienation. More important, the school doesn’t create the conditions in which the pupil can begin to liberate himself or herself [20-22, 15]. Rather the degree of liberation allowed by the school is controlled by those

who are the most influential in setting goals for society. In most cases those setting goals have never wanted a totally liberal education system to the extent of entertaining schooling to be critical to revolutionary and critical thinking elasticity.

To the current Zimbabwe education and its role in societal development, postmodernism and critical theories paint a more realistic depiction compared to the institutional theories. One supportive example in agreement to postmodern implications are the negative features of the current Zimbabwe education system characterised by high literacy but increasing levels of unemployment amongst the

educated. For national stability the belief that more education leads to better jobs has been a principle motive for young people to stay longer in schools and out of criminal activities. However, despite young people spending time in schooling there are still challenges within most African schools. Formal schooling in Africa has been criticised as 'bookish' [23, 24] and often not leading to the teaching of vocational or real-life-skills, but encourages conformity to theories rather than critical thought, innovativeness, contextualisation and an unthinking acceptance of the need for qualifications rather than the application of practical knowledge. There is need for African education systems to question and modify Western models of education to suit current African technology and economic requirements.

### **Zimbabwe's Historical Efforts to make Education a Developmental Catalyst**

From the 1980s the Zimbabwe government tried addressing colonial education challenges including addressing challenges of accessibility, meeting universal free primary education, issuing tertiary education grants and also tried to reform education along education with production approaches with an intention of making the curriculum, science, practical subjects and agriculture focused. By the beginning of the 1990s the concern of education was to localise education examination boards. The 90s also witnessed the concern for educational expansion including gender equity especially trying to eliminate achievement gap among boys and girls by 2000 and increased universities. By 2000 the Zimbabwe education system tried to follow and fulfil international protocols and the Nziramasanga [25] commission of inquiry findings, that mainly described Zimbabwe schools as mediocre at best and that national education was falling behind the international education power houses like Japan and German whose students performed better on international examinations, reading, science, mathematics, technology and design, and engineering competitions-which are seen as key areas for productivity and national development. An education debate after the Nziramasanga report came alive and many proposed a national education system that stressed higher standards for all students especially with a focus on Science, Technology, Engineering and Mathematics (STEM) seen as key subjects to spring forth economic development.

In trying to meet the above educational targets, today educational policy makers are concentrating on setting high sciences based curriculum standards especially for high ability learners in both rural and urban schools and hoping that STEM gifted children can meet the standards and become contributors and cornerstones of education and development. Although one can agree with government efforts and the role of education in development, but in critical considerations one could question whether targeting few STEM gifted

student population could turn around Zimbabwe's economy or STEM education could be a catalyst to bring much needed productivity and increased export revenue for economic development? Also critical to STEM education as a catalyst to economic development, is whether STEM education is proposed at a time when a plethora of educational challenges haunting and derailing effective education to play its vital role for national development are addressed? One could immediately think of other array of questions like, can education as an institution be an adequate stand-alone developmental factor (even given that challenges such as resources devoted to education are sufficiently adequate) for total economic, social and political development?

There are a lot of considerations to implement before one can entertain the thought of education being pivotal to economic development of a country like, careful planning and delivery of a national curriculum, political stability, consistent and followed national educational policies in tandem with economic targets like productivity, teachers to be rigorously trained, supervised and remunerated to meet national expectations like generous time and support for slower students, normalising student-teacher ratios, improving and constructing relevant schooling infrastructure, improving and funding adequately research standards and many other considerations like grooming a national science culture at all levels of schooling. One could literally write a book on how Zimbabwe needs to address its education challenges before its education could play an effective and adequate role in economic development. The burden in the Zimbabwe's postcolonial era so to speak is to address diverse educational challenges, plan and organise its education system to contribute to national economic development, meet contemporary education dynamics and above all eliminate discriminatory education tendencies rooted in historical and current STEM streaming influences. However even remedy to challenges is known there are financial constraints given the situation that most African education systems face a doubled-edged sword threatening to chop down sustainable development, to repair dilapidating infrastructure at the same time burdened to plan and finance new infrastructure.

### **Zimbabwe's Education Burden in the Postcolonial Digital Era**

According to human capital and modernisation theories, Science, Technology, Engineering and Mathematics, are seen as important subjects in any given curriculum and highly instrumental in improving the productive capacity of a population [26, 27, 12, 28]. True as it may be, education can play an indirect major role in economic development through provision of human skills and techniques designed to improve competencies. The direct contribution of education to economic development is therefore, in terms of the quantity and quality of occupational skills assuming

that skilled labour is a vital component to national development input factors. In criticism of the human capitalist perception Berg as early as [29] disagreed by arguing that schooled employees are not generally more productive and in some cases are less productive, from a research sample done with diverse workers. Other researchers like [30-32] also carried out researches and summarised that vocational skills needed for economic development were not usually learnt in schools back then, but on the job experience or practice. They also argued that, educational quality has little effect on subsequent productivity. Given the scenario that the technical-function theory of education, then in developed countries, did not give an adequate account of the human capital theory evidence. To the current Zimbabwe economy, evidence indicates no clear contributions of education to economic development, beyond the provisions of mass literacy.

According to research evidence above, education is often irrelevant to on-the-job productivity and is sometimes counter-productive; specifically, vocational training seems to be derived more from work experience than from formal school training. The quality of Zimbabwe schools, education system and the nature of certificate-dominant-education culture suggest that schooling is inefficient as a means of training for work skills. While in pre-colonial African education systems, learning was more-hands-on, based on experience and practical vocational learning hence there was limited poverty, unemployment and self-reliant non-monetary economies. There are lessons that the current Zimbabwe education system can deduce from indigenous education systems.

Given the two opposing views, how best could the current Zimbabwe education system be improved to contribute to skilled and effective human capital supplementation? Some researchers [33, 34, 3, 35] propose that, the world has entered a period of reaction in education, but the challenge is that, educational institutions are seen as a total failure. In other words, they argue for schooling reformation from theoretical education to real-life skills orientation. For example, the current Zimbabwe education system has experienced, high-dropout-rates due to students seeing no relevance to formal education and citing diverse reasons, a decline in functional literacy, a loss of standards discipline, and dedication by both learners and practitioners, poor scores on standardised tests, streamed access to vocational and STEM disciplines. All these and other challenges have led to declining economic contributors, reduced potential employment creators, poverty, loss of

international competitiveness and above all, socio-political stability-corruption, nepotism, cronyism, mismanagement and so on. Today's education burden is to make schooling more efficient, more responsive to contemporary dynamics. However, there are challenges in finance, dedication, adequate resource supplement to this end, which seems the most prevalent challenge today in Zimbabwe education planning.

Education in Africa has failed to play essential developmental roles because it has been politicised, it is now a site of struggle and compromise. It serves as proxy as well for larger battles over what schools should do, whom they should serve, and who should make these decisions. Thus education according to [36-40] is both cause and effect, determining and determined. Because of this, no single article, nor level of schooling, could hope to give a complete picture of this power-politics complexity in education and economic development. Universities, Science or STEM oriented education alone and adequately funded education will not develop Zimbabwe's and Africa's current and future economies.

Despite a number of burdens to address, the current Zimbabwe's most education burden is to mitigate colonial discriminatory education policies, broaden the current narrowly concerned curriculum, dominated by examinations and general literacy, include technical, vocational, sciences, technology and innovation subjects for all. A number of science subjects, necessary for training the students to take part in the industrial and development of the country are not included and accessed by majority students. For example, historically, there are some subjects that could contribute to the development of a national science culture that were formally a preserve of the minority and only offered in elite schools. There is a need of increased inclusivity in the national curriculum on subjects like Art and Design, Biology, Chemistry and Physics, Engineering, Technology and Design. These subjects are still not availed to majority learners in public schools, colleges and universities, yet essential for science and innovation national development.

**FINDINGS**

By analysing perceptions from two major schools of Thought-Functionalism embracing institutional, allocation, liberal education theories in comparison to Conflict theory embracing postmodernism, critical education theories there were four major findings that were deduced in context of the research question and focus.

**Table-2: Summarising Findings**

<b>Functionalist Theory</b>	<b>Conflict Theory</b>
Education contributes to all development	Develops Capitalist Tendencies
Produces Needed Social Skills	Produces Cheap Labour and Indoctrination
Mass Literacy and Mobility	Furthers Social Inequalities
Liberates	Alienates

The current Zimbabwe education system doesn't focus on teaching learners' real life skills, for example, how to make a computer but focuses on how to use a computer and therefore does not contribute into techno-scientific driven cultures of the 21<sup>st</sup> century world and beyond, hence not reducing Africa's dependence on foreign technologies. To further reduce scientific culture among learners and scientific contribution, the current Zimbabwe education system still hinges on colonial discriminatory science education access practices which was and still is a privilege of a few-for example there are limited pure sciences taught at primary level and no science laboratories in most, if not all Zimbabwe primary schools, at secondary level pure sciences are streamed and most secondary schools have limited supportive science infrastructure and qualified and competent science teachers. In Zimbabwe there is no single science teacher training institute further worsening the plight of non-inclusiveness of sciences sustainability and development.

According to literature reviewed and analysed this research discovered that education has three functions-the integrative, the egalitarian and the developmental. These functions are mostly noticed at individual level and have challenges to be proven applicable to national development. These functions are mostly from basic assumptions concerning the nature of social life and assuming that the accessed education is free, universal, well planned-both qualitative and quantitatively adequate, effectively financed-the school system can render the opportunities of self-development assumingly that can contribute to national development. However, theoretically it may be the case, but in reality especially looking at African education systems, Zimbabwe not being exceptional, education is not free and compulsory, education access is a challenge, those who access it face a plethora of internal challenges that incapacitate them to reach climax of their educational development.

**Table-3: Summarising the Three Category functions of Education**

<b>Economic Benefits</b>	<b>Socio-political Benefits</b>	<b>Human Capital and Professional Benefits</b>	<b>Other Benefits</b>
Skills Knowledge	Decision Making	Professions	Research/Innovation
Employment	Status	Potential Capacity	International Cooperation
Human Capital	Social Mobility	Literate Workers	Technological Progress
Income/Taxation	Reduced Crime	Groomed	Self-Reliance

It came to light that the current Zimbabwe education hinders scientific advancement because of its perpetuation of historical (sciences are still seen through the lenses of ethnocentric exceptionalist and triumphalist-preserve of the few intellectually gifted), cultural and institutional controlled practices, value systems and mentality by focusing on basic literacy, production of moral upright learners who can be employable and adhere to social mobility and rational decision making. However, the current Zimbabwe education system seem to have challenges of being an

important solution to national economic, social and political challenges. There is a need for the current and future Zimbabwe education system to provide equal access to mass science education for all and schooling must be rationalised around national development and technological discovery, and invention goals.

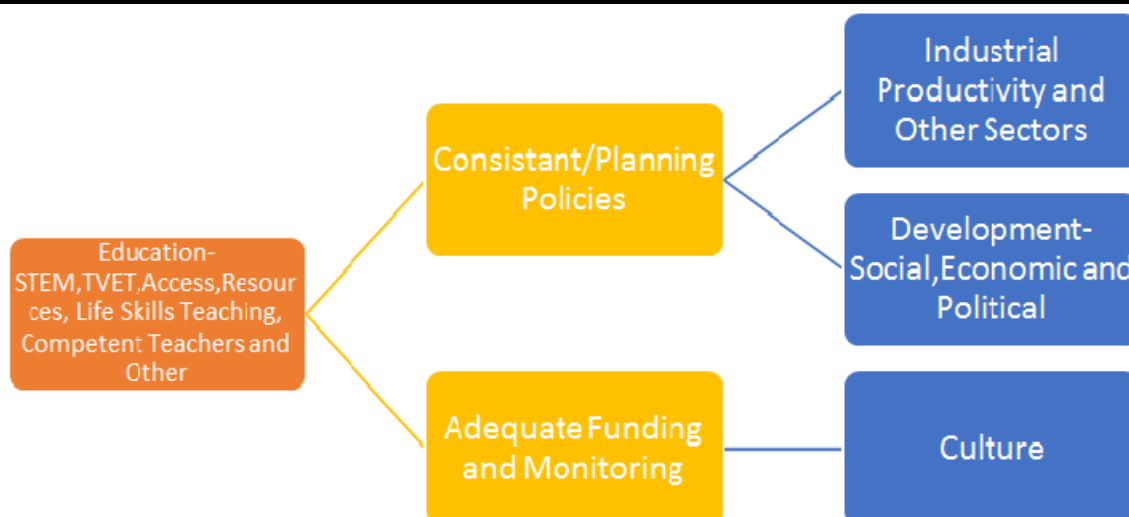
The following challenges can be summarised as key hindrances for the current Zimbabwe education system to be a key institutional contributor to national development

**Table-4: Summarising Challenges Hindering Education Contributing to Development**

<b>Qualitative Challenges</b>	<b>Quantitative Challenges</b>
Lack of Functional Literacy	Lack of Well/No Equipped Laboratories
Limited Science Subjects Curriculum	School Shortages, Poor Infrastructure and Science Teachers
Limited Access to STEM and TVET for all	Discriminatory Education System based on Income
Inconsistent Education Policies	Access Challenges to Technology
Demotivating Working Conditions	Insufficient Teaching Resources and Material

It is the general opinion from synthesised data that if these education challenges are adequately solved, complemented by supportive national consistent integrative policies and productivity, education is

capable of being associated with high economic, technological and functional literacy change and development.



**Fig-5: Proposed Approach to National Development**

**CONCLUSION**

Education seen as an allocating institution operating under certain rules and regulations which allow schools to directly confer individual success or failure in society, has come under criticism in its national developmental role. Allocation theory leaves open the possibility that expanded educational systems have few net effects on societal development. Allocation theory has two major implications, investment in education has traditionally been justified by optimistic exceptionalists and triumphalists claiming that an educated population contributes to socio-economic development of society as a whole and the second, that education contributes to the well-being of the individuals within society. Perhaps there ought to have been specific examining whether education and schooling could be treated as the same or different. But the argument still remains relevant could one conclude that education or schooling alone bring about technological invention, productivity and economic prosperity-the bigger picture of national development? The observed challenge in Zimbabwe is the disintegrated education system that lacks synchronization to promote equal access to a wide science curriculum spectrum from primary level to tertiary yet sciences have been argued to be vital and pivotal to contemporary development.

In this research the allocation theory assumptions have been called into question, the age of innocence has given way to the age of skepticism. Educational expansion, general reading and writing mass literacy in postcolonial Zimbabwe and other developing countries have not necessarily made either people or country more prosperous, instead it has made the former without jobs and the latter with increasingly burdensome claims on public funds. In other words, education in Zimbabwe, perhaps Africa, has not yet played its allocation theory significance of creating jobs, self-reliance, improved technology and innovation, solved economic and political challenges.

Instead, has perpetuated its colonial role of allocating people to fixed set of positions (teaching, nursing, medicine, engineering et al) in society. Even though faced by vast challenges the Zimbabwe education system is in tandem with the allocation theory for being significant in the universality of collective reality-imparting modern ideas and appreciation of science and technology, mass literacy, national history, constructing a common civic order, encouraging citizenship responsibilities and other values. Of much significance is the question on whether contemporary Zimbabwe education system's burden be content with an education system that prepares its learners to fit well in already existing societal structures that are conservative and under developing the country or opt for an alternative education system, that address existing societal challenges like unemployment, lack of technological invention, move from general literacy to high value scientific-techno invention and manufacturing literacy?

African dependency on the West is a major concern and challenge that ought to be addressed by postcolonial education systems. From ancient to contemporary times in any economic and social development, science, technology and innovation have emerged as the 'magnum opus' of all development. Science and society are inextricably linked yet in Zimbabwe science is still accessed by only a few intellectually gifted learners. However, neither science and technology nor the economy of any country should be left to operate wholly on its own without effective education, political stability, consistent and followed national development policies. Africa, Zimbabwe has no choice but to improve its education systems in order to integrate and contribute to techno-scientific driven economies of the 21<sup>st</sup> century world and beyond, if it is to grow sustainably, improve its economies, address colonial and contemporary social challenges of growth and development to reduce extreme poverty and above all, reduce consumption of Western and Eastern technologies, science, inventions and epistemologies.



## RECOMMENDATIONS

Given the burden of the current Zimbabwe education system in a science and technology era, Zimbabwe's rationale in its educational and national plans should be focused on five major resolutions:

- Introduce a wide spectrum of sciences for all from primary school level.
- Construct relevant supportive infrastructure for science and innovation driven curriculum.
- Develop competent human resources in science, technology and innovation.
- Improve both quality and quantity aspects of schooling.
- Promote and support a culture of research, science, technology invention and productivity at all levels of education.
- Increase science education access to all students.
- There is a need to construct an all science special teachers' colleges in addition to the traditionally multi-purpose colleges already in existence.

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