PUPILS' PERCEPTIONS AND THEIR TEACHERS' AWARENESS OF CONTINUITY IN MATHEMATICS INSTRUCTION AT THE PRIMARY – SECONDARY TRANSITION PHASE IN GWERU URBAN SCHOOLS IN ZIMBABWE.

By

Million Chauraya[1]
Department of Applied Education,
Midlands State University,
Zimbabwe

Abstract

The study examined Form 1 pupils' perceptions of continuity in mathematics instruction at the primary-secondary school transition phase and their teachers' awareness of such continuity. Three hundred Form 1 pupils in 6 selected secondary schools in Gweru-urban area, their mathematics teachers and Heads of Mathematics Departments (HODs) participated in the study in 2004. The study focused on the pupils' perceptions of content and pedagogical continuity in mathematics instruction at the transition phase, as well as continuity in their perceptions of the subject. It also sought to examine the Form 1 teachers' awareness of the need for curriculum continuity in mathematics instruction and to identify efforts they made to enhance it in their practice. Questionnaires were completed by the Form 1 pupils and their teachers, whilst interviews were conducted on the HODs.

The results showed that the pupils perceived content continuity in mathematics, but lack of continuity was found in pupils' perceptions of their teachers' instructional practices. Pupils continued to perceive mathematics positively. The teachers and the HODs showed an appreciation of the need for continuity in mathematics instruction, but were doing little to enhance curriculum continuity in mathematics instruction in a deliberate fashion. The study recommended that secondary school mathematics teachers obtain and use primary school documents such as the syllabus and textbooks in preparing their Form 1 lessons. It also recommended the adoption of deliberate strategies such as regular professional development meetings between primary and secondary school mathematics teachers, and pupils carrying their progress reports from Grade 7 to Form 1, so as to provide Form 1 teachers with sufficient mathematics background information about their pupils on which to base their instruction.

Introduction

When children move from one school to another they face several challenges. These challenges can be obstacles in their educational career (Galton, Gray & Rudduck, 1999; Noyes in Skovsmose & Valero, 2002). In Zimbabwe the primary-secondary school transition phase involves moving from Grade 7 to Form 1, and in most cases it entails changing schools.

---

[1]*Million Chauraya is a Lecturer in the Department of Applied Education, Midlands State University, P Bag 9055, Gweru, Zimbabwe. Email chaurayam@msu.ac.zw*

Several changes can have adverse effects on the pupils' learning (Felner, Ginter & Primavera, 1982; Tinto & Goodsell, 1994). The possible adverse effects involved in this change can be minimized if the transition is perceived as a continuous process by the learner. Continuity in mathematics instruction helps the learners to perceive the curriculum as a continuously cumulative and progressive course (Macnab & Cummine, 1986; Dean, 1982).

However there is research evidence that little is done in schools to ensure continuity in mathematics learning, especially where pupils move from one school to another (Dean, 1982; Cockroft Report, 1982; Galton & Hargreaves, 1999; Schiller, 2004). In Zimbabwe the Grade 7-Form 1 transition stage involves changes in the school, the teaching arrangements, the curriculum, etc., all of which can cause perceptions of discontinuity in the pupils. For example in the primary school the pupils are exposed to one teacher who teaches all the subjects, but in secondary school there is a different teacher for each subject. Hence changing school entails the need for adjustment to a new academic and social environment, which has its own new demands and expectations, and this may create perceptions of discontinuity among the pupils.

This study sought to investigate the nature of this continuity in mathematics instructional practices as perceived by Form 1 pupils, and their teachers' awareness of the problem of continuity. The key aspects of continuity in mathematics instruction examined in this study were the content linkages between Grade 7 and Form 1 mathematics, pedagogical continuity as evidenced by the pupils' perceptions of the teachers' instructional practices at the two levels, and pupils' affective perceptions of the subject.

Some studies in the United Kingdom have found a decline in performance in mathematics at the primary-secondary school transition phase (Galton, Gray & Rudduck, 1999; Times Educational Supplement (TES), 1999; Alexander, Entwisle & Dauber, 1994; Stevenson, Schiller & Schneider, 1994). This study was an attempt to investigate one possible cause for such a dip in performance at this stage, which is lack of continuity. The study did not compare the actual performances of the pupils at the two levels. Such comparison could have illuminated any changes in pupils' mathematical performance as a result of transition from primary to secondary school.

The words 'transfer' and 'transition' may have different meanings, depending on the contexts in which they are used. Galton, Gray & Rudduck (1999) regard 'transition' as "the move from one year group to the next within a school," (p.1) and 'transfer' as "the move from one school to another." (p.1). In this study the word 'transition' refers to both situations. Moving from Grade 7 to Form 1 is a transition in the sense that it involves moving from a lower to a higher level on the educational ladder, and this can occur within the same school. The same movement can be viewed as a transfer because in most cases it involves changing schools.

Statement of the Problem

This study sought to assess pupils' perceptions of the degree of continuity in mathematics instruction as they progress from Grade 7 to Form 1, with reference to secondary schools in the Gweru Urban area in Zimbabwe. It also investigated Form 1 mathematics teachers'

and the HODs' awareness of the need for continuity in mathematics instruction and the efforts they make to enhance such continuity.

Research Questions

The study problem was addressed through the following research questions:

1. What are the pupils' perceptions of content continuity in mathematics at the primary –secondary school transition stage?
2. To what extent do the pupils perceive pedagogical continuity in mathematics instruction at the primary-secondary school transition phase?
3. Are there any changes in pupils' affective perceptions of mathematics at the primary-secondary school transition phase?
4. What efforts do Form 1 mathematics teachers make in trying to enhance continuity in mathematics instruction at the primary-secondary school transition stage?

Review of Literature

This section examines literature and research findings that highlight some pertinent issues associated with school transitions, especially when students transfer from one school to another as a result of moving from one level of education to another.

Murdoch (as cited by Noyes, in Valero & Skovsmose (Eds.), 2002) describes some of the challenges faced by pupils at the transition stage as including, facing different teachers and surroundings, changes in the nature of schooling itself, and differences in the length of the school day, timetabling, teaching styles and the general school curriculum. A study carried out in the United Kingdom on the effects of school transfer by Galton & Hargreaves (as cited in Galton, Gray & Rudduck, 1999) established that 45% of year 5 pupils failed to achieve better results on tests of mathematics and language at the end of the transfer year when compared to the previous year in the feeder school. This was accompanied by a decline in motivation towards some subjects. Schiller (2004) states that signs of academic difficulties following school transitions include failing courses, declines in grades, and higher rates of absenteeism. The Times Educational Supplement (TES) (1999) reports the findings of a government-backed study in the United Kingdom that showed that up to 40% of 11-year-olds failed to make satisfactory progress during their first year of secondary school. The study attributed this lack of progress to the prevailing programmes, which placed too much emphasis on the social rather than the academic effects of transfer.

The sentiments above allude to academic tribulations caused by the primary-secondary school transition that sometimes causes a decline in performance, among other adverse effects.

The desirability of curriculum continuity in school transitions has been highlighted by several authors. Dean (1982) says that there must be some continuity in the curriculum to enable pupils to successfully follow it throughout one school, or even from one school to another, when pupils are transferred. According to Bernkopf (1978) mathematics has a hierarchical structure in which one concept builds on another and depends on it. This observation concurs with Gagne (as cited in Macnab & Cummine, 1986, and in Ashlock & Herman, 1970) who

stressed that successful learning of a mathematical task depends on mastery of several lower-level sub-tasks, and that an individual may not be able to learn a particular topic if he/she has failed to achieve any of the subordinate topics that support it at a lower level. These sentiments underscore the significance of content linkages from one phase to another if successful learning of mathematics is to be attained. Since primary school mathematics constitutes the foundation upon which secondary school learning of the subject builds, the existence of content continuity at the transition phase is therefore critical.

The need for pedagogical continuity at the primary-secondary school transition stage in mathematics is in line with the constructivist view of learning, which, according to Selden & Selden (1996), regards cognition as adaptive in the sense that it organizes experiences so that they 'fit' with a person's previously constructed knowledge. In the context of this study, pupils' prior knowledge and skills gained in the primary school are the pillars of successful secondary school mathematics learning. Instructional practices that utilize this knowledge base are therefore likely to enhance perceptions of pedagogical continuity at the transition stage.

Curriculum continuity between primary and secondary school subjects can be achieved through various strategies. Dean (1982) advocates for liaison between primary and secondary schools. Such liaison could involve interchanging of schemes of work and holding subsequent discussions, establishing special posts for meetings among teachers from different schools, and familiarizing secondary school teachers with content and methods in the primary school. The Cockroft Report (1983) identifies other possible areas of liaison. These include secondary school teachers visiting their feeder primary schools, a record card showing each pupil's performance taken from primary to secondary school, and information about a pupil's learning difficulties being availed to the new secondary school teacher by the primary school teacher.

The above strategies could serve to enhance curriculum continuity in instruction across the various subject areas as pupils move from primary to secondary school. Secondary school teachers would gain a lot of information about the content and pedagogy used in the primary school, as well as important academic background information about the pupils entering secondary school. Such information would serve as a basis for adopting pedagogies in the secondary school that enhance curriculum continuity. However the success of these strategies clearly depends on the contexts in which they are tried. In Zimbabwe the implementation of some of these strategies is quite practical and realistic because secondary schools have clearly identified feeder primary schools, which are within reasonable distances of each other. Hence it is possible for secondary school teachers to meet their primary school counterparts from the feeder schools to discuss on issues relating to curriculum continuity as alluded in the above strategies. Such meetings could be organized under the auspices of current teacher professional programmes such as the Better Schools Programme in Zimbabwe (BSPZ).

It was the purpose of this study to determine if pupils perceived content continuity in mathematics, as well as continuity in teachers' instructional practices at the primary-secondary

school transition phase. The study also sought to find out what knowledge Form 1 mathematics teachers had about primary school mathematics curriculum, and whether such knowledge was sufficient to enable them to facilitate continuity in the pupils' learning of the subject.

Method

The study was conducted in 6 schools selected from a population of 14 secondary schools in the Gweru Urban area in Zimbabwe. The 14 secondary schools consisted of 5 former Group A, 6 former Group B and 3 church schools. Group A schools were those reserved for the Whites during the Rhodesian era, and these are located mainly in the low-density suburbs of the city. Group B schools were reserved for the Blacks and are located mainly in the high-density suburbs. The 3 church schools are all located within low-density suburbs of the city.

The 14 secondary schools were stratified according to former Group A, former Group B and Church schools for purposes of selecting the study sample. The main consideration in stratification was the resource base of the schools. Former Group A schools were traditionally well-resourced as compared to the other schools. Church schools also have generally better resources as compared to the former Group B schools. Availability of curriculum documents such as textbooks and library facilities were some of the considerations in stratifying the schools according to the criterion described above. Two schools were randomly selected from the former Group A category, 3 from the former Group B schools and 1 from the Church schools.

The respondents for the study were all Form 1 mathematics teachers, a sample of Form 1 pupils, and all the Heads of Mathematics Department (HODs) in each of the selected schools, in the year 2004. In each school there were 2 mathematics teachers teaching the Form 1 classes. The Form 1 pupils were stratified according to sex for purposes of selecting the sample, except one girls' only school. Random selection was done in each class according to the proportions of boys to girls in all the Form 1 classes. Table 1 below shows the composition of the respondents who participated in this study.

Table 1: Composition of the research sample

School	Pupils		Teachers	HOD
	Male	Female		
A	27	27	2	1
B	0	29	2	1
C	20	20	1	1
D	27	35	2	1
E	21	34	2	1
F	29	31	2	1
Total	124	176	11	6

Altogether 300 pupils consisting of 124 boys and 176 girls, 11 Form 1 mathematics teachers and 6 HODs took part in the study. In one school the HOD was also teaching Form 1 classes.

The research instruments consisted of questionnaires for Form 1 pupils and their mathematics teachers, and an interview schedule for the HODs. The pupils' questionnaire consisted of likert-type items, which sought to find out their perceptions about the mathematics teaching they experienced while in Grade 7 as compared to Form 1. It also had some open-ended items where they stated what the liked and disliked about mathematics teaching at the two levels. An example of an item on the students' questionnaire was,

"Write down any THREE subjects which you enjoyed learning most in:
a) primary school. b) secondary school.".

The teachers' questionnaire consisted mainly of open-ended items which sought to find out their awareness of the need for continuity at the primary-secondary transition phase in mathematics teaching, and strategies they used in their practice to enhance such continuity. An example of an item on the teachers' questionnaire was,

"What do you think Form 1 teachers need to do (if any) to ensure that there is a linkage between Primary School and Secondary School mathematics learning by pupils?"

The HOD interview instrument had similar questions to those for Form 1 teachers but included some items on administrative aspects such as supervision. An example of the interview questions was,

"What strategies, if any, do you use as a department to ensure that Form 1 students perceive secondary school mathematics as a continuation of primary school mathematics?"

All the instruments were pilot-tested at a secondary school, which was not later used in the main study. Some items were modified as a result of the pilot-testing, but no numerical estimates of validity and reliability of the instruments were computed.

Data were collected during Term 3 of 2004, just after the end-of-year examinations, to enable the pupils to use their year-long experiences in Form 1 mathematics lessons in responding to the questionnaire. Through prior arrangements, the instruments were completed and collected on the same day of visiting each school.

The pupils' responses were summarized in frequency tables according to the research questions and these were compared for changes in responses at each of the two levels. Data from the teachers and HODs were mainly analyzed qualitatively and their responses were compared to those of their pupils.

Results

Data are presented and analyzed thematically according to the research questions proposed for the study.

Pupils' perceptions of content continuity

The pupils' responses to items relating to mathematics content are shown in Table 2 below. The responses were classified as SA= Strongly Agree, A= Agree, N= Neutral, DA= Disagree, SDA= Strongly Disagree.

Table 2: Pupils' responses to items relating to mathematics content (n=300)

STATEMENT	SA	A	N	DA	SDA
Grade 7 maths is closely linked to Form 1 maths.	67 22%	129 43%	30 10%	54 18%	12 4%
My knowledge of Primary School mathematics has helped me a lot in understanding Form 1 maths.	112 37%	126 42%	23 8%	24 8%	13 4%

The responses to both items seem to indicate that the majority of the pupils perceived content continuity between Grade 7 and Form 1 mathematics.

The pupils gave the following as the most common primary school mathematics topics they found most relevant to Form 1 mathematics: Fractions and Percentages (50%); Addition, Subtraction, Multiplication and Division (46%); Ratio, Rate and Proportion (43%); Area, Perimeter and Volume (24%).

Overall the data showed that the pupils perceived content continuity in mathematics between the two levels and were able to identify specific topics that typified the linkages.

Pupils' perceptions of pedagogical continuity in mathematics instruction

Table 3 below shows the comparative frequencies of the pupils' responses to statements about the Grade 7 and Form 1 mathematics teachers' pedagogy. Responding to these items was done by the pupils in the presence of the researcher, item by item. Hence there was a hundred percent response rate to each item. The table shows a decrease in levels of agreement with each of the statements on teacher pedagogy from Grade 7 to the Form 1. For example, on the statement that the teacher explained concepts clearly, a total of 89% either strongly agreed or agreed with the statement for the Grade 7 teacher, while 68% either strongly agreed or agreed with the statement for the Form 1 teacher. The same trend is observed on the statement that the teacher demonstrated procedures clearly, where 77% either strongly agreed or agreed with it for the Grade 7 teacher and 62% either strongly agreed or agreed for the Form 1 teacher.

The trend was observed on all the statements, except the statement on the use of teaching and learning aids where the majority of the pupils either disagreed or strongly disagreed with the statement at both levels, indicating that the mathematics teachers at both levels were rated as not using teaching and learning aids. For the Grade 7 teacher, 47% either disagreed or strongly disagreed with the statement, while 61% either disagreed or strongly disagreed with it for the Form 1 teacher.

Overall the pupils perceived the Grade 7 mathematics teachers as better than their Form 1 counterparts on the aspects constituting classroom instructional practices. This might be an indication of discontinuity.

Table 3: Pupils' levels of agreement with statements about their mathematics teachers' pedagogy (n=300)

	Grade 7 Teacher					Form 1 Teacher				
STATEMENT	**SA**	**A**	**N**	**DA**	**SDA**	**SA**	**A**	**N**	**DA**	**SDA**
Teacher explained concepts clearly.	143 48%	123 41%	4 1%	25 8%	4 1%	85 28%	118 39%	18 6%	35 12%	45 15%
Teacher demonstrated procedures clearly	115 38%	121 40%	24 8%	26 9%	14 5%	84 28%	102 34%	22 7%	47 16%	43 14%
Teacher used teaching and learning aids.	40 13%	85 28%	34 11%	75 25%	66 22%	36 12%	52 17%	38 13%	93 31%	90 30%
Teacher showed interest in mathematics.	142 47%	109 36%	13 4%	17 6%	13 4%	97 32%	114 38%	25 8%	39 13%	36 12%
Teacher was patient with pupils.	107 36%	108 36%	24 8%	38 13%	19 6%	69 23%	90 30%	36 12%	63 21%	38 13%
Teacher answered pupils' questions.	125 42%	126 42%	15 5%	16 5%	11 4%	78 26%	108 36%	31 10%	40 13%	33 11%
Pace of content coverage was comfortable for me.	114 47%	121 40%	23 8%	29 10%	8 3%	59 20%	95 32%	35 12%	62 21%	37 12%

The pupils were asked to list the things they liked about the way mathematics was taught to them, first at the Grade 7 level and then at the Form 1 level. This was an open-ended item designed to find out their perceptions of specific aspects of mathematics lessons at the two levels. Only a total of 185 pupils responded to this item. Table 4 shows the comparative frequencies of their responses, in decreasing order of popularity.

Table 4: Professional aspects liked about mathematics instruction at Grade 7 and Form 1 levels. (n=185)

ASPECT	GRADE 7	FORM 1
Teacher explanations	101 (58%)	61 (33%)
Teacher demonstrations	46 (25%)	27 (15%)
Teacher's patience	27 (15%)	19 (10%)
None	11 (5%)	29 (16%)

The responses in Table 4 seem to reflect decreasing perceptions in the level of popularity of the aspects they liked about mathematics pedagogy at the two levels, but the validity of this observation may be weakened by the small numbers of pupils who responded to this item. It is also worth noting that pupils' perceptions of good mathematics teaching were centered on the teacher's activities only, which may be an indicator of the teacher-centeredness of instructional practices in mathematics at both levels.

On the whole the data showed decreasing positive perceptions on those aspects of pedagogy covered in the study between Grade 7 and Form 1, which might indicate discontinuity.

Pupils' affective perceptions of mathematics

Some items on the pupils' questionnaire sought to elicit their affective perceptions towards mathematics at the two levels. This was meant to find out if there were any changes in their attitudes at the transition stage from Grade 7 to Form 1.

Table 5 shows the comparative frequencies of the pupils' responses to statements about their self-rating on the affective aspects of the subject at both levels. All the 300 pupils responded in full or in part to these items, hence percentages in the Table 5 below are expressed out of 300.

The responses show decreasing popularity of the pupils' self-ratings on the three statements, from Grade 7 to Form 1, which might indicate a possible discontinuity in their affective perceptions of the subject.

Table 5: Pupils' agreement with statements about self-rating on mathematics (n=300)

	GRADE 7					FORM 1				
STATEMENT	**SA**	**A**	**N**	**DA**	**SDA**	**SA**	**A**	**N**	**DA**	**SDA**
I enjoyed learning mathematics	139 46%	113 38%	21 7%	12 4%	13 4%	72 24%	107 36%	35 12%	34 11%	30 10%
I understood most of what was taught	102 34%	136 45%	22 7%	31 10%	8 3%	44 15%	74 25%	50 17%	60 20%	35 12%
My performance in mathematics was good	129 34%	112 37%	21 7%	28 9%	8 3%	79 26%	60 20%	54 18%	20 7%	40 13%

The pupils were asked to list any three subjects they enjoyed learning, first in primary school then in Form 1. Table 6 shows the comparative popularity of those subjects found at both the primary and secondary school levels. General Paper is not a subject taught at secondary school.

Table 6: Pupils' responses to subjects enjoyed most at the two levels. (n=300)

SUBJECT	PRIMARY SCHOOL	SECONDARY SCHOOL
English	259 (86%)	139 (46%)
Mathematics	254 (85%)	169 (56%)
General Paper	201 (67%)	N/a
Shona/Ndebele	139 (46%)	66 (22%)

Table 6 shows that Mathematics was second to English in popularity in the primary school, but was rated as the most popular subject in secondary school, in spite of the increased number of subjects on offer. This shows that mathematics continued to be one of the most popular subjects at both levels, which might be an indication of continuity of positive affective perceptions towards the subject from Grade 7 to Form 1. This is despite some indication of discontinuity in the pupils' self-ratings on the affective aspects in Table 5. This could be due to the fact that whilst there are at least 10 subjects in secondary school, only 3 of them are a continuation from primary school as distinct subjects. Hence they might not have formed deeply held attitudes towards the other 7 subjects after studying them for about 10 months.

Form 1 mathematics teachers' efforts to enhance continuity in instruction.

The questionnaire for Form 1 teachers and interview schedule for HODs sought to find out if they appreciated the need for continuity in mathematics instruction at the transition stage. The instruments specifically sought to find out if they had the material resources necessary to establish continuity and the strategies they used to enhance the continuity. Table 7 below shows their responses to some of these questions. The results showed that the teachers were aware of the need to link primary school content to secondary school content in their mathematics lessons, but seemed not to have the relevant primary school documents to establish such linkages. They indicated that they pre-tested assumed knowledge prior to teaching some new topics as a strategy to enhance continuity in pupils' learning of the subject.

Table 7: Form 1 mathematics teachers' responses (n=11)

Question	Yes	No
Do you have the Primary School Maths Syllabus?	1	9
Is it necessary to have the Primary School Maths Syllabus?	10	1
Do you have some copies of primary school maths textbooks in the department?	1	9
Do you have some copies of primary school maths textbooks in the school library?	1	10
Do you sometimes refer to some primary school maths textbooks when preparing Form 1 maths lessons?	1	10
Do you give your pupils tests to assess assumed knowledge prior to teaching some topics?	9	2

In response to the item on what could be done to ensure that there is linkage between primary and secondary school mathematics, the teachers gave the following suggestions.

Having a copy of the primary school mathematics syllabus (4), revision of what was done at primary school (2), regular meetings between primary and secondary school teachers (2), testing assumed knowledge before teaching (1), and referring to mathematics textbooks used in primary school (1).

Responses from the HODs showed a similar pattern. The following table shows their responses to some of the items.

Table 8: Heads of Departments' (HODs) responses (n=6)

Question	Yes	No
Do you have a copy of the primary school maths syllabus in the department?	0	6
Do you have any primary school maths textbooks in the department?	1	5
Do you have any primary school maths textbooks in the school library?	3	3

The responses to the first two items were found to be consistent with those of the teachers. Responses to the third item seem to partly contradict the teachers' responses. While only one teacher indicated that there were some primary school mathematics textbooks in the school library, three HODs gave a similar response, which was a reference to 3 schools.

The overall pattern, however, was that the schools seemed not to have the necessary primary school mathematics documents which could be used to enhance content linkages in Form 1 mathematics lessons.

The HODs cited the following as some of the strategies which could be used to ensure that there is continuity in mathematics teaching and learning between Grade 7 and Form 1, interaction between teachers at the two levels (2), mathematics resources in the primary school to be available in secondary school (1), staff development for teachers at both levels (1). The responses alluded to an appreciation of the need to ensure that there is continuity in mathematics instruction at the transition stage.

The Form 1 teachers and HODs gave the following as the primary school mathematics concepts and skills which are necessary for learning the subject at secondary school level: Addition, multiplication, subtraction and division (8); fractions (6); directed numbers (6); geometrical constructions (3); geometry concepts (3); real number system (1) and inequalities (1). However directed numbers, geometrical constructions and inequalities are Form 1 topics which are not taught in the primary school, hence this may be any indicator of lack of clear knowledge of what content is taught in the primary school.

Four teachers stated that they knew their pupils' Grade 7 mathematics grades, while 6 did not know. One hundred and twenty-two (41%) pupils indicated that their Form 1 mathematics teachers had asked them about their Grade 7 mathematics grades, while 115 (38%) said they had not been asked. The overall picture was that some Form 1 mathematics teachers seemed to lack sufficient mathematics background information about their pupils on which to base their instruction.

Discussion

The results show that some pupils perceived content continuity in mathematics at the primary-secondary school transition stage. Such perceptions are evidently healthy for the learning of

the subject which has a hierarchical structure (Bernkopf, 1978), and whose mastery of new concepts depends on knowledge of other pre-requisite concepts (Gagne in Ashlock & Herman, 1970; Dean, 1982). The spiral nature of the Zimbabwean mathematics curriculum (Zimbabwe Primary School Mathematics Syllabus; Zimbabwe General Certificate of Education; Zimbabwe O'Level Mathematics Syllabus 4008) also serves to reinforce content continuity. Hence the mathematics teachers at both levels need to operationalize the content linkages emphasized in these syllabi in order to buttress the pupils' perceptions of content continuity. However the absence of key primary school mathematics documents, such as the syllabus and textbooks, in the secondary school militates against reinforcing content continuity in mathematics instruction at the transition stage.

The results indicate lack of continuity in pupils' perceptions of teachers' pedagogy at the Grade 7-Form 1 transition stage. Generally the Form 1 teachers were perceived less favourably than their Grade 7 counterparts on those aspects of mathematics teaching covered in the study. Whilst it is appreciated that Grade 7 and Form 1 are different learning environments (Noyes in Valero and Skovsmose, 2002), such a 'dip' in positive perceptions of the teachers' instructional activities may result in 'micro-ruptures' (Grugeon and Artigue, 1995) in pupils' learning of the subject, leading to a possible decline in performance (Galton, *et al.*, 1999; TES, 1999). Thus there is need for Form 1 teachers to base their classroom practices on what goes on in the primary school, and on more comprehensive information about their pupils' mathematical background.

The results show continuity in the pupils' affective perceptions of the subject at the transition stage. The pupils ranked mathematics as one of their popular subjects at both levels. The majority rated themselves positively on the affective aspects of mathematics at both levels, although less so for the Form 1 stage. This result underscores the need for Form 1 mathematics teachers to perpetuate such positive perceptions through their instructional practices.

The study found that the teachers appreciated the need for continuity in mathematics instruction. They pre-tested assumed knowledge prior to teaching some mathematics topics, which is a viable strategy for enhancing continuity in learning at the Grade 7-Form 1 stage. However most of the teachers and HODs indicated that they did not have any of the basic primary school mathematics instructional documents in their schools, but such self-reports could be interpreted in two ways. The first could be that the documents were lying around in the school libraries and departmental offices but were not being used. The second is that the documents were in fact not available in the schools. Whatever the true situation was in the schools, the responses indicated lack of use of primary school mathematics documents by the teachers in preparing Form 1 lessons. The basis and validity of the pre-testing becomes questionable in such a situation. The categorization of some secondary school mathematics topics as primary school content raises questions about the teachers' knowledge of the content taught in the primary school. Lack of comprehensive mathematics background information about their individual pupils, may weaken the teachers' efforts to assist individual pupils with persistent problems in learning the subject.

Recommendations

The study recommends that the mathematics practitioners in secondary schools make an effort to acquire and use primary school documents so that content continuity is enhanced at the primary-secondary school transition phase. Whilst it is very likely that primary school mathematics curriculum documents are available in most secondary schools, especially in the libraries, secondary school teachers need to use them more effectively in preparing their lessons. Such reference to the primary school syllabus and textbooks can help a lot in enhancing continuity in the pupils' learning of the subject in secondary school.

The study also recommends the adoption of some deliberate strategies which can serve to enhance positive perceptions of pedagogical continuity as pupils progress from Grade 7 to Form 1 (Dean, 1982; Cockroft Report, 1982). Such strategies could include pupils bringing their progress reports in primary school to secondary school so that Form 1 teachers familiarize themselves with a reliable performance record of each pupil. Currently pupils bring only the Grade 7 result slip for enrolment in secondary school. No other documented information about their formative academic progress in primary school is availed to secondary school teachers. Regular meetings between primary and secondary school mathematics teachers could also help both to be more familiar with the content and pedagogies at the two levels. Form 1 teachers would base their instruction on such knowledge and this would foster continuity in the pupils' learning of the subject at the transition stage. Currently professional development meetings are commonly held separately, i.e. primary school teachers have meetings separately from those for secondary school teachers.

Conclusion

The results seem to unravel some pertinent issues relating to continuity in mathematics instruction which should be of concern to mathematics educators. The current practice in Zimbabwe is that primary school graduates bring only the Grade 7 result slip as the only academic record of their performance. Form 1 mathematics teachers mostly don't have comprehensive knowledge about their pupils' performance in the subject in the previous school. Under the present environment in schools where class sizes are very large and each teacher is teaching up to 6 classes, it may be tedious and time-consuming to collect such information about individual pupils in their classes. However an academic record of each pupil's performance in primary school could guide Form 1 teachers a lot in their efforts to enhance continuity in mathematics instruction, which in turn could enhance successful learning of the subject in secondary school. Any perceptions of discontinuity in pupils' learning can be detrimental to their success in the subject. The study recommends the adoption of strategies targeted at enhancing continuity in mathematics instruction at this transition stage.

Current teacher professional development activities within schools in Zimbabwe seem to occur as if there are academic boundaries between primary and secondary schools. There is evidently very little cross-sharing of professional and curricular information among teachers across the two levels. This could be attributed mainly to a lack of appreciation of the need for such professional dialoguing as there are no official policy pronouncements either for or

against such interaction. Hence this study highlights this 'gap' and advocates for professional development activities that equip teachers operating at either of the two levels with sufficient knowledge about the enacted academic curriculum of their subject. With such knowledge primary school teachers would better prepare their pupils for secondary school work. Secondary school teachers would also be more knowledgeable about academic activities in the primary school in their efforts to enhance curriculum continuity in the instruction of their subject areas.

It needs to be acknowledged however that this study did not address all the critical aspects of continuity in mathematics instruction, most notably performance in the subject. The author feels that there is need for further related studies in other contexts different from the one used in this study, if the issue of curriculum continuity in mathematics at the primary-secondary school transition stage is to be fully understood and enhanced in Zimbabwe.

References

Ashlock, R. B. & Herman, W. L. (1970). *Current Research in Elementary School Mathematics.* Canada: The Macmillan Company.

Alexander, K.L., Entwisle, D.R., & Dauber, S.L. (1994). *On the Success of Failure: A Reassessment of the Effects of Retention in the Primary Grades.* Cambridge, England: Cambridge University Press.

Bernkopf, M. (1978). *Mathematics: An Appreciation.* New York: Houghton Mifflin Company.

Cockroft Report (1982). *Mathematics Counts.* London: Her Majesty's Stationery Office.
Dean P. (1982). *Teaching and Learning Mathematics.* London: The Woburn Press.

Felner, R.D., Ginter, M., & Primavera, J. (1982). Primary prevention during school transitions: Social support and environmental structure. *American Journal of Community Psychology Vol. 10 No. 3/June 1982 pp. 277-290 Springer Netherlands.* Retrieved May 13, 2004 from http://commerce.metapress.com/content/m63133rk31355u/

Galton M. & Hargreaves, L. (1999). *Inside the Primary Classroom: 20 years on.* London: Routledge.

Galton M., Gray, J. & Rudduck, J. (1999). *The Impact of School Transitions and Transfers on Pupil Progress and Attainment.* Retrieved June 17, 2004 from http://www.dfee.gov.uk/research/query.cfm?cat=5.

Grugeon, B. & Artigue, M. (1995). Issues linked to the transition between didactic institutions: the case of algebra in the transition from vocational high schools to general high schools. In *Proceedings of the 19th PME International Conference 1 231-236.*Recife, Brazil.

Macnab, D.S. & Cummine, J.A. (1986). *Teaching Mathematics 11-16: A Difficulty-Centred Approach.* Oxford, England: Basil Blackwell Ltd.

Noyes, A. (2002). School transfer and the learning of Mathematics: Learning landscapes and Bourdieuan frameworks, in Valero and Skovsmose (2002) (Eds.). *Mathematics Education and Society Part 2, Proceedings of the Third International Mathematics Education and Society Conference*.(pp. 470-479) Denmark, Helsingor: Centre for Research in Learning Mathematics.

Selden, J. & Selden, S. (1996). *Constructivism in mathematics education…what does it mean?* Orlando Meetings: Presentation Summary. Retrieved August 14, 2004 from http://www.mathforum.org/orlando/construct.selden.html.

Schiller, K.S., (2004). *The Trials and Tribulations of School Transitions*. Retrieved October 6, 2004 from http://www.albany.edu/aire/urban/Schiller.html.

Stevenson, D.L., Schiller, K.S. & Schneider, B. (1994). Sequences of Opportunities for Learning. *Sociology of Education, Vol. 67, No. 3 (Jul. 1994) pp. 184-198.*

Times Educational Supplement (TES) (3 September 1999). *The effect of secondary transfer on performance.* Retrieved June 14, 2004 from http://www.literacytrust.org.uk/Database/secondary/prisec.html

Tinto, V. & Goodsell, A. (1994). *A Longitudinal Study of Freshman Interest Groups at the University of Washington.* Retrieved March 12, 2004 from http://eric.ed.gov/ERICDocs/data/ericdocs2sq1/content_storage_01/0000019b/80/15/66/3f.pdf.

Zimbabwe Primary School Mathematics Syllabus (1987). Ministry of Education,Zimbabwe.

Zimbabwe General Certificate of Education (ZGCE) O Level Syllabus Mathematics (4008). Zimbabwe School Examinations Council (ZIMSEC).