

Teachers' experiences with an adapted IGCSE physics syllabus in Botswana

Anthony T. Koosimile

Department of Maths and Science Education, University of Botswana, Private Bag, Gaborone 00702, Botswana

Abstract

This paper focuses on teachers' experiences with implementing a modified International General Certificate of Secondary Education (IGCSE) physics syllabus in Botswana. The syllabus, characterised by a new organisational and pedagogic paradigm, is a significant shift from the traditional "teacher-proof" syllabus to one that is flexible, non-prescriptive and student-centred. Through data from discussions and interviews with teachers, it emerged that policy statements on the nature of the syllabus were contradictory and confusing to guide both the adoption and implementation of the syllabus. It also emerged that teachers accorded the core curriculum component of the syllabus a lower priority and status than the extended curriculum component.

The findings also reveal that considerable overlaps in the core and extended curriculum components of the syllabus blurred the distinction between the two as well as weakening prospect of fidelity of adoption and implementation. The resulting "innovation gap" invariably means that the ideals of the syllabus and the associated paradigm shifts are possibly not realised in teaching in Botswana. The findings generally underscore the importance of clear guidance and policy statements on any new syllabus, and indeed, a new curriculum. Possible directions in future research would be to investigate innovation gaps that might be manifest in teaching.

Keywords: Teachers; Localisation; BGSCE and IGCSE; Core and extended curriculum; Physics syllabus; Botswana

1. Introduction

In any situation where a new syllabus is adopted by schools for implementation, it is imperative to gain some understanding of some matters that arise during the process. This is perhaps important in a centralised education system such as that in

E-mail address: koosimil@mopipi.ub.bw (A.T. Koosimile).

Botswana, where a common syllabus, and invariably an official curriculum, is developed and disseminated to all schools by the Ministry of Education. There are a number of reasons for seeking the understanding. For instance, teacher's sense of ownership of the new syllabus is an important factor in its acceptance or rejection. Sometimes adoption of change is just symbolic, particularly as and when teachers are regarded as

part of the government's resources for education. Most importantly, it is indeed a truism that there are just as many interpretations of any syllabus as there are teachers and other stakeholders. Consequently, it is not in doubt that teachers, being the principal end-users of the syllabus, can yield reliable and valid accounts on the syllabus and its implementation, hence this paper focuses on teachers' experiences with implementing an adapted International General Certificate of Secondary Education (IGCSE) physics syllabus in Botswana.

The Botswana General Certificate of Secondary Education (BGCSE) physics syllabus is for students (age 17+), with an Integrated Science background from lower secondary schools (see Vlaardingerbroek, 2001; Koosimile, *in press*), and pursuing a two-year senior secondary school programme. Candidates successful in the programme enrol either for A-levels or for tertiary education. Teaching facilities in schools include adequate physics laboratories that are equipped to high standards. With no locally developed textbooks appropriate for BGCSE, imported physics textbooks such as Duncan (1999) and Foxcroft and Lewis (1996) are widely used in schools. The textbooks are deceptively relevant for use with the BGCSE physics syllabus as they attempt to present science in contexts that might be familiar to students. This 'anomalous' situation might be understood better in the context of issues in development of official curriculum in Botswana.

As a former British Protectorate, Botswana has until 1996 used the imported University of Cambridge Local Examinations Syndicate (UCLES) O-level Physics 5054 syllabus in the two-year senior secondary education program. Under the guidance and expertise of UCLES, Botswana has now adapted the UCLES' IGCSE physics syllabus for implementation within the Botswana General Certificate of Secondary Education (BGCSE) system. The BGCSE system is Botswana's equivalent of the IGCSE system such that various BGCSE syllabuses and their examinations are accredited to UCLES, promoting their universal recognition and acceptability throughout the world.

The BGCSE system and the associated changes in the entire school curriculum was inspired by the second National Commission on Education of 1993, whose mandate included the evaluation of the progress made in the implementation of the recommendation of Botswana's first National Commission on Education of 1976 (Republic of Botswana, 1993, p. 3). The commission had recommended the localisation of both primary and secondary school curriculum, leading to the first implementation of localised primary and lower secondary school curriculum in 1986. Delays in localising all senior secondary school syllabuses prevailed, prompting the National Commission on Education of 1993 to urge the government to give their localisation an immediate priority.

The localisation process started in 1996 against a background of a relatively non-existent expertise in Botswana in the development of both the syllabus and associated curriculum at senior secondary school level. Consequently, UCLES assumed both an advisory and supervisory role during the curriculum localisation effort (Ministry of Education, 1994; Koosimile, 2001). A 14-member Task Force comprising physics teachers, tertiary education lecturers and personnel from the Ministry of Education was assembled to work on the adaptation of the IGCSE physics syllabus (Ministry of Education, 1997), implemented in senior schools since January 1997 to date.

Nonetheless, the reliance of Botswana on foreign curriculum models in curriculum reform shares many attributes with similar exercises elsewhere in Africa. For instance, see Brand (1998) on recent curriculum reforms in South Africa, Kahn (1986) for Zimbabwe, Crossley (1990) for Papua New Guinea, and Vulliamy et al. (1990) for Papua New Guinea, Malaysia, Sri Lanka and Nigeria. As literature has it, the practice of curriculum adaptation, a typical strategy for curriculum localisation, is best understood within the context of both the dependency and centre-to-periphery paradigms in educational reform (cf. Kahn, 1989; McLean, 1983; MacDonald and Walker, 1976; Owen, 1973). Here curriculum packages from developed metropolitan nations are adapted/adopted by developing nations, typically without questioning very deeply their aims and

philosophical and pedagogical assumptions (see Lewin, 1990).

The exercise is frequently indicative and symptomatic of paucity of appropriate research and alternative definitions necessary to guide the curriculum localisation efforts (cf. Lillis and Lowe, 1982; Gray, 1999). Furthermore, as noted variously by Kahn (1989), Ingle and Turner (1981) and Republic of Botswana (1977), assumptions and beliefs in the universality, cultural and ideological neutrality of formal scientific knowledge has encouraged and supported various curricula reforms in developing countries. The resultant “first world hegemony” arising from the reforms, as it were, Gray (1999) contends, often results not only in the decline in the quality of science education in most developing countries of the world, but it has also constrained and limited the autonomy of critical persons who should be contextually grounded in their thinking.

However, some difficulties in implementing reforms in education are widely documented in the literature. For instance, as Ottevanger (2002) notes with respect to curriculum reforms in the early 1990s in Namibia that espoused learner-centred philosophy and some contemporary international standards in education, “they seemed far removed from the curriculum teachers in Namibia were used to, and even further removed from what was happening in Namibian classrooms” (p. 34). A similar ‘innovation gap’ affects even more advanced countries, but more pronounced in developing nations (van den Akker, 1998) as paradigm shifts that are intended to foster new classroom practices continue to be a challenge (see Brand, 1998), despite the existence of policy initiatives to improve science education, as in South Africa and elsewhere (Jita, 2002).

2. The BGCSE physics syllabus

For the purposes of this paper, syllabus is taken to mean an official policy that is a set of “summary statements of vision, values, goals — a declaration of intent” (Jansen, 1995, p. 338) of physics as a subject in a senior secondary school curriculum in Botswana. The relationship of the physics syllabus

to physics curriculum is to be understood in the context of Levy’s (1993) position that “curriculum is not merely syllabus although it includes the syllabus” (p. 159).

The BGCSE physics syllabus comprise a set of *core objectives* and *extended objectives* (Ministry of Education, 1997) corresponding, respectively, to IGCSE’s *core curriculum* and *extended curriculum*. The *core curriculum* covers mainly foundation knowledge, skills and attitudes—the essential examinable and fundamental physics concepts and principles and attributes compulsory to all students following the syllabus, irrespective of their ability. The *extended curriculum* typically is an ‘advanced curriculum’ that covers more content and skills over and above, and including, the *core curriculum*. Hence, the *extended curriculum* is possibly not a mere extension of the *core curriculum*, but a complete curriculum package in its own right — despite the two being presented together in a *two-in-one* physics syllabus. Some confusion is likely to arise, nonetheless, from the BGCSE syllabus document because it is stated that:

Each topic consists of general objectives which give rise to specific objectives ... These objectives are divided into *core* and *extended* ... All learners are expected to follow the *core* specific objectives. The *extended* objectives provide more challenging work for those learners able to benefit from it (Ministry of Education, 1997, p. v).

The statement may give one an impression that extended objectives are optional and casually linked to the core objectives. This is possibly at variance with the interpretation of the syllabus as embodying two streams of curriculum.

Assessment objectives, as with the IGCSE physics syllabus, fall into three categories, namely, knowledge with understanding, handling information and solving problems; and, experimental skills and investigations (ibid). At the end of the BGCSE, students take *differentiated* terminal examinations comprising the compulsory Papers 1 and 2 for the core curriculum, and an optional Paper 3 for the extended curriculum, as well as practical assessment that allows students to choose

between a practical test and a written alternative-to-practical test. Paper 3 is a crucial and a significant factor in the final grading of assessment since it is stated: “those candidates who are unlikely to obtain grade C (or better) should not be entered. A poor performance in this paper (i.e., *Paper 3*) will not affect the grades awarded for other assessment components” (University of Cambridge Local Examination Syndicate (UCLES), 2002, p. 4).

Regarding grading, BGCSE subjects are graded on an 8-point scale from A* to G, with A* carrying 6 points and 1 point is given to the F grade (Ministry of Education, 2003a). Candidates taking Papers 1 and 2 can only get grades C to G, while those who take all three papers (i.e., Papers 1, 2, and 3) can get grades A* to G. Candidates who fail to reach the standard required for grade G are deemed ‘unclassified’, and no result is reported on the certificate (Ministry of Education, 2003a). Under the Botswana Government’s collaborative link with UCLES, the UCLES also ratifies and confirms that the standard and the demand of each grade awarded for BGCSE subjects is equivalent to the corresponding grade awarded for the IGCSE (Ministry of Education, 2003a).

With students streamed by ability in schools for science teaching, enrolment patterns may invariably embody institutional ideals, perceptions, and significance attached to various subjects in the school curriculum. The table below, showing the percentage of students who passed with Grade C or better for the years 2000, 2001 and 2002, corroborates the latter view. The figures in

parenthesis show the size of the cohort that took examinations for a particular subject in a given year. However, comparisons across years should be done cautiously as the number of candidates increased on a yearly basis (Table 1).

Mathematics is a core subject compulsory to all students. By comparison, fewer students, notably those with humanities as their main concentration, enrol for Double Award Science than for the Single Award Science option. It is perhaps noteworthy that the performance of students taking Single Award Science is somewhat depressing, although it perhaps reflects the fact that the subject is taken by students of low ability. The number of students taking separate sciences is by far the lowest and their performance is by far impressive, although the data in the table does not show how many students in the group sat the optional Paper 3 for the extended curriculum.

3. Towards a statement of research problem

The philosophy and organisation of the new BGCSE physics syllabus embodies an assumption that teachers and their students would both exercise discretion on the extended curriculum of the syllabus within a mixed ability environment. Theoretically, on the paper at least, the BGCSE has turned decision-making on curriculum matters over to teachers. This position is reinforced by the fact that a set of attainment objectives are used to frame the syllabus, such that it is non-prescriptive in terms of the content to be covered and the teaching approaches to be adopted. Within the

Table 1

	Year and percentage passed in grade C or better		
	2000	2001	2002
Mathematics	26.4 (of 15 680)	25.8 (of 16 524)	25.7 (of 17 104)
Science (Single Award)	13.0 (of 8939)	11.4 (of 8949)	11.4 (of 9487)
Science (Double Award)	39.8 (of 4503)	45.8 (of 5126)	48.7 (of 4909)
Chemistry	75.8 (of 2195)	75.8 (of 2460)	76.2 (of 2673)
Physics	76.8 (of 2195)	79.7 (of 2460)	79.8 (of 2674)
Biology	60.6 (of 2195)	62.0 (of 2460)	68.9 (of 2673)

Source: Ministry of Education, 2002, 2003b.

framework of the implied teacher autonomy, teachers rightly assume the responsibility for what is taught, for the way it is taught, and to whom.

From the viewpoint of science education in Botswana, the reform is possibly intended to make physics and its philosophy more accommodating, flexible, and accessible to students of all abilities across different teaching situations. This naturally calls for understanding of how such an ideology is encapsulated in teachers' views and understanding of the syllabus, and how that may impact on the adoption and the implementation of the syllabus at school level. Fullan and Pomphret (1977) and Fullan (1982 and 1995) assert that concerns with understanding policy rhetoric by curriculum users may underlie the unravelling of the *curriculum storehouse* (Hamilton, 1990). This may offer a preliminary basis for understanding any gaps that may exist between policy rhetoric and the implemented curriculum, or as Sayed (2002) puts it, "matching intention with outcome, and rhetoric with practice". Incidentally, the mere introduction to schools of a syllabus and curriculum materials is not a sufficient condition for ensuring its uptake by teachers (see Olson, 1992).

Furthermore, there are also concerns that any paradigm shift in education must come from a perspective shared by stakeholders, lest the change becomes ineffective and counterproductive (Volmink, 1998). As Dyer (1999, p. 45) rightly noted, misjudging the ease of policy implementation is recognised as one of the most common planning mistakes, with the consequent dilution of policy efficiency through adoption of a series of coping strategies.

Consequently, the research question guiding this study is:

What experiences do teachers have in adopting the BGCSE physics syllabus for implementation in senior secondary schools in Botswana?

Two subsidiary questions derived from the main research question are:

(a) What perceptions and interpretations of the BGCSE physics syllabus do teachers in Botswana have?

(b) And, what problems and challenges face the adoption of the BGCSE physics syllabus in schools in Botswana?

The next section describes the research method adopted in seeking answers to the research questions.

4. Methodology

Answers were sought to the research questions through discussions and intensive interviews with some 30 physics teachers in 17 of the 21 senior secondary schools in Botswana. The approach adopted in this study is possibly best characterised as an exploratory, discussion-and-interview-based descriptive case-study that attempts to discover and understand phenomena in the stream of local experience (Miles and Huberman, 1994). The interviews and discussions, the two main modes for data collection, could be regarded as open-ended and unstructured as the exploratory nature of the study demanded methods where important and significant data from the field could be noted, recorded and vigorously followed up and validated (see e.g., Delamont and Hamilton, 1975; Delamont, 1975), with the field data being instrumental in focussing the enquiry. The strategy allowed for greater flexibility and adaptability in data collection, undertaken largely through one-day contact with individual teachers.

Triangulation of data was mainly through presenting viewpoints and perspectives both from the teachers and the researcher for open scrutiny, comment and discussion with other participants (see Brown and McIntyre, 1995; Hitchcock and Hughes, 1992). In that way, teachers checked 'alternate interpretations' of data for validity and close correspondence with reality, as known and understood by them (cf. Knupfer, 1996). In turn, the process also created more data and overviews that helped in data analysis and in preserving perceptions of reality and experiences of the participants while simultaneously being useful in unearthing gaps in field data.

However, document analysis, another vital source for data for use in triangulation, was

hampered by the non-availability of explanatory notes on the BGCSE curriculum system within schools and at the Ministry of Education. Despite the setback, progressive focussing of study and adoption of standard data validation practices (see Vulliamy et al., 1990; Bogdan and Biklen, 1998; Miles and Huberman, 1994) generated a logical chain of evidence, hence research findings, largely through induction. The findings of the study are reported in the next section.

5. Findings of the study

There prevailed in teachers some confusion and uncertainty over the nature of the syllabus, particularly in relation to the conditions conducive to its implementation. Teachers noted the lack of commitment in the aims of the BGCSE syllabus regarding how intellectual and practical needs of students of different abilities would be catered for while they all follow a common syllabus for the extended curriculum, as advocated for by the Ministry of Education. For instance, the aims of the BGCSE physics syllabus are not helpful in how some form of a balance between core and extended curriculum is to be realised in mixed ability teaching environments. The problem appeared to translate into difficulties in adopting and implementing the physics syllabus.

For example, it is clear from the research data that some teachers belabour on whom of the students is to be regarded as either a ‘fast’ or ‘slow’ learner in physics classes. This happens as some teachers invariably attempt to mimic the new style of presentation of content in the syllabus through attempting some form of differentiated teaching in their classes. Such perceptions and practices appeared to result in the ‘practicality’ of the physics syllabus being questionable. As one teacher commented:

Apart from the lower secondary school results, we have no basis for judging if one is a fast or slow learner. Students enrolling for physics get to understand their capabilities better during the course of teaching, although this might be

frustrating to those not-so-academically endowed to handle the extended curriculum.

The concern noted in the citation is important, particularly with such a high value and prestige that appears to be accorded to the extended curriculum component of the syllabus which is widely regarded as a prerequisite and a currency to a wide-range of science-based careers. Reportedly, as noted by one teacher,

At secondary school level, pursuing pure sciences is seen by students as invariably having a ‘plus-factor’ or the ‘feel-good-factor’ ... science is regarded as challenging and for the intelligent. But when all the hopes of succeeding in extended curriculum are dashed ... the teacher might invariably be thrown into the deep-end, having to contend not only with who is a fast or slow learner and their respective needs, but also with defining in teaching the place of both components (i.e., core and extended curriculum) of the syllabus.

Invariably, this may mean starting the physics syllabus with any cohort on a false footing, often to the disadvantage of both the teacher and the students.

Furthermore, research evidence shows that what is perhaps very significant from the viewpoint of many physics teachers is that they feel inadequate as there is also lack of proper guidance on the philosophy and structure of the syllabus. While citing lack of workshops and in-service activities on the syllabus since its inception, there are some teachers who embrace the structure of the syllabus. One reason from teachers is that the structure provides some framework for discussion and reflection on both the nature of the syllabus including its pedagogic aspects. For instance, it appears teachers who hold the structure of the syllabus in high esteem are some of those who feel that the notion of ‘teaching to the middle’ in mixed ability classes has never addressed the needs of any particular target group. On the converse, however, there are indications that the management of the flexibility, control and autonomy in teaching and learning offered by the syllabus is an illusive ideal for some teachers.

Central to their concerns is the question of what, if any, relationship exists in the syllabus between the core and extended curriculum. Generally, concentrating on teaching the core curriculum is perceived by some to be a compromise between having to do with no physics at all and the failure to handle, rather comfortably, the extended curriculum. Furthermore, some teachers argue that the core curriculum cannot supply the depth of study and rigour necessary for deeper understanding of physics. For some, it appears the core curriculum has become synonymous with the barest minimum standard of desirable education and level of competency. The core curriculum component of the syllabus also emerges more like a 'soft option and safety net' since it gets some recognition and prominence mostly during examinations when the less gifted students may be advised not to sit Paper 3. However, as some teachers pointed out, the nature of the syllabus is more often than not left unexplained to students, despite the alleged learner-centred nature of the syllabus. Consequently, it appears the entire syllabus, and invariably the extended curriculum component, is taught as a matter of orthodoxy. Teachers, however, have reasons for behaving that way.

For instance, there is some evidence that such a situation is encouraged by what teachers perceive to be an apparent lack of unity and continuity within and between various components of the syllabus. Some teachers further contend that the distribution of extended objectives in the syllabus appear to be inconsistent, erratic and arbitrary. Out of the approximately 310 specific objectives, about 83% are core objectives (i.e., also for the core curriculum) while the remaining 17% are extended objectives. Moreover, a similar set of competencies (e.g., describing phenomena, application of formula, theory or principle, discerning relationships in data through analysis) promoted through core work is also promoted in extension work, obscuring the identification of key intellectual demands specific to the extended curriculum component of the syllabus. Teachers allege that although the ranking of competencies seems to be based on some behaviourist framework, most tasks fall short of reaching high-order levels of

either the Bloom's Taxonomy of Educational Objectives or, if any, the structural hierarchy of physics concepts and competencies entailed therein.

Furthermore, the noted overlap, while confusing and disconcerting to teachers, has tended to water-down the meaning of either curriculum. One physics teacher, who used to teach mathematics, reminisced thus:

In mathematics there used to be a Mathematics Syllabus C that was compulsory to all students. There was also a separate Additional Mathematics syllabus for high ability students... the two had very little in terms of overlaps ... Why can't we have the same with physics and avoid the temptation of killing two birds with one stone through compulsory teaching of the extended curriculum?

The metaphor also serves to explain the possible need for improvement to the physics syllabus such that any ambivalence over the its nature could be eliminated so as to restore, define, bolster and give both the core and extended curriculum components of the syllabus some distinctive meanings. This would perhaps serve as a means for enhancing their chances of reaching their target students as well as a means for accomplishing their objectives. As noted by teachers, the overlaps and inconsistencies in the syllabus pose some pedagogical problems, particularly as teachers and students need to be constantly engaged in activities suitable for the long-term commitment of both teachers and students to the development, reinforcement and nurturing of a dependable and a durable set of the knowledge, skills and attitudes required for tackling the extended objectives.

The concern over the pedagogical problem appears to be borne out of the contention by some teachers that the extended objectives are a statement of intention and competencies beyond the possibilities of fulfilment in their schools. As one teacher noted,

Our school enrolment has increased dramatically over the years, leading to an increase in the number of students taking physics. This has encouraged even marginally average students to

enrol, sometimes due to the Single and Double Award Science being oversubscribed ... the students generally struggle with the extended curriculum and less so with the core curriculum ... it is difficult to have their own activities apart from the main group and motivating them to work hard is also not easy at all.

Overall, there appears to be sufficient evidence that the nature of the syllabus might not be defined enough to serve as a meaningful basis for guiding teacher action and the subsequent implementation of the syllabus. Some teachers clearly and unwittingly misunderstand and misrepresent the demands and philosophy of the BGCSE physics syllabus. Nonetheless, it is intriguing how so much attention and comments are on the extended curriculum component of the syllabus, possibly highlighting that the style of presentation of the syllabus is more of a hindrance rather than a useful feature in understanding it.

6. Discussion of findings

What is apparent from teachers' experiences with the physics syllabus is the prevalence of conflicts, confusion and uncertainty about it, its purpose and what it seeks to achieve, particularly as teachers seek to reconcile its nature with the wider organisational setting within schools. According to Fullan (1982), the confusion and uncertainties teachers experienced are normal as they responded variously to change as per their idiosyncratic interpretation of the syllabus. However, with the lack of appropriate professional support for teachers in adopting the change, the apparent teacher apathy and indifference to pertinent issues on the syllabus can be understood from two positions.

One position, articulated by Olson (1992), states that:

The tension between the old and the new is the engine which drives critical reflection—it is the source of energy for interpretation. The new says something about the old—often the new is seen as a criticism of the old. It introduces new

language, upsets old assumptions, threatens loss and promises plenty (p. 80).

And, Brown and McIntyre (1995) assert that:

For the innovation to be “practical”, however, it would have to be so clearly superior to the established practices and so certainly achievable and safe, as to justify the abandonment of the extensive craft knowledge about when to use what tactics, that each teacher had built up over the years (pp. 116–117).

Research evidence has so far shown that the two positions were not satisfied in the first instance: the provision of core and extended curriculum within the same syllabus document was never understood by teachers, possibly weakening its authority in guiding its adoption and its subsequent implementation. However, it is also posited here that the appropriate framework for analysis of issues should be shaped by an analysis of the official rhetoric and expectations about conditions for implementing the new syllabus.

It appears the presentation of the content for core and extended curriculum in one syllabus document was also inspired by a combination of two sociological concepts: egalitarianism and meritocracy. Within an ideal egalitarian setting, education is accessible to all, the rich and the poor; high and slow achievers; fast and slow learners (cf. Okada, 1999). Based on this view, the egalitarian interpretation tends to place greater emphasis on a unified and stratified curriculum to ensure its accessibility to all. In a meritocracy, a concept coined in 1958 by Micheal Young (1915–2002) as a ‘nasty word for an undesirable elitism’ in education in Britain (*The Weekly Telegraph*, 2002, p. 30), students deserve their positions such that intelligence, talent, ability, wit and wisdom form the basis of teaching (see also Haralambos and Holborn, 1994). Seen from this perspective, the philosophical basis of the BGCSE physics syllabus embodies two conflicting paradigms that are barely possibly compatible, but not necessarily harmonious in intent and purpose.

The possible inadvertent pursuit of both the principles and ideals of egalitarianism and meritocracy by the physics syllabus and teachers

within the same classroom is an educational dilemma as research evidence from the study shows that there was an apparently clear concern with streaming students by ability and academic performance, rather than concern with mixed ability teaching (cf. Koosimile, 2002). This effectively distorted, stereotyped and narrowed the physics syllabus, both in theory and in practice as teachers sought to attend to the demands of egalitarianism and meritocracy, although with little or no prospect of the intended benefits accruing to students.

However, the research data does not reveal several other issues worthy of consideration. The most important of these concerns teacher-decision making and the modalities of implementing both the core and extended curriculum components of the syllabus. Another issue for consideration is whether there are any significant but missed opportunities in teaching arising from the possible failure to apply the structure of the syllabus in classrooms. The research also leaves un-addressed important issues about the balance in the whole syllabus for each individual student and whether student ability can be a sufficient basis for segregating the content and aims in the syllabus into core and extended curriculum.

The implications of the findings of the study to change management in science education are presented here as questions and policy issues for further investigation and debate in Botswana. They are:

- (a) What is the driving force for change? And, how can it possibly be incorporated into, or rather become, a framework for change management and adoption of the syllabus by schools?
- (b) What specific educational issues, concerns and needs are being addressed or should be addressed by the BGCSE physics syllabus?
- (c) What conditions are necessary for successful adoption and implementation of the BGCSE physics syllabus?
- (d) What mechanisms for supporting, monitoring and evaluating the change are required?
- (e) And, what communication between teachers and curriculum reformers is vital for an

effective and meaningful uptake, adoption and implementation of the syllabus?

While it could be argued that the above are fundamental standard questions that should have been addressed before the adoption of the syllabus by schools, it is argued here that the syllabus was possibly taken as axiomatic and self-justifying to warrant concerns with the questions raised above. As it were, based on the findings of this study, it appears little was done by way of ensuring that key pertinent issues on syllabus adoption and curriculum change at school level were addressed prior to and during the process.

7. Summary

The primary focus of this study was to explore teachers' experiences with the new BGCSE physics syllabus. The syllabus embodies a pair of components (i.e., core and extended curriculum) with significant overlaps in content, knowledge and skills. The study suggests that teachers perceived that there is a weak distinction between the two, leading to their lack of commitment both in principle and possibly in teaching, to both the conceptual and philosophical basis of the syllabus.

The research findings also suggest that issues raised by teachers on the nature of the syllabus are more than just a conflict between new aspirations and attitudes on the one hand and old ones on the other: there appears to be a conflict between teacher expectations and the demands of implementing a flexible non-directive syllabus without any fundamental organisational changes to the teaching environment. As it turned out to be the case, the syllabus is perceived as being couched largely in terms of principles depicting some educational ideals, rather than some clear pedagogic attributes. With the core curriculum component of the syllabus being overshadowed by concerns with the extended curriculum, it is abundantly clear that the situation is failing both students and teachers. Consequently, the issue regarding whom the BGCSE physics is intended for, and the labelling practices applied by teachers on students, is not only perplexing but also a

critical one. Nonetheless, within frameworks of meritocracy and egalitarianism, it becomes apparent that the syllabus has some internal contradictions that may not be reconciled easily and only require a serious consideration for the Botswana context.

The main finding of this study is that any innovation gap that may prevail in the adoption of the syllabus is largely due to contradictions, misinformation and ambiguities in official policy statements vital for guiding its adoption, interpretation and implementation. This has possibly manifestly prevented and distracted both the syllabus and teachers from achieving their respective purposes in education. Hence, this study possibly points out to the need for a planned and coordinated approach to promoting the philosophy of the syllabus, the desired paradigm shifts in thinking and classroom practice, for the benefit of all stakeholders. This is perhaps a reasonable strategy for avoiding a “change without change” scenario (Lewin, 1991).

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