Chapter #5

LEARNERS' VIEWS OF THE TEACHER ATTRIBUTES IN CONTRIBUTING TO MEETING THE CHALLENGES OF THE SOUTH AFRICAN CURRICULUM IN PHYSICAL SCIENCE

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ABSTRACT
A decline in learner performance in South Africa over the years in Physical Sciences at grade 12, in the transition from National Senior Certificate (NSC) to Curriculum and Assessment Policy Statement (CAPS), have implored us to do an investigation of the perceived attributes of the teacher in meeting the challenges imposed by the new CAPS curriculum. 150 university students participated in the study. Learners were requested to give their views about their teachers on a questionnaire designed to elicit characteristics of a successful teacher. Learners were requested to indicate their degree of agreement or disagreement to each of the items of the questionnaire. The data was subjected to the Principal Component Analysis (PCA) procedure by use of the SPSS program, which revealed three broad clustered characteristics of the teacher. These characteristics are Teacher efficacy, Teachers' efficiency, effectiveness, and Teachers' understanding of CAPS curriculum. The results reveal that the teachers' frequent and immediate feedback on the quality of their assessments is considered the most important attribute about a successful teacher, while the use of active forms of learning is an area of concern for the present day teacher in meeting the challenges imposed by the CAPs curriculum for Physical Science.

Keywords: physical sciences, curriculum, teacher, demands, engaged.

1. INTRODUCTION

The achievement in Physical Sciences at grade 12 level has got worse over the last few years in South Africa, more so since the inception of the new CAPS document. Apart from the learners, home, school and peer characteristics, the role of the teacher is of paramount importance in contributing too their knowledge and which according to Hattie (2003) contributes as much as 30% to learner achievement. Hattie (2003) also mentioned that: "It is what teachers know, do and care about which is very powerful in this learning equation" (page 2). This implies that excellence in teaching is considered a single most powerful factor to learner achievement. We are informed from research that whenever the curriculum changes, as with changes in the CAPS curriculum, it is the teachers that are uncomfortable about the content knowledge (Henze, Van Driel, & Verloop, 2008; Lee & Luft, 2008; Ramnarain & Fortus, (2013)). The difficulty that teachers face is their lack of deep and coherent understanding of the CAPS curriculum. The challenges experienced by most teachers was the lack of time for curriculum completion, insufficient content knowledge, insufficient practical skills and large workloads (Gudyanga, 2017). The result of this is that teachers may struggle to monitor learner problems and at the same time unable to provide effective feedback of the subject (Hattie, 2003). A lack of subject

knowledge and PCK in the implementation of the new CAPS document may lead to ineffective and undesired results in the subject (Sharp, Hopkins, & James, (2009)). However, it must be mentioned that although teachers were subjected to professional development before the implementation of CAPS, the limited training they received may not necessarily have changed their traditional pedagogical approaches to teaching (Black, Harrison, Lee, Marshall, & William, 2002) because the new curriculum may introduce instructional approaches and strategies that are not aligned to their way of thinking (Bantwini, 2009). According to Lekgoathi (2010), the new curriculum clearly defines the specific roles of the teacher with respect to lesson outcomes and assessment criteria, and which when implemented should lead to success in teaching and learning. There are a few sections of the Physical Sciences paper, according to the Diagnostic Reports from the Department of Basic Education (DBE, 2011-2015) for which learners have done consistently badly and they are: Photoelectric Effect, Rate of Reactions and Electrolytic Cells. It is revealed from research in South Africa that, of the 84% of teachers that are professionally qualified, only 42% of them are qualified in physics (Makgato & Mji, 2006). This implies that the rest of the teachers will have to undergo sustained professional development in the subject to improve their content knowledge and pedagogical content knowledge (PCK) on the CAPS curriculum to bring about much improvement in Physical Sciences from the national average of around 50%. In this instance, only 50% of the teachers will benefit from such an intervention. Thus in this scenario the role of the teacher plays an important variance in learner achievement. This study aims to explore the views of learners who have been successful in Physical Sciences of their perceived attributes of their teachers. The reason for using these learners is because they are recipients of such knowledge and their views could provide indicators for improvement.

2. RESEARCH QUESTION

The research question for this study is:

What are the attributes of the present day teacher from the perspective of the student in meeting the challenges of the CAPS curriculum in Physical Sciences?

3. CONCEPTUAL FRAMEWORK

The conceptual framework for this study that pertains to the key principles for successful teaching was taken from the work of Fink (2006). Such principles as presented by Peter Connor from the Colorado State University are:

1. **Challenge students to a higher level of learning**: This attribute of the teacher demands more of the learners' ability to comprehend and understand the nature of the problem.

2. Use of active forms of learning: Although passive forms of learning such as watching a video, reading, notetaking and listening has its place in any learning situation, but provided it enriches and allows for debating, interpretation and discussions, then active forms of learning unfolds.

3. Gives frequent and immediate feedback to the learners on the quality of their learning: Teachers provide feedback to the learners on given tasks such as tests, assignments, examinations, practicals, etc.

4. They provide a fair system for assessment and grading of learners: The subject content, objectives, and the outcomes of the course outline are clearly communicated before commencement of classes.

5. They care about what is being taught: The teachers take a lot of care about what is being taught in class; have respect for their learners, are aware of the cognitive ability and pitch lessons accordingly.

6. They provide strong academic leadership: Teachers provide strong leadership in their credibility of teaching and classroom management. Leaners are sensitive to the competency, trustworthiness and enthusiasm of the teacher when embarking in teaching new topics in science.

4. METHODOLOGY

4.1. Participants

A sample of 150 first year university students at a South African university that enrolled for a physics disciplined programme, participated in this study. Prior to the administration of the questionnaire, permission was sought from various stakeholders at the university. Permission was first sought from the lecturer and the students themselves. This study was conducted at the beginning of the year, before the assumption of classes, when the students are still fresh out of high school.

4.2. Instrument and procedure

As mentioned before, this study made use of a questionnaire that was piloted by the author, inspired from the misconceptions in the examiner's reports of the grade 12 Physical Science papers. This questionnaire has been administered to 150 first year university students at the beginning of the year whilst they have a fresh perspective of their grade 12 teachers. The questionnaire is comprised of 11 questions and the students were expected to indicate their levels of agreement or disagreement to each of the items. A Likert-type scale of evaluation from Strongly Disagree (+1) to Strongly Agree (+5) was used in the calculation to obtain the mean scores. For reliability of the data, the Cronbach Alpha was computed.

4.3. Reliability of the data

The Cronbach Alpha for this data was found to be 0.875, suggesting that the factors have a high reliability (should be greater than 0.70 to be acceptable).

5. RESULTS

In Table 1, we have the various items of the questionnaire that corresponds to a specific attribute about the teacher.

Table 1.
Aligning items of the questionnaire to 1 of 6 attributes of the teacher. The average mean for corresponding items are also given.

Item(s)	Attribute of the Teacher	Average Mean
7, 11	Challenge learners to a higher level of learning	3.74
3	Use of active forms of learning	2.64
6, 8, 10	Gives frequent and immediate feedback to the learners on the quality of their learning	3.76
2, 4, 5	They provide a fair system for assessment and grading of learners	3.54
1	They care about what is being taught	3.46
9	They provide strong academic leadership	3.59

Of all the attributes that pertains to a teacher, item 3 whose mean value is 2.64, is not considered beneficial as a good perceived attribute about the teacher. The use of videos, particularly in teaching a difficult section has not proved to be beneficial to the students as an active form of learning. It can be considered as a passive form of learning. The rest of the items from the questionnaire appear to be adequate with respect to the attribute of a teacher, with average mean scores between 3.46 and 3.76.

5.1. Teacher efficacy

They care about what is being taught (item 1)

The inception of the CAPS document has created more curricular demands on the present day teacher in teaching Physical Science. Because of the pressure to teach additional content materials, more time should have been allocated to these teachers, but unfortunately the department or the schools did not cater for this. Teachers will have to spend time after school, weekends and during school holidays to complete the syllabus. With respect to the students' responses to this item in the questionnaire, a mean score of 3.46 (item 1) is a reflection of their commitment to go the extra mile in fulfilling their professional obligations.

They provide a fair system for assessment and grading of learners (items 2 and 4)

In order to eliminate the errors that some of the learners are making in the examination papers, teachers are guided by reports from the department and from past year examination papers. With this kind of information, teachers will be challenging learners to answer examination questions in the same format as required by the examiner. Teachers are making an important contribution in this regard. For this item in the questionnaire, they have responded positively (mean score of 3.79 for item 2) and a positive attribute to their professionalism.

The experience and knowledge of a teacher is important when trying to solicit information beyond the textbook. For those teachers that use the same information year after year without venturing out beyond the confines of the prescribed textbook will be denying learners a repertoire of questions that could be asked on a particular topic. Teachers should also look for alternate questions for the MCQ section, as learners seem to also battle with this section in the examinations. Lack of exposure to a variety of questions in this field and the skill to answer them systematically, will leave them with no option but to guess the answer for those types of questions. The learners have responded positively to this item in the questionnaire. The mean score for item 4 is 3.47.

Gives frequent and immediate feedback to the learners on the quality of their learning (item 10)

Teachers are in the habit of praising, encouraging and motivating learners in their care. This allows them to participate and keeps them sustained in the class lessons. Being able to contribute in class lessons is one way of clarifying ones' conceptual knowledge. For this item in the questionnaire, the learners have responded very positively (mean score of 3.92 for item 10) and an important item for success in any examinations.

Challenge learners to a higher level of learning (item 11)

Being conscious about the time the learner is required to spend per question in the examination or tests is crucial. Learners are challenged to answer every question in any form of assessment from easy to difficult. Teachers are forcing learners to be time conscious. For example, if a question is allocated a mark out of 10, then learners should spend no more than 10 minutes for such a question and if the time is exceeded, they should move on to another question (Mason & Singh, 2010). Learners were most positive about teachers enforcing such a rule (mean score for item 11 is 3.93).

5.2. Teachers' efficiency and effectiveness in teaching

Use of active forms of learning (item 3)

The use of videos in teaching can be beneficial if used in the correct context and if it enhances active form of learning. For example, if a section on Doppler Effect (new topic in the CAPS curriculum) has to be taught, then an animation (motion of objects) of a real life situation could be played out. Likewise, this could be done for sections such as Photoelectric Effect, Rate of Reactions and Electrolytic Cells, where more misconceptions seem to exist at school level. The use of these video lessons should be used cautiously and should not replace the teacher or his/her class lessons. For this aspect of the questionnaire, the learners have responded negatively (mean score of 2.64 for item 3), indicating that their teachers are not using videos to good advantage.

They provide a fair system for assessment and grading of learners (item 5)

Having a sound knowledge of the CAPS curriculum will only come through after a few years of experience in teaching the subject matter. The critical importance of having well prepared and qualified teachers in the classroom as they are responsible for making a difference in the lives of students (National Academic Press, 2000). This is because the teacher's pedagogical content knowledge (PCK) and a deep understanding of the curriculum will have a direct impact on the quality of their teaching and learner achievements. Teachers doing justice to the school curriculum ensures that learners are well prepared for university. For this aspect of the questionnaire, the learners have responded fairly positively about their perception of their teachers' content knowledge of CAPS (mean score of 3.37 for item 5).

Gives frequent and immediate feedback to the learners on the quality of their learning (items 6 and 8)

Marking of tests and examination papers in the same format as required by examiners will give learners a better picture of what to expect in the examinations. Previously, teachers were accustomed to allocating a 0 if the given answers were not correct. In the new format, teachers will have to allocate marks for the correct formula and correct substitutions. In this regard, learners have responded positively about this item in the questionnaire (mean score of 3.63 for item 6). Proper feedback for all assessment exercises is essential, the purpose of which is to zoom into misconceptions held by learners in Physical Science. Just providing answers, for example in the MCQ section of an assessment is futile since it will never demonstrate the essential skills that are lacking. With respect to

homework exercises, teachers should provide meaningful feedback to learners. In this respect, teachers are providing proper feedback for most assessments as indicated by their responses to this item in the questionnaire (mean score of 3.72 for item 8).

Challenge learners to a higher level of learning (item 7)

If teachers are not pitching questions in Physical Science at varying levels of difficulty in school assessments, then students will experience considerable difficulty when confronted with the final examinations. Hypothetically, if questions are all set at levels 1 and 2, then these students will barely cope with demands of questions pitched at levels 3 and 4 in the final examinations (criteria laid out in Bloom's taxonomy. Understanding the cognitive level of demand of questions will be difficult for junior teachers (inadequate PCK) and they will be more inclined to set lower order questions, thus making learners less prepared for the examinations. This perceived attribute of a teacher is good in that they are teaching learners for life-long learning instead for an exit examination only. In this respect, learners have responded positively to this item in the questionnaire (mean score of 3.54 for item 7).

They provide strong academic leadership (item 9)

Being punctual and regular to school is a given norm. Deviation from such practices has consequences in terms of curriculum completion. The implementation of the CAPS curriculum has increased the workload of teachers many-fold, as teachers are barely able to complete the syllabus in time for examinations. This is an ideal attribute of a teacher in being timeous and taking control of the classroom. Having a highly qualified and a well-prepared teacher in every classroom in physical sciences is an ideal to be desired (National Academic Press, 2000). These teachers have sufficient content knowledge and are able to seek information from learners for appropriate interventions. Although this is far from ideal, our teachers are making inroads in their professional duties in becoming better teachers with well-developed PCK. From the survey, the students have commented positively (mean score of 3.59 for item 9) about their teachers fulfilling their professional obligations in being regular and punctual to school.

6. DISCUSSION AND CONCLUSION

Since the role of the teacher is of paramount importance, then the teacher should be able to identify where the major sources of variances in student's achievement lie and then focus on these sources of variances to truly make a difference in their lives. (Hattie, 2003). The perceived behaviour of a teacher as viewed by the learners in terms of efficiency, efficacy, and effectiveness are considered key milestones for learner proficiency. These characteristics clearly have an impact on learner proficiency and should be supported. Teachers' knowledge of CAPS is crucial because it affects the quality of his/her teaching and for meaningful interactions with the learners who are at different cognitive levels. In terms of meeting the demands of the new curriculum, they are making many sacrifices in fulfilling their professional obligations. The results of this study, as perceived by the learners, indicate that teachers are viewed as meeting the demands of the new curriculum, despite all the challenges they face in interpreting the curriculum. The perceptions of the learners are all positive about their teachers having the adequate pedagogical skills in delivering the subject matter to the satisfaction of their learners.

The perceived attributes of the present day teacher in meeting the curricular demands are very encouraging; especially in terms of the study skill, interventions they are making to enhance learning (Hattie, Biggs, & Purdie, 1996). Another perceived attribute of the teacher, which probes their efficacy and effectiveness in teaching, is the depth of their

content knowledge of CAPS and their PCK. Their subject knowledge expertise will allow their learners to develop a sound understanding of the content and this will allow them to be challenged to a higher level of learning. The teachers' academic leadership skills are considered an important attribute in the complex role they play when sound decisions are made for the learners' needs (Darling-Hammond & Barnett, 2001). Learners consider the timeous feedback on the quality of their work as the most important attribute about a successful teacher in this study. Closely linked to this attribute is the teacher providing frequent and immediate feedback on all class assessments. Unfortunately, the use of active forms of learning is a grey area in the teachers' domain and not used optimally for success in teaching and learning.

7. RECOMMENDATIONS

Whilst the attributes of the teacher as perceived by the learner to be largely positive, however active forms of learning needs attention. Physics being a numerical subject lacks opportunities for active forms of learning and allows students to passively listen to lessons instead of actively participating in it. A suggestion to improve improve active forms of learning is to consider the following (some taken from Karamustafaoglu, 2009):

- Revise the curriculum to include topics that involve active forms of learning,
- Students should be allowed to use the laboratories and libraries regularly,
- Teachers should encourage students to research topics on the internet and make presentations in class,
- Allow for group discussions on project topics, and
- Show videos in class and then follow up with strategic questions.

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ANNEXURE

Attributes of a teacher to meet the challenges of CAPS

		Fully Disagree	Disagree somewhat	Neutral	Agree somewhat	Fully Agree
1	My teacher has devoted his holidays, weekends and time after school to complete the syllabus and do some revision					
2	My teacher has taught us correct examination techniques to answer examination type questions					
3	For a difficult sections, my teacher has shown us a video lesson of a particular topic					
4	My teacher has used the best available resources in the market to expose us to a variety of question to make us better prepared for the examinations					
5	My teacher has a sound knowledge of the CAPS curriculum and this has helped my preparation for the examinations					
6	My teacher has marked all our tests and examination scripts in the same format as is required in the final examinations					
7	My teacher has pitched all the school tests and examination papers at a high standard in anticipation of what is expected in the final examination					
8	My teacher is in the habit of giving us proper feedback to all tests and homework exercises					
9	My teacher is always punctual and never misses a class lesson					
10	My teacher always praises us and motivates us to achieve our goals					
11	My teacher prepares us to be time conscious and to adhere to the mark allocation for each question					

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