

The concept of Decolonisation within Engineering Education

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Abstract

The concept of decolonisation continues to be a topic of debate across academia largely in South Africa and other historically colonised nations. There are many questions and few answers, however there seem to be clear directions for soft disciplines like humanities. In contrast for hard science discipline such as engineering, the topic of decolonisation generally remains a baffling endeavour. This research paper undertook a study to understand the applicability of the decolonisation concept within engineering education, as understood by students from three different engineering schools within the University of the Witwatersrand, Johannesburg. The knowledge sought was to address questions such as “what is decolonised engineering education?”, “what are the attributes of such a decolonised engineering education?” and “what are the changes needed within the university in order to decolonise engineering education?” amongst other questions. Discoveries include developing an Afrocentric education taking into account things such as institutional culture, racial diversity and impact of the education in society post-graduation. This paper rates and highlights the intensity and importance of some of the pressing issues that need to be addressed if decolonisation is to take place. At top of the list is the need to transform institutional culture and at the bottom is the need to do away with hierarchies in education.

Keywords

Decolonisation, Engineering, FeesMustFall, RhodesMustFall, Curriculum, Race, Language, Gender, Academia, Afrocentric

1. Introduction

1.1. Research Background

In 2015, University students across South Africa boycotted lectures and embarked on mass demonstrations, under the social media hash tags *#FeesMustFall*, *#RhodesMustFall* amongst other specific demands. Their protest was a campaign for free, quality and decolonised education (Mwaura, 2017). These demonstrations began a series of dialogues and researches across South African institutions and amongst scholars, one of the agendas in these critical inquiries was a need to understand what exactly was meant by 'Decolonisation of education'.

1.2. The problem

Much of the work already done to define what decolonisation is, locates within the context of the Human Science disciplines, for instance literature, history, psychology, sociology and others, where issues highlighted in the preceding section are involved and worked upon, namely; language, culture, race, context of knowledge, gender dynamics, and centering curriculum on local content and experiences. However as far as Science disciplines are concerned for example Mathematics, Chemistry, Physics, there seems to be uncertainty regarding the shape decolonisation takes. In other words, there is uncertainty regarding the meaning of decolonisation in sciences particularly because science is generally viewed as universal, making decolonisation, in the manner described by the Humanities, a more difficult task to conceptualise. Engineering, being a Science discipline is therefore affected by the difficulty of conceptualising what decolonisation means in Science disciplines.

The purpose of this research was to uncover the meaning of decolonisation of engineering education. The focus was to extract meaning from views held by engineering schools from the University of the Witwatersrand, Johannesburg.

2. Literature review

2.1. The concept of Decolonisation

The earliest account of the word *decolonisation* was noted by Professor C.R. Ageron to having being used as early as 1836 by a French writer advocating withdrawal from Algeria. In this context the word took a political context as this unknown French writer was calling for the French government, the coloniser, to end its rule in in Algeria, the colonised. The word *de-colonise* came to embrace liquidation of foreign rule as well as economic and cultural supremacy in the north Atlantic word (Hargreaves, 1996).

The term decolonisation re-surfaced in the 1950s and 60s when it was consistently used by historians to describe the process through which many regions in Africa, Asia and the middle east had broken free from European hegemony (Resendiz, 2014). A vivid description of decolonisation was outlined by a Psychiatrist and French-Congolese Author, Frantz Fanon who also agreed that the coloniser and the colonised are the main subjects of decolonisation, that it is a battle for power struggle between two groups. He writes in his book, *the wretched of the earth* (Fanon, 1991), "Decolonisation is the meeting of two forces, opposed to each other by their very nature, which in fact owe their originality to that sort of substantification which results from and is nourished by the situation in the colonies". This definition of decolonisation does not violate the visible trend of two groups involve, the *coloniser-colonised* link in the description of the decolonisation process.

In Africa, the term decolonisation was dragged through the years into the present day and made popular by Kenyan English professor and writer, Ngugi wa Thiongo in the 1950s. Ngugi, who came to be known as the father of decolonisation after he successfully *decolonising* the department of literature at the University of Nairobi in the 1970s (Mwaura, 2017), became conscious of and consistently used the word since then, when he learned how African languages were dying out due to the dominance of the English language. Decolonisation seems to be the instrument through which all elements of society which are made possible, in their undesired nature, by colonial causes, are transformed.

2.2. Decolonisation within higher education

In 2017, a group of students who were involved in the call for decolonised higher education were very specific in what they mean by decolonisation. In a book written by various activists for free decolonised education, titled *Rioting and writing - diaries of the wits fallists*, their definition of decolonisation is more about envisioning an inclusive future and eradicating all historical elements of society which prevents such a future. They explicitly described decolonisation as “The rejection of white supremacy (racism), heteropatriarchal order and other forms of prejudice that characterises the on-going project and the quest to redress the socio-economic, political and spiritual depredations of colonial history. It includes the transformation of institutional and academic cultures, epistemological and ontological dimensions, curriculum development and pedagogical practice to that informed by local experience” (Canham, et al., 2017).

However even with such a seemingly robust meaning of what decolonisation is, the debates on the subject are on-going. Stake holders involved in the decolonisation of education projects bring many different views to the table. This makes the task of agreeing on a feasible plan of action a difficult one. Some of the views findings brought forth on the subject of decolonisation of education are briefly outlined below:

Language and culture

The question of language is consistently touched by decolonisation scholars. Language is seen as the crucial factor on the decolonisation process, particularly in its power to be a carrier of knowledge and culture or as a barrier to access the same knowledge and culture (Ngugi wa Thiong'o, 1986). An analyst of the Wits language policy stated that taking into account native languages by Wits University is a “crucial step of decolonisation” (Tshwane, 2016). Not only on decolonisation but language is argued to play a pivotal role in the learning process of indigenous people [8].

Curriculum

Decolonisation scholars view curriculum transformation as a major element of decolonisation. In this regard, curriculum takes three forms which are argued must be critically examined for any transformation associated with the higher education curriculum. These forms are; explicit curriculum, hidden curriculum and null curriculum (le Grange, 2016).

Explicit curriculum is the known curriculum of the classroom i.e. the standardised frameworks, prescribed readings, assessment guidelines etc. On this form of curriculum the argument is largely on transforming the Eurocentric nature of the curriculum, doing away with western epistemological supremacy and bringing Afrocentrism and diversifying epistemology (Mbebe, 2015).

Hidden curriculum refers to the elements of the university which influence the student indirectly such as the dominant culture of a university and the values it reproduces (le Grange, 2016). Here it is argued that the focus should be on the role of space within the university. It is argued that things which are not explicit in their nature, like statues, building types and names, culture and every element which makes up the learning space have a force and power to transform a person's thinking and being (Murriss, 2016). This is of concern to students who expressed their concern in this manner; “Our universities in the current form are alien to us as Africans and represents Anglo-Saxon institutions transplanted in Africa” (Canham, et al., 2017). Decolonising the university involves recreating the space such that it does not accommodate certain people while excluding others but must accommodate everyone who is a member of the university.

The null curriculum is what is left out of the curriculum i.e. not taught in the university (le Grange, 2016). This could include indigenous knowledge, in the African context African Knowledge. It is believed that African knowledge is available but is side-lined; i.e. excluded from the curriculum, by western models of academic organisation (le Grange, 2016). In null curriculum decolonisation is all about bringing in other knowledge into the curriculum instead of prioritising western knowledge forms. There also has to be a platform for developing alternative models of knowledge (Mbebe, 2015), which then gets brought into the explicit curriculum.

Hierarchies in higher education

Decolonisation also appears to be a tool for dealing with any form of inequality. This is particularly relevant in the university space because as part of the broader society, the university is presented as a contestant space that often reflects and brings to the fore these broader societal struggles such as inequality, unemployment and poverty (Canham, et al., 2017). Some of the inequalities which are used as argument to form a critical part of the decolonisation project are racism and gender inequality.

Race is involved in that it was the Centre of creating the education institutions in the past. It is said that tertiary institutions were designed and segregated on the basis of race; those which catered for Africans would not enable a black person to obtain a professional qualification while those which catered for white people served white people well i.e. enabling them professional qualifications within the contexts of their needs. This uneven treatment was an instrument in the development of unequal disciplinary academic and ideological identities (Ruggunan, 2016). The effects of racism are believed to be continuing in the modern space of higher learning, this is seen by the continued discrimination on the basis of race within these institutions (Dominguez-Whitehead, 2017). Decolonisation has become the rallying cry for those trying to undo the racist legacies of the past (Mbebe, 2015).

Transforming gender inequality forms part of the earlier definition of decolonisation which highlighted the need to combat the forms of prejudices such as hetero-patriarchal order i.e. a setup which puts males at the centre of decision making, headship and occupation of the political and production spaces. Statistics shows that many professors in higher education institutions over the world are male and that there are only few females that are working in high levels of academia (Tickle, 2013), such as holding positions in the higher management committee of university departments. Hence it is argued that another layer of decolonisation must look into gender inequality in higher education.

2.3. Decolonising Engineering education

Engineering education is possible because of the existence of scientific knowledge. Therefore a preview of engineering decolonisation is taken hand in hand with the agenda of decolonisation of science. While science related fields such as physics, chemistry, biology and others, make the understanding of the world and the universe possible, engineering enables this understandings to come to life through problem solving, designing and building things. Engineering is defined as the application of scientific knowledge to solve problems in the real world (Case, 2010). Decolonisers are more concerned about the later part of the definition, namely, whose problems is this application of science solving? Of interest would be a question such as, “in engineering education what African societal challenges need a transformation within the engineering curriculum in order to be addressed?” This is irrespective of the origin of the science itself. Knowledge, including scientific knowledge, can be African centred, but it is believed it does so only when it is entangled in African realities, lexicons and matrices and shaped by these contexts (Naude, 2017).

A case is given of an approach taken by a certain medical school to decolonise the curriculum as a response to a challenge of lacking cultural diversity within the training process. Medical specialists were trained to cater for a limited audience, as such when they were exposed to other cultures on duty; they had difficulty with the doctor patient relationship, which saw the patient not getting the full benefits of science. To address this challenge, i.e. to decolonise, the school developed a curriculum which was diverse culturally, as stated in the article; “medical curriculum must be bold and embrace cultural diverse education in the classroom and on the ward.” This approach was said to help address power imbalance in the patient-clinic dynamics and improved tailored care (Nazar, et al., 2014). They further suggested that education should consider adopting a bidirectional mode of teaching where appropriate and work with students to decolonise the medical curriculum. The approach used by this medical faculty emphasises the argument stated by decolonisation scholars that decolonisation should respond to the challenges faced in society (Canham, et al., 2017).

3. Research Question

This main research question is: How is decolonisation within engineering education conceptualised?

Sub questions used to support the main question:

- What are the attributes of decolonised education?
- Are these attributes applicable to engineering education?
- Based on these elements, what is decolonised engineering education framework?

4. Methodology

A qualitative research approach was selected as the most suitable for obtaining the information required. As much was unknown about decolonisation and there was a need to get views from many people as possible yet the same time having relative depth to the information provided. It was selected to conduct a survey using a questionnaire that contained open ended questions to capture the views of the participants on the subject of decolonisation. In this way both a wide participation and relative in-depth to the responses was achieved.

4.1. Setting of the study

The study was carried out in the academic year 2017 within three different engineering Schools; School of Mechanical Industrial and Aeronautical Engineering (MIA), School of Civil and Environmental Engineering (CEE) and School of Metallurgy and Material Engineering (MME) under the faculty of Engineering and the Built Environment at the University of the Witwatersrand, Johannesburg. There were 194 participants: 39% CEE students, 40% MIA students and 21% MME students. They ranged from 2nd to 4th years of study. In collecting data, the key assumptions were that the subject of decolonisation is not only for the historically colonised, anyone from any race can have a say; and that the views and opinions of all students, locally and internationally have the same weight on the subject of decolonisation.

4.2. Data collection

Using questionnaires, data was collected from engineering students from the above mentioned Schools. Printed questionnaires, with closed and open ended questions, were handed out to the students who were willing to participate. The questionnaires were handed out following class sessions to capture as many students as possible, and ethical procedures were observed, where students were free to voluntarily participate. The results were collected for further analysis. Content analysis was then undertaken for analysis of data and simple descriptive statistics was also possible (Maree, 2007).

4.3. Ethical considerations

The research was ethically cleared by the School Ethics Committee of the university where the study was carried out.

5. Results

The table below shows the responses of participants in codes which are in the form of general encompassing phrases. The table also shows the frequency in which a particular issue came up from the participants.

Table 1: The outcome of the open ended questions

Codes for Decolonisation definition	Key Phrase	Frequency (Out of 100)
1. What the education entails; it's Centricism-particularly Afrocentricism. This includes language in most cases. Also involves change in curriculum to inclusivity origin of knowledge as well as African Way of doing things	Centrism	51
2. Influence on the education particularly the values, ideals, beliefs, models and history, on the basis of which was are more supreme	Who influences the education	37
3. Diversity of content (i.e. considering contents from different backgrounds) and racial diversity of stuff/lecturers	Diversity	15
4. Accessibility to education for everyone	Accessibility to the education	14
5. Who the education benefits, who it empowers and who it favours	Who the education benefits	13
6. Teaching and learning style(pedagogy)	Teaching and learning style	8
7. Education biasness - in terms of originality; in terms of inherited values and ideals also in terms of who it empowers	Biasness in education	6
8. Downgrading of education(Completely bring change-especially un-progressive change)	Downgrading of education	3
9. Assessment of the content being taught	Manner of assessment	1
10. Hierarchy in education (including racially)	Hierarchy in education	1

6. Discussion

Decolonisation of engineering education proved to be a complex endeavour in the literature review as no prior work was found. However from student surveys returned in this study, several views on decolonization were realized. Interestingly, issues such as curriculum changes, language of instruction, race, space, centrism, gender and culture came up. On the issue of race, majority of students rejected the notion that engineering education will be decolonised if it is fully delivered by African lecturers. Notably, institutional culture took the centre stage as one of the top priorities when the question of decolonising engineering education is concerned.

From the results, most of the students agree that there has to be changes on curriculum centrism, but still hold the view that decolonisation can still take place without the use of indigenous languages. These views contradict with the idea of language as a carrier of culture as presented in literature because while majority of students saw the possibility of decolonisation without an African language (albeit very important), they still rated institutional culture as the keyset aspect of decolonisation.

There were no contradicting views on racial diversification of staff and the need for staff-student collaboration in an attempted process to decolonise engineering education. There was also little opposition on the need for addressing gender inequalities as part of decolonising engineering education, echoing the findings from literature. Furthermore, students felt that gender and race cannot be separated, hence in gender transformation, race should be taken into cognisance. However, gender equality was more important.

All other themes from literature, such as space and pedagogy, were confirmed as important aspects of decolonisation in line with the literature; notably the question of Afrocentric education baffled a lot of students. Even though majority agreed the concept is necessary, a large part of the students neither agreed nor disagreed to the concept nature.

Four aspects of explicit curriculum were rated by students on their importance in a decolonisation process of engineering education, namely; the change in engineering content, desired outcome of the engineering education, the style of teaching and the manner of assessment. Generally across the schools, the views are that all these four aspects need to be reviewed as part of the decolonisation process. Comparing with literature it is noted that, the view regarding the need of change in engineering content, is also indicated in the literature which mentions a need for epistemology to be diverse, and that epistemology should not be Eurocentric (Mbebe, 2015). The second view, regarding desired outcome of engineering education, also speaks closely to what was revealed in literature concerning the problems which the engineering education solves (Canham, et al., 2017). It was discovered that it matters whose problems the education solves.

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7. Conclusions

The study has met its purpose and succeeded in exploring the meaning of decolonisation in Engineering education from the perspective of students who were involved in agitation around the concept hence uncovering its meaning. It should be noted that the concept of decolonising engineering education proves to be an emotive subject hence of disruptive nature as evidenced in the lack of visible neutrality from participants. Clearly there are strongly held views and there is not one common accepted meaning by everybody. Nevertheless, even though the decolonisation of engineering education means different things to different people, the study has found that the concept of decolonisation is considered applicable to engineering education by Engineering students. In addition the study has found that certain views about decolonized Engineering education stand out more prominently than others among the students. The study findings indicate that curriculum reform is a crucial part of decolonising engineering education. Primary focus should be given to developing a curriculum inclusive of knowledge from different backgrounds, devoid of dominant western influence culturally and historically, and free of bias of any form e.g. towards a certain race or gender. The study findings recognise Science as a universal discipline and that engineering education cannot be complete without the laws which govern the universe, therefore science must remain within the engineering curriculum. However the position is that it should not come with the traditions of western supremacy within the local university. This is addressed by developing a locally centric education, in this case Afrocentric education. The study notes that the use of an African language is a crucial element of developing Afrocentric engineering education. While the removal of western discovered science from engineering will result in an education which is no longer able to solve engineering problems. However efforts must be invested in including African science (knowledges) within the engineering curriculum as well as on developing new knowledges.

8. Suggestions for future research

For future research some themes are worth pursuing that have arisen from this study. Among these, an investigation into indigenous scientific knowledge's should be made with the focus on discovering formerly available knowledge and knowledge being developed today which is excluded from the engineering curriculum.

Another area of interest is the applicability of an African language which has been highlighted as necessary for developing an African centred education. A detail investigation should be made on the implementation of an African language within engineering education.

A notable highlight which came from the research is that decolonisation is a collaborative process between staff and students. An investigation should be made on the role of students in the decolonisation process.

Finally, it is recommended that an investigation be carried out on the potential impact of engineering education on the local society, particularly the society of the very individual who acquire the engineering education.

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