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The effects of the shift from traditional craft subjects to design and technology - the Botswana experience

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Abstract
At independence in 1966 Botswana inherited, amongst other things, one of the world's poorest education systems and infrastructure. In seeking to develop this sector, the government has since given education the highest priority. Consequently, the education system has been rapidly expanding, more so in the last decade with the advent of Community Junior Secondary Schools. Pre-vocational education at secondary level has also experienced a similar expansion and a shift from traditional craft subjects, namely woodwork and technical drawing, to Design and Technology.

The introduction of Design and Technology has been fraught with problems. Chief amongst them is the acute shortage of local Design and Technology trained teachers. There was also the clash of philosophies derived from influences of the various donor agencies involved in the development of the subject. This clash of philosophies also appeared at initial teacher training level.

The paper discusses these aspects and the attempts that have been made to address them. Finally the paper will discuss possible solutions for the future.

Introduction
The primary purpose of this paper is to share with the conference Botswana’s experience following the shift from traditional craft subjects (woodwork and technical drawing) to Design and Technology. It will highlight achievements as well problems arising from the transition. Strategies for combating the problems and projections for the future will also be discussed. To set the scene, the paper begins with a description of the context of Botswana.

Topography
Situated in Southern Africa, Botswana is a land locked country which shares its borders with Namibia, South Africa, Zambia and Zimbabwe. It is a democratic non-racialist country which has enjoyed economic success and political stability since independence. The population was estimated at around 1.3 million following the 1991 census and is one of the world’s fastest growing at a rate of 3.4 per cent per annum. It is expected to reach 2 million by the year 2000. Today about 50 percent of the population is under 15 years of age. About 80 percent of the population live in the eastern part of the country where land is fertile and the communication system is good. Botswana is about the size of France, though two thirds of it is semi-arid desert - the Kgalagadi (Kalahari). It is a very hot and dry country, prone to severe droughts which often affect arable farming and livestock. Setswana (the vernacular language) and English are both official languages.

Historical Background
Botswana gained independence from Britain in 1966 after being a protectorate for over 80 years. However, it suffered gross negligence as a protectorate, much more than other former colonies. Consequently, it inherited one of the poorest economies and infrastructures in the world with beef as its main export [Colclough and McCarthy 1980]. The education system was seriously underdeveloped, benefiting a small minority, and was concentrated at primary level. There was only a handful of educated Batswana (plural for the indigenous people). Available statistics reveal that at independence 96 per cent of the high level jobs were held by expatriates [The World Bank 1988].

Because of the poor economic status, Botswana was expected to rely heavily on its former colonial power and donor organizations for financial support, as Colclough and McCarthy note:

...a number of economic-survey missions had visited the protectorate to assess aid requirements and development prospects. Each of them concluded that the likelihood of achieving a rapid growth of domestic income was negligible - so much so that the government would be unable to raise sufficient revenue from local sources to even cover its recurrent expenditure within a foreseeable future. [Colclough and McCarthy 1980:54]

There was virtually no hope for Botswana to become what it is today. It was perceived more as a 'labour reserve' [Parson 1984] for South Africa and, at some point, at risk of being annexed to the latter. It was
saved by the introduction of apartheid. Notwithstanding this, the colonial negligence and naivety were a blessing in disguise. They helped conceal most of the potential wealth that would have otherwise been heavily exploited. Even independence may have not come so easily. Today Botswana has a thriving economy, largely attributable to the discovery of mineral resources, notably diamonds, metals and other precious stones. These have made it a success story almost overnight.

Education System

Education is one of the major beneficiaries of the economy and accounts for about 22% of the annual recurrent budget [National Development Plan 1991-97]. It has expanded rapidly since independence and accelerated more in the late 1970s. The system consists of three levels; primary, junior secondary (known as Community Junior Secondary Schools-CJSS) and senior secondary level. Primary lasts for seven years, junior secondary lasts two years and senior secondary has a three year duration. The entry age to the primary phase is six-eight years. There are final examinations at the end of each cycle and these determine progression from one level to another. Since independence, and particularly from 1979 for primary education, and 1984 for junior secondary, both levels have undergone massive expansion. The number of primary schools has increased from 388 in 1979 to 597 in 1991, increasing the enrolment from 156,667 to 298,812 [Central Statistics Office 1991]. Secondary schools have increased sharply from 58 in 1984 to about 200 hundred in 1994. The results of both initiatives have been very impressive for Botswana in that, since the expansion, two major developments have been achieved. Firstly, Universal Primary Education was achieved in 1980, followed by universal access to the CJSS level in January 1994. Secondly, school fees were abolished at both levels. Consequently, equality of opportunity to education was achieved. Despite this, education is not compulsory in Botswana.

The Development of Design and Technology

Since inception, Design and Technology in Botswana has gained reputable status at a time when practical subjects are viewed as only being suitable for low achievers. It is a subject favoured by teachers, students and, indeed, the government. When opening the National Design and Technology Exhibition of Botswana in July 1993 the President of Botswana said:

An education that produces an independent citizen who can cope resourcefully with the demands of the real world is what we need in Botswana. Design and Technology is very much in line with this philosophy. [His Excellency Sir Ketumile Masire, President of Botswana, NDETEBO 1993 Speech:13]

Design and Technology has been declared a core curriculum subject, with effect from January 1996 Government Paper Nº 2:1994]. This will further remove it from the category of optional subjects, which it currently shares with Home Economics, Art and Religious Education.

History of Design and Technology in Botswana

The development of Design and Technology in Botswana dates as far back as 1987. The idea came after a former colleague, who was then Senior Education Officer for Technical studies, was commissioned by our Ministry of Education to undertake a study tour of British institutions. The purpose of the study was to investigate the provision of technical and vocational education in the British system for educational innovations that Botswana might benefit from. Stemming from the tour, recommendations were made in favour of Design and Technology, as a suitable replacement for traditional craft subjects. A consultant was engaged and a series of familiarization workshops were held for teachers and other key personnel. In 1990 the subject was piloted in five senior secondary schools (out of 23) and in 16 CJSS (out of about 140 at the time). Since then it has been gradually replacing traditional craft subjects at both levels. Full implementation has now been achieved at junior secondary level. Perhaps at senior level, full implementation will be achieved in the next three or four years.

Rationale Behind the Introduction of Design and Technology

Design and Technology came at a time when two major developments were taking place in Botswana. Firstly, it was at the time of a rapid expansion of secondary education, particularly at junior secondary level. Secondly, because of the mineral gains, the economy was thriving and therefore transforming from a predominantly agrarian to an industrially based one. The need for technological 'know how' had become paramount and reforming technical education was one way of achieving the desired effect. This was why Design and Technology was adopted.

The coincidence with the initial stage of a rapid expansion was like a marriage of convenience for Design and Technology. It had several advantages. First of all, the number of trained local teachers was
still very small, so retraining them was cost-effective. It was also convenient to replace craft subjects at local pre-service teacher training institutions, thus stopping the flow of graduates with only craft training. In new schools it was also convenient to incorporate new workshop layouts for a Design and Technology environment at the planning stage. All these aspects were a substantial cost saver and the transition at CJSS level was quite smooth. Attempting such a transition today would be a mammoth task, let alone a very costly venture. At senior secondary level, the situation was different. When Design and Technology was introduced, workshop facilities had already been built in the traditional style. As a result, their facilities are still separate craft subject units. However, some recently built senior schools have been custom designed for a Design and Technology environment.

Problems of Implementation

Although the implementation of Design and Technology was, by and large, a great success, some major problems were inherited. Some were well anticipated and plans made beforehand, but other plans were not successful.

Other problems were simply underestimated. Now they have manifested themselves and are proving to be quite a hurdle to overcome. For the sake of this presentation I will discuss the three major ones, notably the shortage of teachers and conflicting philosophies of the junior secondary and the senior secondary Design and Technology curriculum. Also to be discussed are the contrasting approaches to teacher training in Design and Technology.

Teacher Shortage

Shortage of local Design and Technology teachers is both a serious and difficult problem. It is complicated by the fact that trained Design and Technology teachers are very scarce in Southern African countries. These countries do not offer Design and Technology in their curricula. South Africa has only just begun to pilot the subject. As a result expatriates are recruited and then given in-service training in Design and Technology at the expense of the Botswana government. Considering that they are temporary and expensive to employ, in-service is not only a further cost to the government but in the long term it is the expatriates who gain more by being given the extra training. This may sound like a very awkward arrangement, considering that the money could be used to train more local teachers. Unfortunately, the problems of cost-effectiveness with regard to employment of expatriate teachers have not been considered fully in the past. Perhaps the transition has been so overwhelming that such an aspect became secondary.

Another recruitment route is through the Teachers of Britain Recruitment Scheme (TBRS) which is administered by British Council. Through this programme only graduates in Design and Technology are recruited. The advantage of this route is that these teachers do not require INSET albeit they are still very costly. Their air fares to and fro and in between contracts are met by the Botswana government.

Therefore the whole situation surrounding recruitment of expatriate teachers is a conundrum. It seriously affects the localization process and the cost to the tax payer is dear. One way out of this problem is by speedily training as many local teachers as possible. Otherwise the situation will worsen when Design and Technology finally becomes a core curriculum subject.

In response to the drastic teacher shortage two institutions have been providing pre-service teacher training for local teachers. Molepolole College of Education (MCE) runs a three year diploma course in Design and Technology for CJSS teachers. Botswana Polytechnic runs a five year B.Ed programme for senior secondary teachers. Since inception in 1985, MCE has been producing an average of 25 teachers each year. This has been a significant output and has increased the number of local teachers each year thus reducing dependence on expatriates at CJSS level.

Botswana Polytechnic on the other hand, has hitherto had a small and intermittent output. The programme, despite having the right facilities and resources has suffered from poor organization and management. It is an example of aid that has failed to achieve the desired effect. For instance, out of a group of 20 students in 1987, nine dropped out because of the alleged disorganization of the course. The remaining 11 were transferred as a matter of emergency to the United Kingdom where they completed their last two years of the course. The second group in 1988 also suffered a similar predicament, ending up with only three students. They too had to complete the final two years in the UK. In 1989 no students were enrolled and the effect of this is that this year there will be no Design and Technology graduates entering teaching. These are but a few of the problems that have contributed to the current shortfall in local teachers. It means that in the period between 1987 and 1989, out of 60 places about 46 were forfeited. In other words the programme was grossly under-utilized.
This figure would easily have made local teachers at senior secondary level a significant majority of perhaps 70-80%. Another example of a plan that did not go well! Hopefully these were only teething problems of the programme. Now that the programme has been redrafted, coupled with the recent affiliation of the Botswana Polytechnic to the University of Botswana, things are very likely to improve.

In the meantime, the only route for upgrading of teachers from Diploma to B Ed. level and to prepare them to teach Design and Technology rather than Craft is to continue to train them abroad, an exorbitant and expensive route which limits the number of teachers trained each year. Since 1986 about 25 teachers have been trained through this route including the 14 Botswana Polytechnic preservice teachers discussed above. So only 11 in-service teachers were retrained in 8 years. There are more than 50 teachers needing similar training. Hopefully, with the coming on stream of a new vocational teacher training centre, the problem of in-service training will be alleviated. However, this will not happen soon enough and one also wonders whether it may not contribute to the fragmentation that already exists. Ideally, in-service training should be a responsibility of the Botswana Polytechnic.

Conflicting Philosophies

Botswana has undoubtedly benefited immensely from the generous assistance from donor agencies over the years. Unfortunately, the assistance has not been coordinated to ensure harmony between different initiatives and that it meets the national goals of Botswana. As a result different donor agencies have concentrated their projects on particular levels of the education system, say primary education. Because such projects have been heavily influenced by philosophies of the donor countries, each level has a different philosophy.

Consequently, the entire curriculum is fragmented and this was noted by the 1977 Commission on Education. Design and Technology, is no exception in this regard as it is presently run on conflicting philosophies. While the junior secondary curriculum is based on the American model of Industrial Arts, the senior secondary curriculum is based on the British model of Craft Design and Technology. This problem has caused confusion and frustration, let alone fierce personality clashes between the parties involved. Post-school vocational education has been developed by the Germans, Norwegians, Swedes, British and Canadians!

Another conflict in philosophies concerns teacher training programmes, namely the diploma course at Molepolole College of Education (MCE) and the degree programme at the Botswana Polytechnic. This conflict too has been an outcome of external assistance. The diploma course was established by the same organization that initiated the junior secondary programme. As a result at MCE the programme emphasizes acquaintance with the junior secondary materials. This inevitably includes some grounding in the philosophy of the subjects. The Botswana Polytechnic on the other hand has always had support from Britain and the degree programme has had tremendous professional support from that country. Therefore the programme has a British bias considering that it prepares students to teach Cambridge O'level.

Meanwhile, the system continues to produce teachers with completely different philosophies, adding to the already varying flavours of foreign teachers. The teachers are required to teach the same subject, albeit at different levels. The implications of this situation have been far reaching. For the teachers, the hurley-burly often comes when they transfer from one level to another. They encounter serious problems in trying to adjust to a philosophy that conflicts with the one they are familiar with. Students also have to adjust to a different philosophy when they enter senior secondary school or take up vocational training.

In other words, the element of continuity is still lacking in Design and Technology. Therefore, the need for harmonization of the philosophies at school level and at teacher training institutions is paramount.

One of the models is particularly out of step with needs of Batswana children, yet it continues to affect the future lives of thousands of unsuspecting youngsters. Let us be clear, Botswana is most grateful to the aid agencies and for the generosity of governments funding them. The problem lies in a failure to realise that a philosophy developed for one context cannot be transposed unchanged to meet a totally different need.

Although there is no ultimate solution to the problems outlined above, the need to attempt to rectify them is paramount. External assistance no longer exists and in one way, this is a positive aspect. I am deeply concerned about children who graduate in tens of thousands annually from the junior secondary phase, for whom this is the end of formal education. They are expected to fend for themselves. This year alone more than 32 thousand children found themselves in this position. Most may never engage in any meaningful income generating activities for their entire lives. Places at senior
secondary are very limited and only 27% of the junior secondary leavers are absorbed. The job market is extremely limited and further education can only admit 5% of CJSS leavers. Moreover, recent developments show that even further education graduates are being retrenched in industry because of the world recession.

**Possible Solutions for the Future**

In view of the plight of school leavers, I am conducting some research into possible means of attuning the current programmes to achieve relevance, while at the same time eliminating existing flaws.

Presently, youngsters leave the system ill prepared for the demands of the real world. Of course, education is not the answer to every problem. Nonetheless, it is fundamental in the cultivation of attitudes and dissemination of knowledge and skills necessary for the post-school life. One of the biggest criticisms of education in Africa is that it alienates children from their culture because of being heavily influenced by foreign cultures [Babs Fafunwa and Aisiku 1982]. I strongly agree with this. However, my focus is on children presently in the system who will soon be faced with uncertain futures.

The research is exploring ways of instilling positive attitudes in children to make them more resourceful for their rural communities and still earn a decent living. These attitudes include amongst other things, adaptability, initiative and resourcefulness. Design and Technology has the potential to nurture such attitudes, but the way it is presently delivered in Botswana makes it far removed from the world with which Batswana children are familiar. In this sense it has been unrealistic. I hope to design a model of curriculum that would remove the subject from the classroom and take it into the communities in which these children live, a model that will make them feel that they have much to offer. The research will also explore some cost-effective and efficient models of in-service teacher education to alleviate the current teacher shortage.

In spite of the problems mentioned here, the long term benefits of introducing Design and Technology in Botswana are great. I am positive that very soon most of the problems mentioned in the paper will have been alleviated. Botswana needs to be congratulated for having the courage to undertake such a mammoth task, regardless of the cost involved. Change is something that many countries dread. However, the fruits of this endeavour will, in future, benefit the economy and lives of Batswana.

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