

CHAPTER 5

RESULTS AND DISCUSSION:

THE NATURE AND EXTENT OF HELP PROVIDED BY SUPPORT DOCUMENTS

This chapter presents the results of the investigation of the extent to which the policy documents, syllabus document, and textbooks provide support to teachers to help them promote the approaches required by the new curriculum.

5.1 POLICY DOCUMENTS

The literature shows that support materials play an important role in the implementation of new curricula. So in this last part, I looked at the available support documents with the purpose of answering the following research question.

Research Question 6: To what extent do the support documents (policy documents, *Junior Secondary Science* syllabus, and available *Science* textbooks and teacher's guides) help teachers to promote the new goals (relating to skills and attitudes as well as knowledge) and approaches, with particular reference to the teaching of breathing and respiration?

Originally I had intended to get all the available policy documents that could give me information about what the curriculum requires teachers to do. However, it proved very difficult to locate any such documents. During my discussion with members of the *Science* panel it transpired that there are no such curriculum documents. One research article I had read had a good quote of what learner-centredness means, and cited a Lesotho government document. I had intended to get this particular policy document as it seemed a promising source of information regarding the new syllabus. However, when I talked to the author it turned out that he had been referring to the syllabus document (although the direct quote he had cited is not in the syllabus document). When the study started there were no policy documents so I could not answer the question on the extent to which policy documents help teachers promote new approaches. In May 2007 I was given access to the draft of *Curriculum and assessment policy framework document* which was being developed in Lesotho 2007, but this document had not yet been released.

5.2 JUNIOR SECONDARY SCIENCE SYLLABUS

The absence of such important policy documents suggests that the only information given to teachers about the curriculum was that appearing in the syllabus.

As reported in section 4.1.1 on page 46 the requirements of the new curriculum are not clearly stated in the syllabus document. There are statements in the *general information* section under the headings *mission statement*, *approaches*, and *lists of general objectives* and *specific end-of-course objectives*

which give some indication of what the curriculum requires, as summarized in Chapter 1 section 1.3.2, page 4, and Chapter 4 section 4.1.1 page 46. One of these statements indicates that learner-centred approaches should be used, but does not define the term “learner-centred”. Another statement under “suggested methods to be used” indicates active involvement of learners in practical work as a second requirement but does not explicitly suggest using activities as basis for learning (i.e. using activity-based approach). Engaging learners meaningfully in the learning process is important as learners learn better when they discover things for themselves. Thirteen of the seventeen *general objectives* mention acquisition of scientific skills and attitudes, without necessarily specifying the skills and attitudes to be learned. For instance, learners are expected to “*have acquired scientific knowledge, skills and attitudes to solve problems related to socio-economic and technological change.*” (Ministry of Education and Manpower Development, 2002, 6). Furthermore, 18 more skills are mentioned under *specific objectives*, and some are found embedded between statements indicating content that has to be learned such as “*describe how to care for a light microscope*” (Ministry of Education and Manpower Development, 2002, 8). The fact that skills are scattered all over the syllabus document makes it difficult for teachers to identify them easily and target them as skills to be actively taught. Skills should at least be grouped or clustered in a way that all teachers will be able to comprehend (see Appendix H as an example). This is too little information given to teachers if they are expected to effectively implement the new approaches.

5.3 TEACHER’S GUIDES

Stronkhorst and van den Akker (2006) point out that curriculum materials can play an important role in implementation of a new curriculum as they can clarify to teachers the implications of innovations and how they can be implemented. They should provide clear and practical guidelines about how lessons can be executed, as having a clear direction on how to go about implementing the curriculum helps reduce early implementation concerns of teachers (Stronkhorst and van den Akker, 2006).

As discussed on page 35 in Chapter 3, only the books of two publishers (which will be referred to as Publisher 1 and Publisher 2) were used for this study. Only one publisher had teacher’s guides, and two guides (one for Form B and one for Form C) were analysed for this study. Most of the wording on the cover pages and introductory sections of the teachers’ guides for Form B and Form C is identical. Where this is the case quotes will have both references cited.

In order to establish the extent to which teacher’s guides help teachers, the cover pages, introductory sections, and one chapter on breathing and respiration (chapters were used as a sample) of the teachers’ guides were analysed using a qualitative checklist. The purpose of this analysis is to see what information they provided relating to learner-centredness and activity-based approaches, and the development of skills and attitudes. The following sections present the results of the analysis.

The checklists completed as the teachers' guides and textbooks were analysed in this study are included as Appendices E and F. The quotes from the teacher's guides used in the following discussions are extracted from these appendices.

Guidance given about implementing a learner-centred approach

The meaning of "learner-centred": On the back cover of both Form B and C teacher's guides analysed, a statement appears saying

"The course emphasises a learner-centred approach, enabling students to become active, problem-solving participants in their own learning process."

(Lepota *et al.*, 2005 and Khanyane *et al.*, 2006a)

Even though it states clearly that a learner-centred approach will be used, neither guide defines "learner-centred". Furthermore the explanation that follows is confusing because it is incorrectly linked with learner-centredness yet it is about learners' active involvement in the learning process. This explanation implies that "learner-centred" and "activity-orientated" are the same, but these two concepts are different, as explained in Chapter 1, section 1.3.2. This could give a misleading message to teachers.

In a section on the *components of the course* in the Form B guide (Lepota *et al.*, 2005, iii) the guide indicates that

"the student's book is learner-centred..."

Several pages later, under the section on *helping students with difficulties*, some features of a learner-centred approach are mentioned, such as learners having different learning abilities and learning at different paces, as shown by the following quote.

"[e]very student is unique and has his or her own talents, strengths and weaknesses. Some students may be good at practical activity but not so good at reading. Others may be good with numbers but not good at discussing environmental issues."

(Lepota *et al.*, 2005, xii, and Khanyane *et al.*, 2006a, 7)

Because these features are divorced from the concept of "learner-centredness" it is not easy to say whether the book is trying to explain the term "learner-centredness" or not. Furthermore, although the books mention two important differences between learners in this quote they leave out other important differences such as different cultural backgrounds, experiences and prior knowledge, as well as different interests and needs.

A further problem was identified under the section on *helping students with difficulties*, where the examples provided of learners with difficulties points to learners with physical disabilities, such as learners who have problems with vision, hearing, etc. This sways teachers' attention away from recognizing individual differences in "normal" classes.

With the two problems discussed above (lack of a definition, and misleading wording which suggests that learner-centredness is equated with activity-orientated learning) there seems to be little guidance given in the teacher's guide to help teachers understand the concept of learner-centredness.

How to make classrooms learner-centred: There is also very little guidance given on how to make lessons learner-centred. The guides states that

“You may sometimes allow more time for some students to complete activities while you give faster students something else to do. Use group work for mixed-ability learning and make sure that each group is composed of students with different abilities.” (Lepota *et al.*, 2005, xii, and Khanyane *et al.*, 2006a, 7)

Teachers are asked to take learners’ pace of learning into consideration by giving more time for slower ones to keep up, while keeping faster learners busy with extra work. But that is as far as the guidance goes. There is no guidance given on how to recognize differences or how to accommodate differences other than in pace of learning. It is important to note that because the given features are not directly linked to “learner-centredness” in the explanation I am assuming the authors are referring to learner-centredness. The authors may not be making this link.

There is no further reference to strategies for coping with differences in the rest of the teachers’ guide. Nothing in the chapter on *breathing in the world around us* (Form B teacher’s guide) and on *the respiratory system* (Form C teacher’s guide) makes any reference to either catering for differences, or allowing students’ choice in what or how to learn. So the teachers’ guides do not seem to give that much guidance to help teachers use a learner-centred approach.

All in all the teacher’s guides mention that a learner-centred approach be used but do not define the term. Furthermore, they give misleading wording that equates learner-centredness with learners’ active involvement. While the guides mention two important features of learner-centredness, as mentioned above, many more important features are left out. There is little guidance given relating to giving more time to slow learners, and no guidance at all on how to recognize and accommodate other differences.

Guidance given about “activity-based learning”

The use of activity-based learning is a worldwide move in science teaching and it is well supported by the theory of constructivism. I used the term “activity-based” (in Chapter 1 section 1.3.2, page 10) because I had originally been influenced by the fact that the cover pages of the first set of books given to schools when the new syllabus was introduced used the term “activity-based”. This suggested to me that the authors were working in line with the world trends. However, the syllabus document does not use this particular term, and it is possible that their use of the activities may involve “activity-orientated” rather than “activity-based” learning. As described in Chapter 1, pages 5-11, these two concepts differ.

Guidance on the meaning of “activity-based learning”: Activity-based learning is not mentioned or defined anywhere in the teachers’ guides of this publisher. However, the teacher’s guides do suggest **using** activities. For instance, on the cover pages of the teachers’ guides for both Form B (Lepota *et al.*, 2005) and Form C (Khanyane *et al.*, 2006a) is a bullet list of the *notable features in the student’s book*, and bullet 4 states

“practical activities and experiments” as a notable feature.

And the introductory section states

“give students the opportunity to take part in practical projects and experiments.”
(Lepota et al., 2005, iii)

“Other activities are the practical aspects of applying the theory the students have learned. These activities might stretch over weeks or even months — as plants grow and mature, for example.”
(Lepota et al., 2005, xiv)

“A few activities involve discussion and problem solving.” (Lepota et al., 2005, xiv)

“give students the opportunity to take part in practical projects and experiments.”
(Lepota et al., 2005, xiv)

In several places wording suggested activity-orientated learning where the activities are done for the purpose of verifying the facts learned (as shown in underlined sentences below), not using activities to help learners to construct knowledge as would be expected from activity-based learning. For example, under the section on the *aims of the course* in the Form B teachers’ guide, bullet six states that the course aims to

- *“support theory with practical activities.”* (Lepota et al., 2005, xiv)

A few lines down under the section on *Components of the course*, bullet four states that

“it encourages the students (with teacher’s support) to work through theory before undertaking the activities and practical application of what they learned.”
(Lepota et al., 2005, xiv)

Guidance on how to make classes activity-based: Activity-based learning, according to the literature, requires that activities form the basis for learning. So I therefore looked at the activities the guides recommend for teachers and checked whether they are activity-based or activity-orientated. The section on *resources for teaching and learning* states that

“in agriculture students must have access to plots of land etc., so that they can carry out the various activities and apply their theoretical knowledge in practice.”
(Lepota et al., 2005, xii)

“in Science students must have access to science laboratories etc., so that they can carry out the various activities and apply their theoretical knowledge in practice.”
(Khanyane, et al., 2006a, 6)

Under the section on *activities* the teacher’s guide (Form C) indicates that

“activities often take the form of experiments which you would need to do with the class and about which they must then write.”
(Lepota et al., 2005, xiv)

From a number of quotes cited above, the books suggest that learners have to do activities, and that the purpose of the activities is to support what they already learned in the class. In this way the books confine learners’ active involvement in learning to doing activities to support theory while activities should be used to develop the understanding of the concepts as would be expected in activity-based lessons.

Generally guidance given about meaningfully involving learners in the construction of knowledge from activities is minimal. Instead the activities in the guides dwell on doing practical work to verify theory taught. In the chapter on *breathing in the world around us* (Form B) and *the respiratory system* (Form C), the teachers’ guides do not give activities that guide teachers on how to use activity-based learning. The wording of the teacher’s guide suggests that learners should just follow instructions. The

chapters give answers to the question posed in learners' textbooks where activities are included. For instance,

"Activity 9.1 (Student's Book page 75)

Answers

4. a) *Oxygen comes into body*

b) *Carbon dioxide goes out of the body ...*" (Lepota et al., 2005, 37)

So in general the activities provided by the guides seem to be more on activity-orientated learning not activity-based learning.

Guidance given about development of skills

Guidance on what skills to teach in each form: In a number of places the teacher's guides suggest development of skills. For instance, under the section on *aims of the course* three of the ten aims listed refer to the learning of skills. *"Excel in science aims to:*

- *enable students to acquire scientific skills needed for survival in a rapidly changing world*
- *develop students' skills in co-operative learning (working in a group or as a class)*
- *develop students' critical awareness through discussion."* (Lepota et al., 2005, iii)

Under the section headed *language use in the classroom* it is stated that

"practicing their English will help students to become more confident and will improve their communication skills." (Lepota et al., 2005, xi)

Under the section on *assessment* the guide states that

"it is important for students to develop the skill of evaluating their own achievement and then to check their own progress over the year."
(Lepota et al., 2005, xiii, and Khanyane et al., 2006a, 7)

The skill of comparison is also emphasised in Form C teacher's guide under the section on *Methodology*;

"There is a lot of comparison in this chapter and this should be looked at carefully and thoroughly as it will help the students to grasp the differences between concepts such as breathing and respiration." (Khanyane et al., 2006a, 39)

The wording *"be looked at carefully and thoroughly"* seems to suggest to teachers that there is need to teach the skill, but no guidance is given on how teachers should teach comparison skills.

In the chapter on *[t]he respiratory system* (Form C guide) in a section on *knowledge, skills, attitudes the students will acquire*, two further types of skills are mentioned

- *"comparing and contrasting types of respiration."* (the same skill is mentioned in Lepota et al., 2005, 36)
- *"conducting experiments safely."* (Khanyane et al., 2006a, 38)

From the above quotes it can be seen that the only skills named are

- co-operative learning,
- critical thinking,
- communication skills,
- the skill of evaluating achievements and progress
- making comparisons

- conducting safe experiments

This list leaves out a number of skills including those that the syllabus specifically recommended learners need to develop. Sanders (2007) has produced a concept map that shows how skills can be clustered by type into categories and sub-categories in a way which makes it easier for teachers to clearly see what skills to teach (see Appendix H).

Guidance on how to teach the skills: There are some places where some guidelines are given on how to teach the skills, as will be indicated in the following quotes. In the introductory section, under the heading *working in groups* it is indicated that

“if you find that students do not work well in a group, change the composition of the group. This will give students the chance to get to know other classmates and will improve their communication skills.”

(Lepota *et al.*, 2005, xi, and Khanyane *et al.*, 2006a, 6)

Just one sentence is given about arranging groups which is not much. Sanders (2006) in T. Khoali (work in progress) developed a useful package on group work that can be adapted.

In *activity 9.5* (Form C guides) the teacher is asked to

“make sure the students know how to write a report ...” (Khanyane *et al.*, 2006a, 40)

This clearly indicates that teachers have to teach learners how write a report. Later on the same page, under a section headed “*assessment*”, some guidance for report-writing is given in the form of a list of questions on how learners should self-assess their achievement on their projects and report writing:

1. *How well did I plan my assignment?*
2. *How well did I collect my information for my assignment?*
3. *How well did I structure my assignment? Did I use different headings and sub-headings?*
4. *What features did I put into my assignment, for example drawing or diagrams? If I did not use these features, why not?*
5. *Does my assignment have a bibliography? Why should I include a bibliography?...*
10. *Could I improve my assignment? How?”* (Khanyane *et al.*, 2006a, 40-41)

These questions could serve as guidelines that teachers can use to teach this skill. However, there are no guidelines given for teaching other skills mentioned, especially the skills listed in the syllabus document such as *skills of basic research, ability to form new ideas, solve problems, and design and produce materials for learning in all situations* (Ministry of Education, 2002, 1). If skills appear in the syllabus document they should be made a focus in the teacher’s guide.

All in all, although a few skills are mentioned above, there seems to be little guidance given about the teaching of skills, and most importantly about the activities that can be done to help learners to develop and hone the skills. This is what should have been emphasized about all skills in the guide, as the literature (e.g. Beyer and Charlton, 1986) indicates that one needs to continue using the skill in order to become perfect.

Guidance given about development of attitudes

Guidance on what attitudes to teach: The back cover of the teacher’s guide states that the course involves

“development of relevant attitudes to the learning of science.”

(Lepota *et al.*, 2005, and Khanyane *et al.*, 2006a)

Under the section on the *aims of the course* in the Form B teachers’ guide, bullet two indicates that the course aims to

“enable students to acquire attitudes in science such as inquisitiveness, curiosity, logical reasoning and creative thinking.”

(Lepota *et al.*, 2005, xiv)

Guidance on how to teach attitudes: The above quotes are the only areas where reference to attitudes is made, and there is nowhere in the chapters on *breathing around us* (Form B guide) and *respiratory system* (Form C guide) where the books refer to the development of attitudes and how they should be taught.

5.4 TEXTBOOKS

According to Ottevanger (2002) textbooks are the most easily accessible resources for teachers. Even though textbooks are support materials for learners, two South African papers, Ensor *et al.* (2002) and Jita (undated), claim that textbooks are also important support documents for teachers, as textbooks help them plan their lessons and construct questions, and provide work for their learners. It was important to find out the extent to which the Lesotho textbooks helped teachers to promote learner-centred, activity-based learning and to develop skills and appropriate attitudes.

Two sets of textbooks from two publishers (Publisher 1 and Publisher 2) were analysed. The reason for using them is that one set of textbooks (Publisher 2) were given to schools when the new syllabus was put into place, while the other set (Publisher 1) was chosen because the textbooks seem to be used in many schools in Lesotho.

The extent to which textbooks help teachers promote a learner-centred approach

Both sets of textbooks recommend that a learner-centred approach be used. The cover pages of the textbooks of Publisher 1 indicate that the

“the course emphasizes a learner-centred approach enabling learners to become active, problem solving participants in their own learning process.”

(Lepota *et al.*, 2005, and Khanyane *et al.*, 2006b)

The cover pages also indicate that the

“the student’s book includes exercises for a wide range of student’s ability.”

(Lepota *et al.*, 2005, and Khanyane *et al.*, 2006b)

From this claim one would expect a variety of exercises of different levels of difficulty, but this is not obvious in the chapter on breathing and respiration. Students are required to work in groups for some activities but how learners with different abilities will help each other is not clear, as there is no indication which activities are for slower and faster learners. This contradicts what the authors said on the cover page that the textbooks include exercises for a wide range of student’s abilities.

Because this is a student textbook one would not expect to find guidelines directed to teachers about learner-centredness. But some sections, for instance under the section on *Welcome* note to Form C (Publisher 1), it states that

“You will also build on the knowledge you gained in Form A and B...”
(Khanyane *et al.*, (2006b, iv)

Building on previously gained knowledge indicates that learner’s prior knowledge should be taken into consideration. Teachers who understand learner-centredness can capitalize on this and use this feature in their teaching.

The next paragraph on the same page says

“Remember that you all have different strengths and skills so be ready to help those classmates who find certain parts of the work difficult. If you help your partner by explaining some difficult new words, your partner will probably be keen to help you by showing you how to do some strange calculation or interpret an equation.”
(Khanyane *et al.*, 2006b, iv)

This paragraph brings to the attention of learners the fact that they are different, which is one of the features of learner-centredness. This makes two features of learner-centred given in the textbook but with no direct link to the term “learner-centredness”. As stated earlier, these words are directed to students, but if teachers can capitalize on these words they can, to some extent, be able to accommodate different learners. But this will depend on whether teachers will see the words that way.

A page-by-page analysis of the chapter on breathing and respiration of the Form B textbook of the same publisher showed no further guidance given about learner-centredness. The chapter has only three activities and one revision exercise. All focus on the learning of concepts. The rest of the six-page chapter gives content related to the topic. All the students do the same thing. I did not find extra work meant for faster learners, nor remedial work for slower ones.

The cover pages of another set of textbooks (Publisher 2) indicate that

“the course is especially useful in promoting learner-centred teaching, guiding students to carry out investigations that are science-based and can be applied in everyday lives.”
(Mpeta *et al.*, 2003)

This clearly states that the course promotes learner-centred teaching. However, a problem arises when the authors qualify the explanation of “learner-centred” as guiding learners to carry investigations that are science-based. This suggests that the authors consider “learner-centred” to mean the use of activities in the form of investigations. There is no place in the books where learner differences are catered for, furthermore, the wording gives the impression that learner-centredness means engaging learners actively in the learning process.

There is no further mention of learner-centredness anywhere in the introductory sections of these two sets of textbooks or in the chapter on breathing and respiration. But as stated earlier this is a learner’s textbook so one would not expected to see guidance given to teachers. There is mention of the use of a learner-centred approach, with wording implying that learner-centredness means engaging learners in practical work. There is little guidance given relating to learners recognizing that they are different which a teacher may capitalize on.

The extent to which textbooks help teachers promote the use of activities

I have already indicated that since this is a learner's textbook one cannot expect to find guidelines meant for teachers. But explicitly stated activities, with appropriate questions for students, can also serve as good guidelines that teachers can use to facilitate effective learning.

The section on *Welcome* note to Form C (Publisher 1) has two paragraphs which talk about active involvement of learners.

“By conducting the experiments and investigations yourselves, either in pairs or in small groups, you will be the first to find out how something works. Instead of listening to a long explanation, you will work hands-on to discover the truth!”

(Khanyane et al., 2006b, iv)

“One way of working out how and why something happens in Science is by discussing results and observations with the other members of your group or class. Group discussions offer the opportunity of exchanging ideas and of listening to other ideas that you had not thought of. Very often, if you have to contribute your ideas in a group discussion, you will have to think of them carefully so you can express them clearly and convincingly.”

(Khanyane et al., 2006b, iv)

The term “activity-based” is not used by these authors, but the explanations given above imply “activity-based” learning. For instance, the first quote of the text suggests the importance of active involvement of learners, in helping them discover things through investigations and experimentation. This implies that the activities lead to learning rather than just verifying facts already taught. The second quote emphasises working in groups or in pairs, and explaining that if students work in groups they listen to each other, think carefully and present ideas. This suggests mental engagement in activities that leads to construction of meaning, which implies activity-based learning. It appears, therefore, that the textbooks provide more guidance on activity-based learning than do the teacher's guides.

Under the section on “*field trips*” the book indicates that

“In the classroom, we learn about the theory and facts of Science but we need to go to other places to see how scientific theory is carried out in practice in every day life. A field trip will show you how scientific fact is applied in various useful ways. It should help you to understand the concepts you learned in this textbook

Before you return to class, you may want to make notes of your findings so that you are prepared to write a report, give an oral presentation or discuss your observations with your group or class. You should try to link your observations with the theory you learned in class.”

(Khanyane et al., 2006b, v)

Both paragraphs clearly suggest that learners do practical work to verify the theory they have already learned, which implies activity-oriented learning not activity-based learning. But the second paragraph indicates that after the field trips learners should make notes which they can use in writing reports or to present their work to others. This suggests that they will be cognitively engaged, and that they will be learning actively, which is more than just activity-oriented learning and more towards activity-based learning because learners use their findings to learn.

A page-by-page check though the topic on breathing and respiration reveals more activities which are not just verifying facts. For instance, for activity 15.1 in Seboka *et al.* (2005, 102) learners are asked to

“stand up straight. Inhale and exhale a few times. Do this as naturally as possible. Place one of your hands flat on your stomach, between your navel and the bone under your chest (the breast bone). Breathe in and out again. What do you notice? Talk about this with a partner.”
(Seboka *et al.*, 2005, 102)

Going through a process like this in order to answer questions promotes thinking. It allows learners to think about what they are doing and in the process they are constructing their own knowledge. They start with activities and talk about their observation with partners. If they engage in listening and speaking they are actively involved, provided their minds are engaged. Learning is activity-based if they come up with answers based on the activity rather than being told the answers by the teacher or the textbook and then verifying answers by doing practical work.

In activity 15.3 (Seboka *et al.*, 2005, 105) the students are asked to use a lung model to demonstrate volume and pressure change.

“... Gently pull the sheet downwards and observe what happens to the balloon. Gently push it upwards and observe what happens to the balloon,”

Then they have to answer these questions

“What happens to the balloon when the plastic sheet is pulled downwards? What happens to the balloon when the plastic sheet is pushed upwards? Discuss your answers to these questions with a partner.”
(Seboka *et al.*, 2005, 105)

This particular activity allow for mental engagement. In order for learners to answer questions properly they must observe what happens and must think about what is happening. This allows them to construct meaning, providing they go beyond just obvious answers of “the balloon inflates” “the balloon goes down”, and discuss volume and pressure changes.

This, however, may not be true for all other activities. Khanyane *et al.* (2006b) activity 9.2 learners are asked to

“write down the word equation for aerobic respiration. Write down and balance the symbolic equations for aerobic respiration.”
(Khanyane *et al.*, 2006b)

The activity does not promote meaningful thinking because they have already been taught about aerobic respiration and the equation is given in the text so they could just copy it. The activity seems to just verify what they learned.

In the other set of textbooks (Publisher 2), the cover pages of both textbooks clearly state that

“The course is activity-based and gives students hand- on experience.” (Mpeta *et al.*, 2003)

However, the explanation involving giving students *hands-on experience* creates problems because teachers could interpret this as meaning activity-based is just being physically involved manipulating apparatus and following instructions to see what happens. According to the literature this is not the case, as activity-based learning involves using activities to construct knowledge. In activity-based learning, making activities the starting point is the crucial part.

A page-by-page check through the chapters on breathing and respiration in the Form B and C textbooks of Publisher 2 revealed a number of activities which could help learners to construct knowledge, as in most cases these activities come before explanations are made. Table 13 below gives a summary of the activities drawn from Publisher 2 textbooks. A detailed analysis was made for this publisher in particular because the cover page specifically indicated that the course is activity-based so judgment can be made.

Table 12. A summary of activities from the chapters on breathing and respiration (Mpeta *et al.*, (2002 and 2003)

	Activity prior to explanation	Activity after explanation
Activity 1 (Mpeta <i>et al.</i> , 2002, 32) asks students to “a. Sit down and relax. b. Take air slowly and deeply through the nose or mouth. c. Slowly let the air out through the nose. This activity is followed by this question “what have you just done? (This is followed by explanation)	✓	
Activity 2 (Mpeta <i>et al.</i> , 2002, 32) “Using the diagram above, trace the path taken by air from the moment it enters the nose until it reaches the air sacs in the lungs.” (Explanation follows)	✓	
Activity 3 (Mpeta <i>et al.</i> , 2002, 33) instructs the students to “Work in pairs. a. Study the inside of your partner’s nose. b. What do you see? c. Why is the nose lined with these structures?” Have you ever cleaned your nose on a dusty day or after sweeping a dusty classroom? What did you observe? (Explanation follows)	✓	
Activity 4 on (Mpeta <i>et al.</i> , 2002, 34) asks students to; a. Find out why the trachea is open all the time. b. What structure in the trachea keeps it open like this? c. Why it is important for it to have this structure? Discuss your findings. (Explanation follows)	✓	
Activity 5 (Mpeta <i>et al.</i> , 2002, 34) “Work in pairs. a. Ask your partner to breathe in deeply and describe what happens to the chest and abdomen. b. Ask him /her to breathe out and describe what happens. c. Swap and repeat the exercise. Write down what happens during inhaling (breathing in) and exhaling.” (Explanation follows)	✓	
In activity 6 (Mpeta <i>et al.</i> , 2002, 34) students are asked to “use the passage opposite to answer the questions” (They extract the information using this activity to learn)	✓	
Activity 7 (Mpeta <i>et al.</i> , 2002, 35) asks students to “Study the diagram of the air sac showing gaseous exchange. a. Describe what happens to the inhaled air. Describe what happens to the carbon dioxide produced by the body.” (Explanation follows) activity	✓	
The “Chapter review”(Mpeta <i>et al.</i> , 2002) has a number of questions that help learners recap about what they learned in the chapter, but it is mostly about the content of the topic. For instance, “1. Thabo finds a woman lying in the streets on a cold winter morning. He suspects that she is dead. He has only a mirror in his pocket. How can he use this mirror to find out if the woman is still alive?” (They apply what they have learned)		✓
In activity 1 (Mpeta <i>et al.</i> , 2003, 38) students are to “construct a word equation for respiration using the information in the passage above” (This is more of application of what they learned)		✓

On (Mpeta <i>et al.</i>, 2003, 39) they carry out an experiment 1 whose Aim: “To show that yeast respire without oxygen.” A list of apparatus and materials to be used is given. There is a drawing showing learners how they are going to set up the apparatus followed by a list of instructions they have to follow to make the set up. Under the part on <i>observation</i>, the following questions are asked “1. How do the tubes feel when you touch them? 2. What do the contents of the tube smell like? 3. What else did you observe in the two tubes? 4. What happened to the lime water?” Under the section on <i>discussion</i> learners are asked these questions 5. Which gas made the bubbles you observed? 6. Where do the bubbles come from? 7. What caused the change in the limewater? 8. State the purpose of the oil layer? The section on <i>conclusion</i> asks the following 9. What has happened to the sugar in tube 1? 10. Name the other products of this reaction. 11. Did yeast respire? (Explanation follows after they have done all these activities)	✓	
Experiment 2 (Mpeta <i>et al.</i>, 2003, 40). “Aim: to show that ethanol has energy. Place ethanol on a flat container. Set it alight. <i>Observations</i> 1. Describe what happened to the ethanol. <i>Conclusions</i> 2. Why is it able to burn? 3. How can you use ethanol in your daily life? (They apply what they already talked of)		✓
Experiment 3 (Mpeta <i>et al.</i>, 2003, 41) Aim: To compare the number of bacteria found in fresh and sour milk. Place a drop of milk on a slide and study it under the microscope. Pour the rest of the milk into a petri dish, cover it and put it in a warm place overnight. Take a drop of milk and study it under the microscope. <i>Observations</i> 1. What happened to the milk overnight? 2. What differences can you find in the samples of milk you studied under the microscope? <i>Conclusions</i> 3. What caused the changes in the milk? Explain. (Explanations comes after activities)	✓	

Since this is a learner’s textbook one cannot expect to find explicit guidelines for teachers on how to make classes activity-based. But most of the activities in the textbooks are appropriately placed, with suitable questions to get students thinking, these activities could be used for activity-based learning (rather than just illustrative activities). In most cases, learners **start** with activities, and talk about their observations with partners. Learning is activity-based if they come up with answers based on the activity rather than being told the answers by the teacher or the textbook, and then verifying them during practicals.

The extent to which textbooks help teachers promote development of skills

Under the section on *Welcome* note to Form C (Publisher 1), it is indicated that

“You will develop your skills in carrying out experiments, recording results and coming to conclusions about your observations.” (Khanyane *et al.*, 2006b, iv)

The above quote hints that teachers need to help learners acquire skills such as carrying out experiments (recording results and making deductions), but there is no guidance given to teachers as to how they should go about teaching these skills.

There are no activities suggested to help learners to develop the skills either in the introductory section of the book or in the chapter on breathing and respiration. I was aware that it could be possible that these skills could have been taught in other chapters so I did a chapter-by-chapter check. However, I could not find anywhere where guidelines are given about developing the skills. In all the chapters activities done are only related to the content of the topic, and nothing else.

Not much guidance was found in the other set of books by Publisher 2 either. The cover pages of the textbooks of this publisher states that the course “*promotes acquisition of scientific skills*” (Mpetta *et al.*, 2002 and 2003). This wording suggests the importance of learners developing appropriate skills. The section below gives example of skills that can be learned.

Activity 8 in the Form B textbook (Mpetta *et al.* 2002, 36) indicates that students should

“*Work in groups.*

- a. Design an experiment to investigate the difference in temperature, amount of water vapour and carbon dioxide between inhaled and exhaled air.*
- b. Let your teacher check your design and assist you with the materials you will need for the experiment.*
- c. Present your experiment to the rest of the class.”*

Two skills are implied from the text, that of designing an experiment and presenting to the class. Even though nothing is said about fair experiments I think learners could actively get involved in learning the skill if they could be well guided. But there are no guidelines given about what things to consider when designing a fair experiment. As bullet (b) above shows, the teacher’s job is confined to checking designs learners make and to assisting with providing materials needed. There are no guidelines on how the teachers should help with the design.

There are no activities in Form B and Form C books in the chapters on breathing and respiration or even in other chapters that encourage development and perfecting of skills. There is lack of guidance in the textbooks about the skills to be learned, and there are no activities in either set of books given to learners to help them develop and practice the skills. According to Sanders (2007) teachers will only be able to teach skills if they know how to do so.

The extent to which textbooks help teachers promote development of attitudes

The covers of both sets of textbooks encourage the development of appropriate attitudes. For instance, the textbook cover of Publisher 2 indicates that the course “*promotes...and development of relevant attitudes to the learning of science.*” (Mpetta *et al.*, 2002 and 2003). These authors acknowledge the importance of developing attitudes, but no activities or guidelines are given about teaching attitudes anywhere in the book. There is no further reference to attitudes anywhere through chapters in the books.

5.2. CONCLUDING REMARKS

The chapter looked at the analysis of four types of support material to see the extent to which they help teachers put the four requirements of the new curriculum into practice. A summary of this analysis is given in the next chapter.