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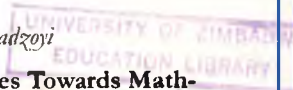
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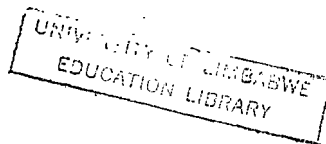
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CONTINUITY AND PROGRESSION IN SCIENCE CURRICULA FROM THE PRIMARY SCHOOL TO THE SECONDARY SCHOOL IN MASVINGO DISTRICT IN ZIMBABWE

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Abstract

This study sought to find out if there was a meaningful relationship between the primary school science curriculum and the secondary school science curriculum in Masvingo District in Zimbabwe. The research design was a descriptive survey in which the researchers analysed both the primary school and the secondary school national science syllabuses and sought the opinions of both the primary school teachers and the secondary school science teachers in Masvingo District on what they considered to be important science process skills (SPS). This was done in order to detect any similarities and differences between these syllabuses as well as perceptions of the teachers on the issues. For the latter, the Spearman Rank Order correlation coefficient was calculated in order to quantify the degree of agreement / disagreement. A structured interview was held with both the primary school teachers and the secondary school science teachers on the kind and extent of liaison there was between them in terms of science teaching.

The research findings revealed that the primary and secondary science syllabuses had a lot in common; the primary school teachers and the secondary school science teachers were in general agreement on important SPS; there were a number of significant differences in the way science was taught, learnt and assessed at the two educational levels and that there was no formal liaison between the primary school teachers and the secondary school science teachers. These research findings seem to suggest that there is need for more use of SPS at primary school level and a lot more liaison between the primary school teachers and the secondary school science teachers.

Background to the study

Hawes (1979) argues that secondary school education should seek to build from where the primary school leaves off instead of setting an entry level based on its own needs. Equally important, the primary schools must know the expectations

of the secondary school so that they can prepare their pupils to meet these expectations.

Jarman (1990) asserts that curriculum continuity and coherence is very important because it prevents unnecessary and unintentional duplication in teaching. Intentional duplication is when a topic taught at primary school level is revisited at greater depth at secondary school level. Unintentional duplication is when a secondary school teacher assumes that the pupils do not have certain knowledge and skills when they have these and the teacher proceeds to teach these already known facts and skills. Unintentional duplication can easily breed boredom and lower pupils' motivation to learn science. This does not in any way imply that there is no room for revisiting ideas already learned. Indeed the revisiting of ideas at greater depth can contribute to coherence and continuity in learning. Continuity also maintains the momentum of learning gathered at primary school level. On the other hand, if secondary school teachers assume that primary school pupils have certain scientific knowledge and skills that they do not have, then secondary school science can easily become too challenging, too difficult and too different from what has gone on before. Both scenarios are not beneficial to the learners.

Jarman (1990) argues that curriculum coherence and continuity is not very easy especially between different educational levels such as primary and secondary educational levels. She, in fact, maintains that curriculum continuity between primary and secondary school science, in the United Kingdom (UK), is rarely a reality because secondary school science teachers fail to take account or advantage of early science learning.

Dawson and Shipstone (1991) showed that where there is liaison between primary and secondary schools, secondary school science teachers developed greater confidence in the ability of the primary school teachers to teach science; both levels of education increased their use of SPS in teaching science; there was greater awareness and understanding of the other educational level's materials and there was increased confidence and self - esteem among primary school teachers to teach science while giving primary school pupils the necessary background for successful performance in subsequent science courses at secondary school level (Sherwood and Gabel, 1980).

Dawson and Shipstone (1991) noted that there was little contact or liaison between primary school teachers and secondary school science teachers in the

UK resulting in secondary school science teachers not fully understanding and empathising with primary school science; primary school teachers showing little interest in secondary school science; science teaching styles in the secondary school being markedly different from those in the primary school. Literature seems to say that, in the UK at least, there was little, if any, liaison between the primary school teachers and the secondary school science teachers.

The national science curricula for both the primary school and the secondary school in Zimbabwe are produced by one agency, the Curriculum Development Unit (CDU). One would therefore expect to see continuity, coherence and progression in the two intended science curricula. These curricula are however implemented by people with varying backgrounds in education in general and in science in particular. Most secondary school science teachers have majored in science and trained to teach science at that level while primary school teachers are generalists who teach all subjects including science with or without any background in science. These differences could cause differences in the way science is taught and assessed at these two levels.

The researchers hoped that the research results would help primary school teachers identify ways of developing in their pupils those SPS that are essential for secondary school science work while secondary school science teachers' knowledge of SPS that primary school pupils possess would help these teachers to determine the most suitable starting point and to adopt the most appropriate pace of work when they meet the primary school graduates for the first time.

The research problem

It is against this background that the researchers sought to find out how close the primary school science content and practices were to the secondary school science content and practices in Masvingo District. Specifically the research sought to address the following questions:

- Is the transition from the primary school science curriculum to the secondary school science curriculum smooth, logical and progressive?
- Is there liaison and agreement between primary school teachers and secondary school science teachers on what constitutes good science teaching?

The study

This research is a descriptive survey where the researchers analysed and described the primary school and the secondary school national science syllabuses, the major events during science lessons at both the primary school and the secondary school levels and the opinions of both the primary school teachers and the secondary school science teachers in Masvingo District on what they considered to be good science teaching practices. The research design can also be described as observational since the researchers observed and analysed science lessons at both the primary and the secondary school levels.

A sample of thirteen out of one hundred and twenty seven primary schools (10.2%) was chosen. Twenty grade 7 classes from the thirteen schools were randomly sampled. All the twenty grade 7 class teachers of the selected grade 7 classes were chosen as participants in the research (Grade 7 is the last grade at primary school level in Zimbabwe). A sample of five out of forty four secondary schools (11.4%) was chosen. All the twenty-six secondary science teachers in these schools were chosen as participants in the research. In order to enhance generalizability of results, efforts were made to include the various school types in Zimbabwe viz four government schools, four mission schools, three rural district schools two farm schools, one resettlement school and two army and police schools were chosen from the urban and rural areas.

The research instruments used were curriculum material analysis, a questionnaire, an interview and science lessons observation schedule. The researchers used a self made curriculum material analysis scheme based on Hanssler and Pittman (1973) in Eraut, Goad and Smith (1975) and Schirmer (1986) to analyse both the national primary school science syllabus and the National Zimbabwe Junior Certificate science syllabus. The major purpose of this analysis was to determine whether the primary school science syllabus offered enough preparation for Form One science work. Both the Grade seven and the secondary school science teachers completed a questionnaire. The questionnaire to the Grade seven class teachers sought the SPS that these teachers thought were important and necessary to be acquired and developed by the Grade seven pupils while the questionnaire for the secondary science teachers sought to find out the SPS these teachers thought were important and necessary for Grade seven graduates to possess if the graduates were to cope with form one science work. A structured interview was held with each of the Grade seven class teachers and the secondary school science teachers in the sample. The aim of the interview was to find the degree,

form and importance of liaison that existed between the primary school teachers and the secondary school science teachers. The interview also aimed at determining whether the two educational levels were familiar with each other's teaching and learning materials in science. A self-made science teaching observation schedule was made to observe both Grade seven and Form One science lessons. The aim of these observations was to find out whether the Grade seven science work and the Form one science work linked smoothly in terms of the SPS, teaching methods, learning activities, teaching and learning materials used. Qualitative descriptions were used to show the similarities and differences between the science syllabuses and science lessons at the primary and secondary school levels and also to describe the kind, degree and importance of liaison that exists between the primary school teachers and the secondary school science teachers. The Spearman Rank Order Correlation Coefficient was used to compare the rating of the importance and necessity of SPS for grade 7 pupils by the primary school teachers and the secondary school science teachers.

Results

Data were analysed to assess whether:

- The transition from the primary school science curriculum to the secondary school science curriculum was smooth, logical and progressive.
- There was liaison and agreement between primary school teachers and secondary school science teachers on what constitutes good science teaching.

Transition and progression of primary school science to secondary school science.

In order to assess whether there was a smooth, logical transition and progression from the primary school science to secondary school science both the primary school and the secondary school science syllabuses were analysed. The researchers also observed and analysed science lessons at both levels.

Comparing the science syllabuses at primary school and secondary school levels.

An analysis of the science syllabuses at the two levels revealed that they had a lot in common in terms of the teaching methodology (both syllabuses emphasize the need to use SPS), the science topics to be covered and the suggested assessment scheme. For example, the topics taught at primary school are revisited, albeit at greater depth and width, at secondary school level. Table 1 below shows the level of content coverage in two different topics as outlined in the primary school and secondary school science syllabuses

Table 1: Level of content coverage in two different topics in the primary school and secondary school science syllabuses.

Topic	Level of coverage	
	Primary school Syllabus	Secondary school syllabus
Water	<ul style="list-style-type: none"> • Water has three states and can be cycled • Many substances dissolve in water • Impure water can be made clean and safe to drink 	<ul style="list-style-type: none"> • Water cycle • Impurities in water. Water is a solvent of many substances • Methods of treating water for drinking
Plants and Animals	<ul style="list-style-type: none"> • Green plants need sunlight, carbon dioxide and water to make plant food • Food comes directly and indirectly from plants in food chains and food webs 	<ul style="list-style-type: none"> • Photosynthesis- green plants as producers and the ultimate source of food for all animals • Food chains and food webs – the movement of energy

It is clear from the table above that the transition and progression from the documented primary school science curriculum to the documented secondary science curriculum is smooth and logical. For example, at primary school level the three states of water are introduced whereas at secondary school level these three states of water are revisited and new scientific terms such as evaporation and condensation are added to the learners vocabulary..

An analysis of science lessons at both primary and secondary school levels.

Both levels emphasized on science content, facts and principles. Pupils were made to learn and remember a great deal of scientific facts. The major teaching methods, at both levels, were class discussions, group discussions and recall of

scientific facts as a way of revising previously covered work. Both levels were heavily dependent on textbooks. For example, both levels read from the textbook and discussed diagrams or illustrations in the textbook. A serious shortage of equipment and materials was experienced at both levels.

There was a lot more practical work and more equipment at secondary school level than at primary school level. Primary schools, generally, used larger groups than secondary schools. Secondary schools encouraged their pupils to talk and write about the experimental procedures followed, the observations made and the conclusions they could make from the experimental results. This was rare at primary school level. At both levels the researchers saw very few occasions where pupils were involved in: making hypotheses and speculations, identifying and controlling variables, designing experimental procedures and making their own independent interpretations of the observed data. For example, the design of experimental work was, in most cases, teacher dominated with the teacher telling pupils what to use and how to use it. Where this was not done, the researchers witnessed a lot of poor experimental work. For example, in an experiment to find which substances dissolve in water, some pupils used opaque containers, others used the same water for different substances and yet other did not stir the substances. There was a lot of dogmatism bordering on indoctrination on the part of the teachers especially when it came to the statement of observations made and the interpretations of the observations. Very often the pupil's attempts to make these statements were frustrated by the teacher as he/she tried to panel beat the pupils' statements until they fitted well into the teacher's or the textbook's point of view.

The analysis of science lessons at both educational levels revealed that while there were a number of common experiences, practices and activities, there were a number of significant differences as well.

Agreement between primary school teachers and secondary school science teachers on important SPS.

Data for this section of the study were obtained by comparing the ratings of the primary school teachers and secondary school science teachers on whether they thought given SPS were important or not for generating and developing science knowledge and for first year secondary school science work. The Spearman Rank Order Correlation Coefficient was computed to show the strength of the agreement/disagreement on important SPS by these two groups of teachers.

There was positive correlation between the ratings of the primary school teachers and the secondary school science teachers on important SPS. The correlation ranged from very weak positive relationship for interpreting and communicating data ($r = 0.02$) to strong positive relationship for the measuring skills ($r = 0.69$). The primary school teachers thought that all the selected individual SPS were important while the secondary school science teachers thought that 15 out of 17 (88.2%) of the selected individual SPS were important.

From the above information it can be concluded that primary school teachers and the secondary school science teachers were in agreement on the importance of these SPS.

Liaison between primary school teachers and secondary school science teachers.

Structured interviews were held with both primary school teachers and the secondary school science teachers to determine the kind and extent of liaison between teachers from the two educational levels. Discussions with the Regional Office of the Ministry of Education were held on the same issues.

Both the interviews and the discussions revealed that there was absolutely no official liaison between these teachers and that there did not exist any official structure or mechanism to facilitate this liaison. Other reasons given for the non liaison were: each educational sector was too busy with its own heavy, often overloaded programmes leaving little or no time and energy to liaise with the other sector; the great distances between the primary schools and the secondary schools were prohibitive and lack of faith and trust in the teachers in the other educational level. This mistrust was shown by the comments made by the teachers. For example, primary school teachers felt that "secondary school science teachers do not expect much from primary school science teaching", "they never take into consideration science work done at primary school level", "they would base their work on their own perceptions and prejudices" while secondary school science teachers felt that "Grade seven graduates knew nothing about science", "we would have to start from the very beginning", "the primary schools are meddling with Form One science work which they cannot handle".

When asked if they were familiar with the science resource materials (syllabuses,

textbooks) used in the other educational level, it was found that only those teachers who had taught at the other level before or had children, spouses, friends, neighbours in the other educational level had some idea about these science resource materials. Not a single teacher claimed to use the other educational sector's science materials when planning their science lessons.

More than ninety-five percent of the interviewed teachers felt that liaison was necessary arguing that liaison would ensure that primary school teachers prepare the grade 7 pupils for what lies ahead of them while the secondary school science teachers would start from where the grade 7 pupil is.

We come to the conclusion that while teachers see liaison as important there was no formal liaison between these teachers and while teachers see the need for familiarity with each other's science materials, teachers were not familiar with each other's materials.

Discussion

Research evidence has shown that the transition and progression from the documented/intended primary school science curriculum to the documented secondary school science curriculum was, to a very large extent, smooth and logical. This may be because the documented science curricula, at both levels, are produced by the same curriculum agency in Zimbabwe.

The results have shown that while there were a number of comparable practices, activities and experiences in the two educational levels, considerable disparities exist here. These differences could be because of the different science qualifications and backgrounds between primary school teachers who are generalists and secondary school science teachers who are science specialists and also because of lack of science equipment which is very acute at primary school level.

Research evidence has shown that while there was a significant agreement between primary school teachers and secondary school science teachers on important SPS there was absolutely no formal liaison between the primary school teachers and the secondary school science teachers in Masingo district. The research evidence also showed that the teachers in the two educational levels were not familiar with the science resource materials in the other educational level. Without this liaison, this contact, it is very difficult to ensure curriculum

continuity and coherence in practice between the primary school and secondary school.

The significant agreement between primary school teachers and secondary school science teachers on important SPS is a clear demonstration that both groups of teachers knew what good science teaching entails. The unsatisfactory science teaching at primary school level may be explained in terms of the generalist teacher and the insufficient equipment and materials in science at that level. The somewhat improved science teaching at secondary school level could be a result of an improvement of both science qualifications and availability of equipment and materials at that level. At both levels, the pressure of national examinations may militate against the use of SPS which may be viewed as a waste of time when there is a syllabus to cover. Good science teaching is sacrificed in an effort to get good examinations results through emphasizing science content which is thought to be important for those examinations. Taba (1962) says that given the choice between good teaching and good examination results, teachers, pupils and parents will choose good examination results. Lack of liaison can be explained in terms of lack of official policy/guidance/mechanism for that liaison, great distances between the secondary schools and the neighbouring primary schools, overworked teachers who, at the end of the day, have neither the time nor the energy for liaison and mistrust between the two groups of teachers.

Conclusions

Of the three questions that this study attempted to address, namely: continuity of science curricula from primary school to secondary school; agreement between primary school teachers and secondary school science teachers on important SPS and liaison between primary school teachers and secondary school science teachers, the most serious problem is that of liaison where there was virtually no liaison. It is the belief of these researchers that if there was greater liaison between the two educational levels, there would be greater agreement between them and greater continuity of science curricula between the primary school and the secondary school.

It is therefore recommended that the teachers from both educational levels could meet on regular basis, e.g., for joint workshops where materials and equipment from each level would be displayed and explained; teachers and pupils could make formal visits to the other level and witness science lessons in session;

schools could lend to and borrow from each other science teaching equipment and key documents; schools from both educational levels could have joint interschool science clubs and subject committees. During training, students could be attached to a school in the other educational sector in order to learn what happens in that other sector as is the case in the United Kingdom. Specialization at primary school level could also be considered very seriously.

Some of the recommendations could pause challenges in terms of feasibility. For example, since most secondary schools do not have much science equipment and materials for their own use and since such equipment is expensive and can easily break, it is highly unlikely that they would lend this equipment to the neighbouring primary schools. Primary schools might misconstrue class visits by secondary school teachers and pupils as fault finding and a way of discrediting primary school teachers. Despite these misgivings, we still make these recommendations because of the importance we attach to liaison. Ways of overcoming the above mentioned challenges should be worked out.

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