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PRACTICALITY OF EXEMPLARY CURRICULUM IMPLEMENTATION MATERIALS: THE CASE OF A CHEMISTRY MODULE IN SCIENCE EDUCATION IN-SERVICE TEACHER TRAINING PROGRAMME

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Abstract

This paper reports on a research study that investigated the practicality of a chemistry module. Practicality was with respect to two intentions of the module, i.e. to bring about learner centred teaching and learning as well as teaching subject content in context. The two changes were directly related to the need to bring about teaching with understanding at advanced level. As such, the module was written with the intention to exemplify the necessary pedagogic changes as discussed by teachers at workshop level to classroom level. In light of the above, this paper describes a case study that involved two teachers at two different schools teaching chemistry using the module. Classroom observations by two researchers as well as student and teacher interviews were employed as data gathering procedures. It was found that 'contextualisation' of subject content improved the quality of dialogue among students as well as between teachers and students. There was also a change in classroom interactions towards more student involvement.

Introduction

Exemplary curriculum materials have been produced in a number of curriculum innovations (Berg, 1996; Ottevanger, 2001; Stronkhost, 2002). In these innovations, materials were produced to support teachers to implement new teaching strategies. Whilst promoting such strategies, the materials are also meant to guide teachers in planning and actual teaching of lessons in a way intended by the curriculum developers. Such materials have been found to be effective if they contain procedural specifications (van den Akker, 1988). These are 'how

to do it' instructions for the teacher (Berg, 2000).

Useful curriculum implementation materials are those that close the gap between the curriculum developers and the curriculum implementers, i.e. facilitating the new curriculum or new intentions to be carried out in a way as close to what the developers intended as possible. When materials are able to do this, then they are said to be practical (Nieven, 1999). SEITT project had produced materials intended to transfer workshop ideas into the classroom. The principal intention of these materials was to facilitate learner-centred teaching in an environment where subject content was put in the context of the learner.

Theoretical Framework

Teaching Science in Context

Distinctiveness and functionality of materials could be achieved through considerations of the local student and teacher environment. This can be achieved through basing teaching on a familiar context 'contextualisation' of science. This means linking Science to everyday life experiences that students may have had or are likely to have (Lubben et al.1996). Contextualised Science teaching derives scientific concepts from a selected situation or context. The knowledge and skills to be taught are embedded in the chosen context. Students explore a familiar context, and come into contact with the concepts to be learnt. Everyday contexts are used in mathematics and science lessons to help learners connect school concepts to their own experiences in the tradition of the constructivist paradigm (Fensham et al.1994). This approach stresses that, regardless of the teaching strategy used in class, realistic contextualised situations are valuable starting points for developing understanding in mathematics and science. Everyday situations may also be a starting point for lessons in order to provide a justification for learning science concepts, to generate interest and to motivate learners to participate in their own learning (Boaler, 1993; Lubben et al. 1996). This paradigm has been credited with improving students' participation in science learning (Lubben et al., 1996 & Bennet et al. 1999), increased student interest and motivation (Coenders, 1998, Dlamini et al.,1995; Ottevanger, 2001, Stronkhorst, 2002). Campbell and Lubben (2000), however investigated the effectiveness of contextualised materials and concluded that their use does not guarantee the application of science by students to everyday life settings. Verschaffel (1995) in de Feiter et al. (1995) argues that the new knowledge and skills acquired through 'contextualisation' must be 'decontextualised' to facilitate transfer to other situations.

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Literature on teaching with understanding has generally zeroed on constructivism. This theory views learning as an activity where students actively construct their own knowledge, rather than being passive recipients of teaching (Anderson et al., 1994; van den Berg, 1996). Anderson further elaborates by saying that learning is dependent on prior conceptions of students, shared understandings that learners negotiate with others and learning in context. Van den Akker (1998) also noted the following international trends in learner-centred teaching and learning: that emphasis is on in-depth learning of issues rather than covering a lot of information in a superficial way; importance of learning to learn as opposed to acquiring a lot of scientific knowledge; and promoting scientific literacy. Understanding student cognitive structures and facilitating learning through specific teaching strategies facilitates this. This paper reports on student reactions when they are taught in a learner-centred way as well as student and teacher perceptions concerning learner-centred teaching and learning.

Aim of the Study

In this study the researchers aimed at determining the practicality of the chemistry module. Practicality of materials is viewed in terms of their functionality, i.e. their ability to facilitate classroom environments as intended by the developers (van den Akker, 1988, Nieven, 1999). Practicality was viewed with respect to the ability of the materials to stimulate learning through 'contextualisation' of subject content, use of locally available materials and support for learner-centred teaching and learning. Specifically the research sought to answer the following questions:

1. How do teachers use the module in classroom practices?
2. How do teachers perceive teaching using the module?
3. How do students perceive learning with the module?

Methodology

Sampling

Sampling for try out of the chemistry module was complicated by the following two issues. First the teacher collaborator failed to secure time and resources to travel to another region for organisation of the research and data collection. The only choice was for the university partner to travel to the teacher's region

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A male teacher taught class S whilst class M was taught by a female teacher. Both teachers had trained as resource teachers within the SEITT project. The two teachers had therefore been involved at least once in the development of the module through discussion with the writers. Both teachers were therefore familiar with the objectives of SEITT. Schools *S* and *M* were located in the high-density suburbs of Bulawayo. In these areas, students are generally not fluent in English.

Procedure and Instruments

Two lessons, one in each of the two schools were observed. In each school the same lesson was taught but having been planned independently by the two teachers using the same module and the same section of the module. Data was gathered using three procedures, which included lesson observation by both researchers in the same class, student questionnaire, and student and teacher interviews. A 28-item curriculum profiler was prepared in advance and used to observe the lesson. Besides just ticking occurrences of predetermined behaviours, observers also made notes to elaborate on specific observations. To facilitate inter-coder agreement, a discussion on possible indicators for each observation item was held before the actual observation. A questionnaire was administered to all the students in each of the two classes at the end of each lesson. After the lesson, six students (three girls and three boys) were randomly selected per class and interviewed as a group. Both researchers took part in interviewing the students, with one leading the interview whilst the other listened and added one question or two as a follow up. This was to ensure students' responses were as complete as possible and were clear with regard to meaning. The interviews were also recorded on tape and later transcribed. After interviewing the students, the respective teachers were also interviewed. Instruments for student and teacher interviews were prepared in advance to ensure both groups of students and teachers responded to similar questions.

Data Analysis

Soon after data gathering, the two researchers started the data analysis procedures. First they prepared a consolidated observation where they compared and discussed each other's observations. There was an initial 87% inter-coder agreement. After discussion of the differences, a consensus was reached. The questionnaire was processed through frequencies and calculation of means and percentages of responses. Interview tapes were transcribed and summarised.

Results

Presentation of results is grouped according to the three questions that this research sought to answer.

How do teachers use the module in classroom practices?

Observations: Class S

The teacher started the lesson by asking students to read the 'contextualising' story and then discussed it with their neighbour. Reading of the story and discussion went quietly, with students discussing in subdued voices, in keeping with their teacher's instructions to keep their voices down. When the teacher took over and led the discussion of the story, the discourse turned out to be mainly a teacher dominated affair. The teacher asked questions, often twice or three times over. He also repeated student responses, and wrote some of the responses on the board. Whenever he did this, students immediately copied the notes into their own notebooks. Not even once throughout the discussion did students raise, out of their own curiosity, an unsolicited question. They appeared to struggle to find a question whenever the teacher invited them to ask questions. Teacher *S* periodically requested students to be quiet, each time the students started spontaneous discussions on an issue that was relevant to the class. The body of the lesson involved more question and answer, student discussions in groups and usually up to three groups, out of six having a chance to report their discussions in front of the whole class.

Observations: Class M

As soon as the teacher asked students to read the story and discuss it with their neighbour, students spontaneously started discussions without appearing to have read the story. Some students were talking excitedly as they demonstrated borehole-pumping motions. Other students concentrated on the

hardships of rural environments with regards to securing water supplies for domestic use, whilst two boys in particular appeared focussed on the actual problem of calcification of water pipes. The latter was the real problem behind the story. Each of the two boys appeared to have an explanation of his own so they appealed to the teacher for a good explanation. The teacher used this opportunity to bring the class to order and invited the two boys to present their explanations. This became the start of a lengthy question and answer session. In this class however, students had their own ideas, especially with concepts behind ion exchanges, which appeared to be based on previous lessons. The teacher spent some time either leading a particular line of reasoning, or answering student questions. Whenever the teacher had covered some amount of subject content, she would refer students to an exercise in the module for them to do in groups and subsequently take turns to present solutions to the class.

Observations in Classes *S* and *M*

Observation in both classes showed that the two teachers closely adhered to guidelines with respect to student grouping and whole class reporting by students. Some students appeared to write their own notes, even during discussions whilst others only wrote down what the teacher wrote on the board. In both classes, the teachers gave notes that summarised 'important' concepts of the lesson, even though this was not directly recommended by the module. In both classes, teachers tended to spend a lot of time doing question and answer and thus ran out of time, leaving out some aspects of the lesson in a rush to give summary notes.

From the observation alone, it was concluded that teachers used the module to plan and execute the lesson. Teachers had lesson timing problems, making it difficult to complete the lesson as planned. Although a considerable amount of time was spent doing student discussions, the lesson had considerable opportunities for some experiential activities. Teachers had not planned these into the lesson. This made the lesson too teacher dominated and having too much seat-work. There was need for the module to provide more tips for practical activities, since leaving these to the teacher, leads to interpretation of student centredness as just discussions and reporting.

How do teachers perceive teaching using the module?

A number of issues were raised with teacher *S* and *M* during post observation interviews. Commenting on the usefulness of the module in lesson execution,

both teachers agreed that the module facilitated planning since it provided objectives, for the lesson. Teachers did not have to formulate these on their own. Introduction to the lesson was also provided. Whilst teacher *S's* introduction went according to plan, teacher *M* stated that she was a bit nervous since the noise levels were above normal during the time students were discussing the context story. Both teachers noted that the module gave ideas during lesson planning, and hints at specific points during activities. These were appreciated by teachers. Teachers however pointed out that the module lacked actual guidance during the actual lesson delivery. Both teachers would have preferred lessons that were already split into a series of consecutive lesson plans. Time keeping would become easier due to adequate guidance. This was in response to the fact that they had both failed to complete their lessons.

Both teachers were of the opinion that the level of English language used in the module was considerate of students' level of English. Teacher *S* attributed his repeat of questions to habit, rather than out of need to rephrase module questions as a way of simplifying language, something he said he had to do often when using imported text books.

When asked to comment if starting the lesson by a contextualising story made any difference to student understanding, both teachers agreed that the story made a positive contribution. Teacher *S's* response captured both teachers' perceptions well. He said , "It actually brings students into focus, into the issue at hand. It motivates them as I normally have pupils who sleep in class. However today they were awake and others who don't normally volunteer to participate or answer questions were answering because its something practically intended".

Both teachers noticed a change in their student's response to their lessons. Teacher *S* summarised his students responses by saying that , "...Yes, there was a difference; when I taught this topic it was always me doing the talking, telling them everything. Their participation in this lesson was much more than in the previous lessons. The module departs from the traditional method of teaching. To the same question, teacher M responded, "I think so because of the way they responded to questions. It shows that more applications were done. There was much difference. They (students) did not feel lost though the concept was abstract. Normally the group is quiet but some students who normally don't say a lot were participating".

In terms of bringing about understanding, both teachers perceived that stu-

dents understood better when taught the way they were taught that day. Teacher *M* particularly made this claim, "The students understood better. They participated more instead of just listening and writing. They answer the questions given and work out the exercises so that when the teacher comes with the actual answers, they are eager to compare them to theirs. By doing it themselves they understand better".

When the final crunch question was asked: "Left to your own decision, would you adopt this method of teaching?" both teachers said they would since the strategy eliminated most cramming of facts due to its facilitation of actual student participation. The use of contexts in teaching concepts made understanding a lot easier. Whilst teacher B was conclusive about the adoption of this method, teacher *S* held some reservations. He prefered to use both methods, student centred as well as teacher centred, arguing that there was insufficient time during the year to complete the syllabus if student centred teaching was used all the time. She also added that student centred teaching and learning would be most suitable for some of her slow learners, since they required more time to do more activities in order to understand.

Teacher reactions and perceptions lead to the conclusion that student centred teaching as promoted through the module is generally more effective than the usual student passive classroom discourse. This was particularly so since it facilitated student understanding through promoting more student participation, and bringing about visible changes in classroom dynamics. Whilst this was the case, learner centred teaching and learning as promoted by the module was very time consuming. Failure to complete lessons was viewed as a negative aspect of the module. Since teachers consider completion of the syllabus ahead of everything else, adoption of learner centred teaching and learning is made more difficult. Teachers cite pressure to complete the syllabus as emanating from the examination system. Students expect the syllabus to be completed early to allow at least two months of revision.

How do students perceive learning with the module?

Student perceptions of learning through the module were expressed via three areas, i.e. simplicity of language and clarity of instructions, contextualising of subject content and learner centred teaching and learning.

Simplicity of Language and Clarity of Instructions

Table 1: Practicality of the Module

Questionnaire item	Class A (N = 36) Agree	Neutral	Disagree	Class B (N = 69) Agree	Neutral	Disagree
1. The instructions in module were easy to follow	86	11	3	91	4	2
2. The language was easy to understand	89	8	3	86	10	4
3. Materials were easy to set up and handle*	25	53	19	62	25	13
4. The materials were appropriate for the task*	36	47	11	57	29	13

Note:*The two lessons did not include any apparatus manipulation.*

In both classes, students were agreed that the instructions in the module were easy to follow (86%, 91%) respectively whilst 89% and 86% were agreed that the level of language was suitable for second language speakers. Both groups confirmed this position during interviews. Neutral and negative responses increased considerably when students responded to items on materials and apparatus. This was because the lesson in question did not involve any practical activities, whilst other lessons prior to this had. The positive responses were as a result of these previous experiences.

Contextualisation of Subject Content

As shown in Table 2, students in classes *S* and *M* generally agreed (78% and 85% respectively) that the story used to contextualise content was relevant and helped them get interested in the topic (78% and 74% respectively). They were not that favourably inclined to agree the story placed the topic close to their environment (67% and 46%, respectively). During interview, five students agreed starting with a story enhanced their interest by using the following phrases: *made understanding easier; brought us into a real life situation; ..you could picture the whole situation; .. story on its own gave a lighter note to a difficult topic.* The sixth student however did not quite agree, although his dispute was more to do with order than the concept. In his own words: "I do not believe starting with a story made any difference in my understanding. I would have preferred maybe starting with the concepts and the story coming

later, so that you know that those concepts shall be used to apply to this situation rather than starting with the situation itself".

Teaching a subject using local contexts was highly appreciated by students and credited with increased understanding, and increased motivation. Although this was generally the case, students appreciated familiarity of the context of the story but did not particularly associate with the context at individual level. This points to the need for teachers to consider their immediate environment and thus choose a context that is nearest to their students' environment.

Table 2: Contextualisation and Teaching Methodology

	Class A (N=36)			Class B (N= 69)		
Questionnaire Item	Agree	Neutral	Disagree	Agree	Neutral	Disagree
5. The story was relevant	78	11	6	85	4	11
6. The story placed the topic as close as possible to my environment	67	22	11	46	25	27
7. The story helped me get interested in the topic	78	17	5	74	22	0
8. The activities helped me understand	80	17	3	93	4	1
9. The lesson taught this way was more interesting than just listening to the teacher and writing down notes	69	19	5	75	17	7
10. Discussing a lot among ourselves helps me to understand the content	72	19	8	77	16	7
11. The materials helped me understand better	56	28	11	49	38	10
12. I would prefer to be taught this way all the time	58	19	22	32	38	30

Student Centred Teaching and Learning

Questions 8 to 11 in the Table 2 indicate students reactions to student centred teaching and learning. Students perceived increase of understanding (80% and 93% respectively). This increase was attributed to an extensive use of student discussions (72% and 77% respectively) and general increase in interest (69% and 79% respectively). This position was further strengthened when students perceived, during interviews that the methodology increased their understanding. One student captured the sentiments of the others well when she said that, "I think the way he taught today was different from what he normally does because today I got to understand because some other days he tells us things only. He does not ask us to discuss. Today we were discussing and I could see where I was going wrong and could see that their points (other students) were valid but if the teacher is the one who tells us everything, I don't understand much because I wont be able to remember everything. But if I consider group-work I believe I will be able to understand because I will be remembering what others said". The positive responses dropped significantly when asked about materials for the same reason as noted earlier. Very few students (58% and 32% respectively) expressed willingness to be taught the way the module promoted. This about turn was surprising considering their favourable responses in the other items.

The results show that students seem to appreciate teaching and learning that recognises their previous knowledge. Discussions with other students provide a chance for this knowledge to come out. Students however seem to use the words *remember* and *understanding* interchangeably, where *understanding*, as clarified by the quoted student actually should be *remember*.

Discussion

Although there were mixed reactions to the module intentions by some teachers and students, the outcomes weighed favourably towards the module's ability to make a difference. Contextualising subject content was viewed favourably by both teachers and students, with claims that it increased understanding, interest and possible increase in retention as well. These findings are consistent with those of Fensham et al. (1994), Boaler (1993) and Lubben et al. (1996). It was important to note however that teachers opened the lesson in a similar way as suggested in the module's specifications. As such students were provided with sufficient time to discuss their past experiences and knowledge with the context. Exhausting their own ideas most likely contributed to the students' expressed satisfaction with 'contextualisation'. Teachers how-

ever need to be reassured in the advice in the module that learner centred lessons do not always flow according to the laid out lesson plan. Teachers need to be flexible and allow for deviations from their plans, especially if those deviations facilitate student understanding of science concepts.

Student centred teaching, though viewed as different and beneficial to the learning process, was viewed as too time consuming, thus jeopardising chances of syllabus completion. Ottevanger's (2001) teachers in Namibia also complained of time constraints whenever constructivist to teaching and learning were being employed. Both teachers and students, including researchers' observation suggested that the module made a positive difference with respect to teaching and learning. Students appeared to value discussion among themselves and credited this with ability to remember factual knowledge. Students also generally recognised a difference in the way they were taught using the module, credited their participation with increased ability to remember and understand. With this positive view of learner centred teaching and learning, one would have thought that both teachers and students would consider permanent use of such methodology. However both stakeholders seem to view this method as time consuming hence jeopardising syllabus completion. At A-level, syllabus completion is important since students take international examinations that examine the entire syllabus, with the assumption that students experienced the entire intended curriculum.

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How do teachers use the module in classroom practices?

Observations: Class S

The teacher started the lesson by asking students to read the 'contextualising' story and then discussed it with their neighbour. Reading of the story and discussion went quietly, with students discussing in subdued voices, in keeping with their teacher's instructions to keep their voices down. When the teacher took over and led the discussion of the story, the discourse turned out to be mainly a teacher dominated affair. The teacher asked questions, often twice or three times over. He also repeated student responses, and wrote some of the responses on the board. Whenever he did this, students immediately copied the notes into their own notebooks. Not even once throughout the discussion did students raise, out of their own curiosity, an unsolicited question. They appeared to struggle to find a question whenever the teacher invited them to ask questions. Teacher *S* periodically requested students to be quiet, each time the students started spontaneous discussions on an issue that was relevant to the class. The body of the lesson involved more question and answer, student discussions in groups and usually up to three groups, out of six having a chance to report their discussions in front of the whole class.

Observations: Class M

As soon as the teacher asked students to read the story and discuss it with their neighbour, students spontaneously started discussions without appearing to have read the story. Some students were talking excitedly as they demonstrated borehole-pumping motions. Other students concentrated on the

hardships of rural environments with regards to securing water supplies for domestic use, whilst two boys in particular appeared focussed on the actual problem of calcification of water pipes. The latter was the real problem behind the story. Each of the two boys appeared to have an explanation of his own so they appealed to the teacher for a good explanation. The teacher used this opportunity to bring the class to order and invited the two boys to present their explanations. This became the start of a lengthy question and answer session. In this class however, students had their own ideas, especially with concepts behind ion exchanges, which appeared to be based on previous lessons. The teacher spent some time either leading a particular line of reasoning, or answering student questions. Whenever the teacher had covered some amount of subject content, she would refer students to an exercise in the module for them to do in groups and subsequently take turns to present solutions to the class.

Observations in Classes *S* and *M*

Observation in both classes showed that the two teachers closely adhered to guidelines with respect to student grouping and whole class reporting by students. Some students appeared to write their own notes, even during discussions whilst others only wrote down what the teacher wrote on the board. In both classes, the teachers gave notes that summarised 'important' concepts of the lesson, even though this was not directly recommended by the module. In both classes, teachers tended to spend a lot of time doing question and answer and thus ran out of time, leaving out some aspects of the lesson in a rush to give summary notes.

From the observation alone, it was concluded that teachers used the module to plan and execute the lesson. Teachers had lesson timing problems, making it difficult to complete the lesson as planned. Although a considerable amount of time was spent doing student discussions, the lesson had considerable opportunities for some experiential activities. Teachers had not planned these into the lesson. This made the lesson too teacher dominated and having too much seat-work. There was need for the module to provide more tips for practical activities, since leaving these to the teacher, leads to interpretation of student centredness as just discussions and reporting.

How do teachers perceive teaching using the module?

A number of issues were raised with teacher *S* and *M* during post observation interviews. Commenting on the usefulness of the module in lesson execution,

both teachers agreed that the module facilitated planning since it provided objectives, for the lesson. Teachers did not have to formulate these on their own. Introduction to the lesson was also provided. Whilst teacher *S's* introduction went according to plan, teacher *M* stated that she was a bit nervous since the noise levels were above normal during the time students were discussing the context story. Both teachers noted that the module gave ideas during lesson planning, and hints at specific points during activities. These were appreciated by teachers. Teachers however pointed out that the module lacked actual guidance during the actual lesson delivery. Both teachers would have preferred lessons that were already split into a series of consecutive lesson plans. Time keeping would become easier due to adequate guidance. This was in response to the fact that they had both failed to complete their lessons.

Both teachers were of the opinion that the level of English language used in the module was considerate of students' level of English. Teacher *S* attributed his repeat of questions to habit, rather than out of need to rephrase module questions as a way of simplifying language, something he said he had to do often when using imported text books.

When asked to comment if starting the lesson by a contextualising story made any difference to student understanding, both teachers agreed that the story made a positive contribution. Teacher *S's* response captured both teachers' perceptions well. He said , "It actually brings students into focus, into the issue at hand. It motivates them as I normally have pupils who sleep in class. However today they were awake and others who don't normally volunteer to participate or answer questions were answering because its something practically intended".

Both teachers noticed a change in their student's response to their lessons. Teacher *S* summarised his students responses by saying that , "...Yes, there was a difference; when I taught this topic it was always me doing the talking, telling them everything. Their participation in this lesson was much more than in the previous lessons. The module departs from the traditional method of teaching. To the same question, teacher M responded, "I think so because of the way they responded to questions. It shows that more applications were done. There was much difference. They (students) did not feel lost though the concept was abstract. Normally the group is quiet but some students who normally don't say a lot were participating".

In terms of bringing about understanding, both teachers perceived that stu-

dents understood better when taught the way they were taught that day. Teacher *M* particularly made this claim, "The students understood better. They participated more instead of just listening and writing. They answer the questions given and work out the exercises so that when the teacher comes with the actual answers, they are eager to compare them to theirs. By doing it themselves they understand better".

When the final crunch question was asked: "Left to your own decision, would you adopt this method of teaching?" both teachers said they would since the strategy eliminated most cramming of facts due to its facilitation of actual student participation. The use of contexts in teaching concepts made understanding a lot easier. Whilst teacher B was conclusive about the adoption of this method, teacher *S* held some reservations. He prefered to use both methods, student centred as well as teacher centred, arguing that there was insufficient time during the year to complete the syllabus if student centred teaching was used all the time. She also added that student centred teaching and learning would be most suitable for some of her slow learners, since they required more time to do more activities in order to understand.

Teacher reactions and perceptions lead to the conclusion that student centred teaching as promoted through the module is generally more effective than the usual student passive classroom discourse. This was particularly so since it facilitated student understanding through promoting more student participation, and bringing about visible changes in classroom dynamics. Whilst this was the case, learner centred teaching and learning as promoted by the module was very time consuming. Failure to complete lessons was viewed as a negative aspect of the module. Since teachers consider completion of the syllabus ahead of everything else, adoption of learner centred teaching and learning is made more difficult. Teachers cite pressure to complete the syllabus as emanating from the examination system. Students expect the syllabus to be completed early to allow at least two months of revision.

How do students perceive learning with the module?

Student perceptions of learning through the module were expressed via three areas, i.e. simplicity of language and clarity of instructions, contextualising of subject content and learner centred teaching and learning.

Simplicity of Language and Clarity of Instructions

Table 1: Practicality of the Module

Questionnaire item	Class A (N = 36) Agree	Neutral	Disagree	Class B (N = 69) Agree	Neutral	Disagree
1. The instructions in module were easy to follow	86	11	3	91	4	2
2. The language was easy to understand	89	8	3	86	10	4
3. Materials were easy to set up and handle*	25	53	19	62	25	13
4. The materials were appropriate for the task*	36	47	11	57	29	13

Note:*The two lessons did not include any apparatus manipulation.*

In both classes, students were agreed that the instructions in the module were easy to follow (86%, 91%) respectively whilst 89% and 86% were agreed that the level of language was suitable for second language speakers. Both groups confirmed this position during interviews. Neutral and negative responses increased considerably when students responded to items on materials and apparatus. This was because the lesson in question did not involve any practical activities, whilst other lessons prior to this had. The positive responses were as a result of these previous experiences.

Contextualisation of Subject Content

As shown in Table 2, students in classes *S* and *M* generally agreed (78% and 85% respectively) that the story used to contextualise content was relevant and helped them get interested in the topic (78% and 74% respectively). They were not that favourably inclined to agree the story placed the topic close to their environment (67% and 46%, respectively). During interview, five students agreed starting with a story enhanced their interest by using the following phrases: *made understanding easier; brought us into a real life situation; ..you could picture the whole situation; .. story on its own gave a lighter note to a difficult topic.* The sixth student however did not quite agree, although his dispute was more to do with order than the concept. In his own words: "I do not believe starting with a story made any difference in my understanding. I would have preferred maybe starting with the concepts and the story coming

later, so that you know that those concepts shall be used to apply to this situation rather than starting with the situation itself".

Teaching a subject using local contexts was highly appreciated by students and credited with increased understanding, and increased motivation. Although this was generally the case, students appreciated familiarity of the context of the story but did not particularly associate with the context at individual level. This points to the need for teachers to consider their immediate environment and thus choose a context that is nearest to their students' environment.

Table 2: Contextualisation and Teaching Methodology

	Class A (N=36)			Class B (N= 69)		
Questionnaire item	Agree	Neutral	Disagree	Agree	Neutral	Disagree
5. The story was relevant	78	11	6	85	4	11
6. The story placed the topic as close as possible to my environment	67	22	11	46	25	27
7. The story helped me get interested in the topic	78	17	5	74	22	0
8. The activities helped me understand	80	17	3	93	4	1
9. The lesson taught this way was more interesting than just listening to the teacher and writing down notes	69	19	5	75	17	7
10. Discussing a lot among ourselves helps me to understand the content	72	19	8	77	16	7
11. The materials helped me understand better	56	28	11	49	38	10
12. I would prefer to be taught this way all the time	58	19	22	32	38	30

Student Centred Teaching and Learning

Questions 8 to 11 in the Table 2 indicate students reactions to student centred teaching and learning. Students perceived increase of understanding (80% and 93% respectively). This increase was attributed to an extensive use of student discussions (72% and 77% respectively) and general increase in interest (69% and 79% respectively). This position was further strengthened when students perceived, during interviews that the methodology increased their understanding. One student captured the sentiments of the others well when she said that, "I think the way he taught today was different from what he normally does because today I got to understand because some other days he tells us things only. He does not ask us to discuss. Today we were discussing and I could see where I was going wrong and could see that their points (other students) were valid but if the teacher is the one who tells us everything, I don't understand much because I wont be able to remember everything. But if I consider group-work I believe I will be able to understand because I will be remembering what others said". The positive responses dropped significantly when asked about materials for the same reason as noted earlier. Very few students (58% and 32% respectively) expressed willingness to be taught the way the module promoted. This about turn was surprising considering their favourable responses in the other items.

The results show that students seem to appreciate teaching and learning that recognises their previous knowledge. Discussions with other students provide a chance for this knowledge to come out. Students however seem to use the words *remember* and *understanding* interchangeably, where *understanding*, as clarified by the quoted student actually should be *remember*.

Discussion

Although there were mixed reactions to the module intentions by some teachers and students, the outcomes weighed favourably towards the module's ability to make a difference. Contextualising subject content was viewed favourably by both teachers and students, with claims that it increased understanding, interest and possible increase in retention as well. These findings are consistent with those of Fensham et al. (1994), Boaler (1993) and Lubben et al. (1996). It was important to note however that teachers opened the lesson in a similar way as suggested in the module's specifications. As such students were provided with sufficient time to discuss their past experiences and knowledge with the context. Exhausting their own ideas most likely contributed to the students' expressed satisfaction with 'contextualisation'. Teachers how-

ever need to be reassured in the advice in the module that learner centred lessons do not always flow according to the laid out lesson plan. Teachers need to be flexible and allow for deviations from their plans, especially if those deviations facilitate student understanding of science concepts.

Student centred teaching, though viewed as different and beneficial to the learning process, was viewed as too time consuming, thus jeopardising chances of syllabus completion. Ottevanger's (2001) teachers in Namibia also complained of time constraints whenever constructivist to teaching and learning were being employed. Both teachers and students, including researchers' observation suggested that the module made a positive difference with respect to teaching and learning. Students appeared to value discussion among themselves and credited this with ability to remember factual knowledge. Students also generally recognised a difference in the way they were taught using the module, credited their participation with increased ability to remember and understand. With this positive view of learner centred teaching and learning, one would have thought that both teachers and students would consider permanent use of such methodology. However both stakeholders seem to view this method as time consuming hence jeopardising syllabus completion. At A-level, syllabus completion is important since students take international examinations that examine the entire syllabus, with the assumption that students experienced the entire intended curriculum.

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