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Lecturing versus Teaching in Foundation and First Year Mainstream Chemistry

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Abstract: At secondary schools, students are spoon fed and often encouraged to regurgitate their work. The transition from secondary schools to tertiary institutions is often frightening, together with the mode of instruction, which is lecturing. When lecturing, the instructor teaches, instructs', addresses or talks. Lecturing is a way of imparting knowledge to students and it strongly encourages self studies. When teaching, the instructor educates', tutors, edifies and trains the students. In teaching, the responsibility is more on the lecturer to cover the module in-depth and explicitly; teaching thus focuses more on imparting understanding compared to delivery of concepts. According to Gibbs, the presentation of lectures is important as, "a lecture may inspire a student to read more." When teaching with the hope of imparting both knowledge and understanding, the lecturer must adopt specific assessment methods. "Appropriate assessment methods, engages students in exactly the kind of learning, you, the lecturer, want to achieve." The transition from traditional lecturing to teaching allows one to adopt various methods of assessing students; a deep approach to learning is encouraged. According to Luckett "a deep approach to learning encourages active, long term engagement with tasks." Research on (1) the mode of instruction in Foundation Chemistry and mainstream first year Chemistry was conducted and (2) the students pass and failure rates were compared. The findings revealed that the teaching method used in Foundation Chemistry yielded better results compared to the lecturing method used in the mainstream Chemistry. The research findings recommend that teaching and lecturing methods should be implemented in the mainstream Chemistry to improve the student pass rates.

Key words: lecturing methods, teaching methods, student pass rates

1. Introduction

At secondary schools, students are spoon fed and often encouraged to regurgitate their work. The transition from secondary schools to tertiary institutions is often frightening for most students. The main problems encountered by our students include the following: (1) the language of instruction during lectures, (2) the method of instruction being lecturing and not teaching and (3) time management. The University of Venda is situated in a town called Thohoyandou where the majority of the students come from the surrounding villages. The language of instruction, in this vicinity is mainly Tshivenda and at secondary schools, most teachers teach science in their

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mother tongue; hence the struggle with English as a language arises when these students arrive at University. At the secondary schools, students are provided with memorandums of their tests in English and encouraged to study regurgitate the work. Time management is also a problem, as secondary schools in the rural villages starts at 7 am and ends at 4:30 pm; when entering University the sudden freedom of no adult supervision is a huge problem as many do not attend lectures and thus the high failure rates.

According to Gibbs, the manner in which, you the lecturer present yourself and your lectures is very important, as "a lecture may inspire a student to read more." When lecturing, it is important to impart both knowledge and understanding of the concepts of the module; this requires the lecturer to adopt various assessment methods. According to Ramsden (1992), assessment is an additional method of teaching in which the lecturer can determine the quality of student learning taking place. "Assessment is a way of teaching more effectively through understanding exactly what students know and do not know. Assessment is about several things at once. It is not about simple dualities such as grading versus diagnosis. It is about reporting on students' achievements and about teaching them better through expressing to them more clearly the goals of our curricula." (Ramsden P., 1992). Ramsden (1992) believes assessment should involve (1) reporting on the performance of students' learning, (2) determining and measuring students' learning, (3) the ability to identify certain problems or misunderstandings and the development of specific methods to overcome these problems effectively, (4) the quality of teaching, (5) quality of learning, (6) the ability of the lecturer to be open minded enough to learn from ones students, (7) the ability to adapt to changes as a lecturer and students and finally (8) the foresight of a lecturer to observe what the student can do and the meaning thereof.

"If students perceive that their learning will be measured in terms of reproducing facts or implementing memorized procedures or formulae, they will adopt approaches that prevent understanding from being reached." (Ramsden P., 1992). This method of learning is known as the surface approach to learning and is flawed, as no real understanding and knowledge of the module takes place this is due to lecturers providing students with inappropriately low levels of cognitive assessment activities (Biggs J., 1999). The main reason students prefer the surface approach to learning is due to the lack or poor alignment of assessments in their modules (Biggs J., 1999). Ramsden regarded assessment as a method of assisting student learning, as well as a method in which the instructor can learn how best to teach his or her students. "Assessment, like teaching, is something done to students. As teaching tells information and procedures, so assessment classifies the student on the criterion of how well they have absorbed the data transmitted." (Ramsden P., 1992). Assessment is an activity used to stimulate student interests, promote intellectual challenges and a means of determining the amount of learning which has occurred.

The transition from traditional lecturing to teaching, forces students to adopt a deep approach to learning; "a deep approach to learning fosters active, long term engagement with tasks." (Luckett K. & Sutherland L., 2000). This learning strategy, allows the lecturer to accommodate student learning via the implementation of various problem-based learning strategies. Problem-based learning (Biggs J., 1999) and the use of various teaching and learning activities, actively engages students in activities which use higher order cognitive levels which permit students to speculate, ask questions and generate solutions to their learning problems or misunderstandings.

In 1995, Clark (1995) identified specific cognitive and affective goals which proved to be effective for teaching at the university level. The cognitive goals included, (1) knowledge, in which the aim of the lecturer should be to strive to change the students factual knowledge and competence in the course and at the same time encourage the students to develop an intellectual appreciation for the subject. (2) Organization of instruction, this

forces the lecturer to reflect on how well planned and organized his or her lectures and discussions are; (3) clarity of expressions, this deals with how well a lecturer is able to explain concepts or theories in a simple manner to students. And (4) quality of presentations; this deals with the tone of the lecturer's voice and other aspects of presentation, i.e., the lecturer's enthusiasm; are you able to grasp your students attention during lectures and interact well with them.

The affective goals included: (1) stimulate student interest; this refers to the degree of interest the lecturer has for his or her subject and whether he or she is able to promote student interest in the subject module. Student interest promotes self studies, increase in lecture attendance and class discussions; it also encourages students to work harder and develop an interest in the module. (2) Student participation and openness to ideas; the lecturer should encourage active student participation in lectures and discussions also students should be encouraged "to think for themselves in a flexible and creative manner." (3) Interpersonal relationships, the lecturer should promote student-lecturer friendly environment and finally, (4) communication and fairness; as "open and effective communication contribute to student learning and performance"; it also provides constructive feedback to the lecturer about student performance.

Two major categories of teaching methods exist namely teacher-centered and student-centre. In mainstream Chemistry, the method of instruction is lecturing. Lecturing is a method of conveying knowledge, critical information, theories, equations, etc., and it strongly encourages self studies and note taking during lectures by students. Self studies are strongly encouraged by lecturers to guarantee the acquisition of in-depth knowledge of specific chapters covered in lectures. Lecturing is a teacher-centered approach and generally regarded as a "one way communication of prepared talk" (Malawi Institute of Education, 2004), in which the instructor speaks to the students in an autocratic way. "Teacher-focused strategies are transmission of theories of teaching; that is knowledge is conceived as being transmitted from expert teacher to inexpert learner and the teacher's task is to 'get it across'" (Biggs J., 1999). During lectures, some lecturers are too focused on completing the module in the shortest students. Students are thus passive during lectures, as a result learning is therefore not guaranteed during lectures. Although the first year mainstream students have prescribed text books, lecture notes are not provided, thus note taking during lectures is strongly advised. Also, the assessment methods employed include assignments, two class tests and chemistry first year practicals only. Students are only actively engaged in group discussions during lectures. The disadvantages of this method of instruction are:

(1) It favors only a handful of hardworking students as majority of the students prefer being spoon fed.
(2) Most lecturers are not open minded to student-centered and teacher-centered approach concurrently.
(3) Most lecturers refuse to adopt various assessment methods due to the increased workload it involves.
(4) Lecture notes are not provided to students.
(5) Note taking during lectures limits student interaction or involvement during lectures, hence learning is not guaranteed.

According to Ramsden (1992), "some lecturers in higher education become stuffy and formal when the talk turns to student assessment… Assessment is all hedged around with a thick bureaucratic mystique designed to form an effective barrier against the inquisitive."

The method of instruction in Foundation Chemistry is teaching; this is a two way communication relationship, as it involves both the teacher-centered and student-centered approaches (Malawi Institute of Education, 2004). "Student-focused strategies see the focus on being on bringing about conceptual change in students' understanding of the world, and it is what students do to achieve understanding that is important and not

what teachers do." (Biggs J., 1999). Teaching is a method of imparting knowledge and understanding and or skills, compared to the delivery of concepts which occurs in lecturing. When teaching, the instructor, educates, tutors, edifies and trains the students; the responsibility of the core and in-depth knowledge of the module is ensured by the lecturer during lectures. "The teacher's job is then to organize the teaching/learning context so that all students are more likely to use the higher order learning processes which "academic" students use spontaneously." (Biggs J., 1999). Seven qualities of effective teaching was characterized by Axelrod, namely (1) accessibility and approachability, (2) fairness, (3) open-mindedness, (4) mastery and delivery, (5) enthusiasm, (6) humour and (7) knowledge and inspiration imparted. In 2003, Ralph (2003) identified the characteristics of effective instructors which included the following; commitment to learners; knowledge of material; organization of management of the environment; desire to improve and collaboration with others.

In Foundation Chemistry, detailed lectures notes, additional problems, various assessment methods, etc., were provided to students to facilitate and encourage understanding during lectures and self studies. The various assessment methods allow continuous active learning amongst students. In the Foundation Chemistry modules, the various assessment methods include the following, namely; mini lectures held by students, group discussions, problem solving lessons, tutorials, assignments, weekly spots tests, class tests and chemistry practicals. Students are actively engaged in the module and the use of the various assessment methods forced the students to adopt a deep approach to learning. "Continuous assessment involves assessing students regularly in a manner that integrates teaching and assessment; it uses feedback from each assessment to inform further teaching and the construction of the next assessment." (Gibbs G., 1999). The beginning of the third semester, the lecturing method together with the teaching method was implemented to assist the students with the transition and preparation for mainstream entry levels. The drawbacks of this method of instruction is: (1) It is strenuous, time consuming and challenging; (2) It involves a greater workload for the lecturer and (3) dedication of the lecturer to his or her work is required.

2. Materials and Methods

The effectiveness of (1) the method of instruction in the Foundation Chemistry and the first year mainstream modules were compared over a period of 3 years; from 2009 to 2011 and (2) the students pass and failure rates over the 3 year period was compared using pie and bar graphs. The positive outcomes of the teaching methods are due to effective one-on-one teaching in comparison to lecturing. Students are actively engaged in open discussions during lectures, thereby encouraging their individual abilities to think and reason for themselves. Understanding chemistry is simplified by making use of examples of day-day experiences; students are taught to understand various terms by using everyday life terms, e.g., chemical bonding is explained in terms of marriage and divorce; the rate of reactions with respect to the surface area of reactants can be explain in terms of grinding maize, i.e., the finer the grounded maize, the fast the rate of cooking pap will be achieved, etc. In-depth knowledge and a genuine grasp of the subject taught, together with the detailed lecture notes provided to students, gives the Foundation Chemistry students a better advantage over the mainstream students. The use of various assessment methods in Foundation Chemistry, engages the students in appropriate learning activities which forces the students to adopt a deep approach to learning.

3. Results

From both the pie and bar graphs it is evident that the teaching method implemented in Foundation Chemistry has proven to be very effective and the effectiveness thereof can be seen by the high performance rates achieved over the 3 year period, from 2009 to 2011.

3.1 First Semesters Results for 2009 to 2011

Table 1 Number of Students Registered, Passed and Failed of First Year Mainstream Chemistry, CHEM 1540 & 1545 and Foundation Chemistry, FCH 1540, for 2009 to 2011

YEAR	2009	2009	2009	2010	2010	2010	2011	2011	2011
Course	CHE 1540	CHE 1545	FCH 1540	CHE 1540	CHE 1545	FCH 1540	CHE 1540	CHE 1545	FCH 1540
No. Registered.	279	136	170	117	144	157	289	83	178
No. Passed	133	26	113	20	38	130	102	23	153
No. Failed	146	110	57	97	106	27	187	60	25

3.2 Average Percentage Pass Rates

Table 2 Comparison of Percentage Pass Rates for of First Year Mainstream Chemistry, CHEM 1540 & 1545 and Foundation Chemistry, FCH 1540, for 2009 to 2011

	CHE 1540	CHE 1545	FCH 1540	CHE 1540	CHE 1545	FCH 1540	CHE 1540	CHE 1545	FCH 1540
% Pass Rate	48	19	67	17	26	83	35	28	86
% Failure Rate	52	81	33	83	74	17	65	72	14

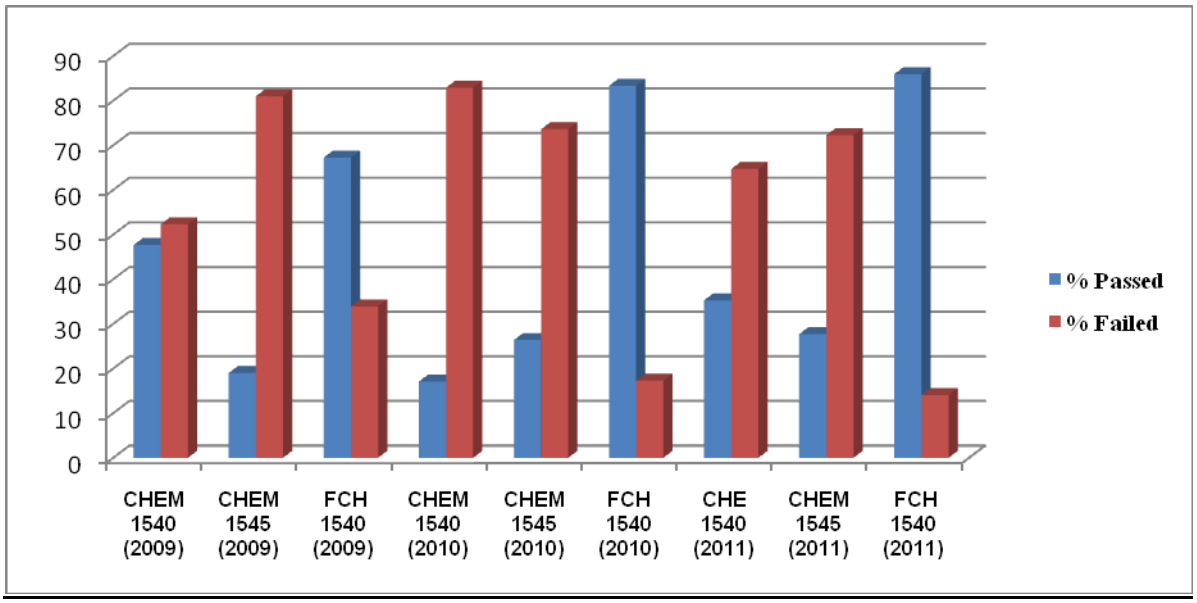

Figure 1 Representation of the First Semesters Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1540 & 1545 and Foundation Chemistry, FCH 1540, for 2009 to 2011

Table 3 Comparison of Average Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1540 & 1545 and Foundation Chemistry, FCH 1540, for 2009 to 2011

	Ave. CHE 1540	Ave. CHE 1545	Ave. FCH 1540
Ave. % Pass Rate from 2009 to 2011	33	24	79

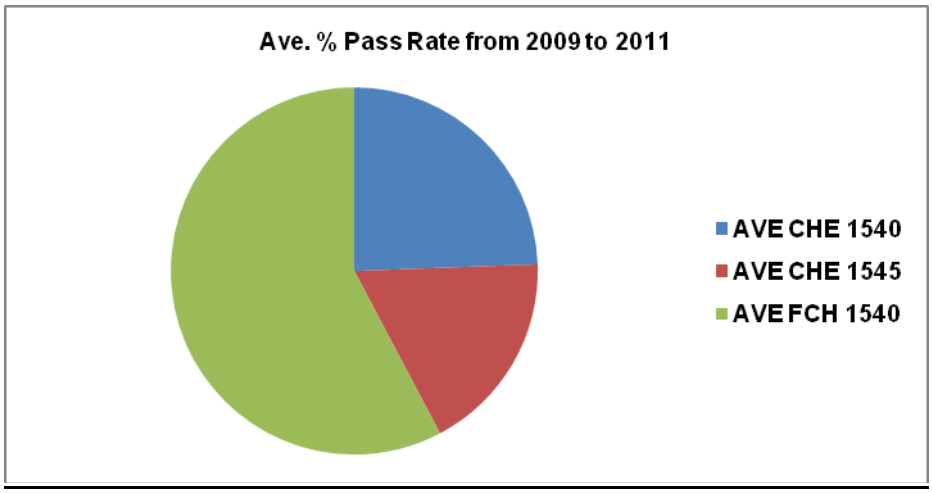

Figure 2 Representation of the First Semesters Average Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1540 & 1545 and Foundation Chemistry, FCH 1540, for 2009 to 2011

3.3 Second Semester Pass Rates for 2009 to 2011

Table 4 Number of Students Registered, Passed and Failed of First Year Mainstream Chemistry, CHEM 1621 & 1622 and Foundation Chemistry, FCH 1640, for 2009 to 2011

Year	2009	2009	2009	2010	2010	2010	2011	2011	2011
Course	CHE 1621	CHE 1622	FCH 1640	CHE 1621	CHE 1622	FCH 1640	CHE 1621	CHE 1622	FCH 1640
No. Registered	136	185	148	149	165	144	212	184	170
No. Passed	26	90	125	92	95	95	183	99	147
No. Failed	110	95	23	57	70	25	29	85	23

Table 5 Comparison of Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1621 & 1622 and Foundation Chemistry, FCH 1640, for 2009 to 2011

	CHE 1621	CHE 1622	FCH 1640	CHE 1621	CHE 1622	FCH 1640	CHE 1621	CHE 1622	FCH 1640
% Pass Rates	19	49	84	62	58	83	86	54	86
% Failed Rates	81	51	16	38	42	17	14	46	14

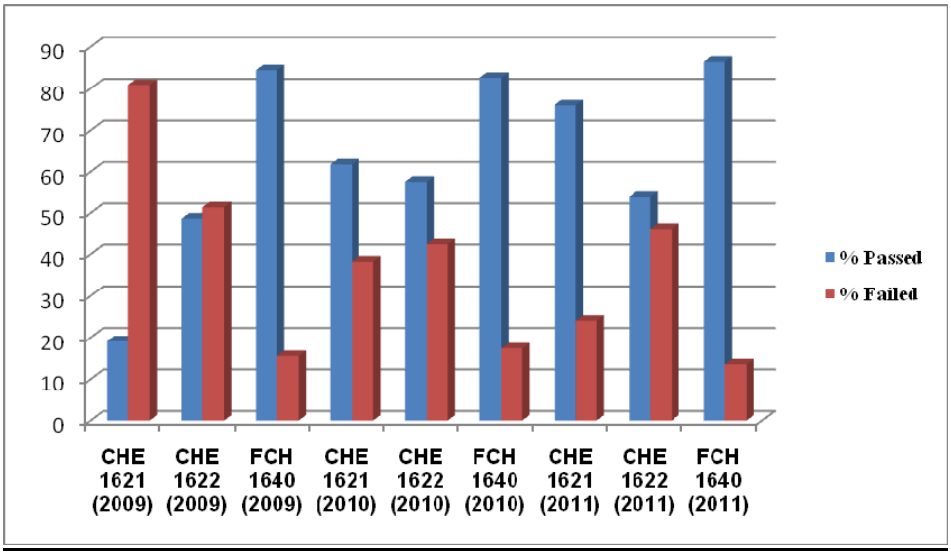

Figure 3 Representation of the Second Semesters Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1621 & 1622 and Foundation Chemistry, FCH 1640, for 2009 to 2011

3.4 Average Pass Rates for 2009 to 2011

Table 6 Comparison of Average Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1621 & 1622 and Foundation Chemistry, FCH 1640, for 2009 to 2011

	Ave. CHE 1621	Ave. CHE 1622	Ave. FCH 1640
Ave. % Pass Rate from 2009 to 2011	56	53	86

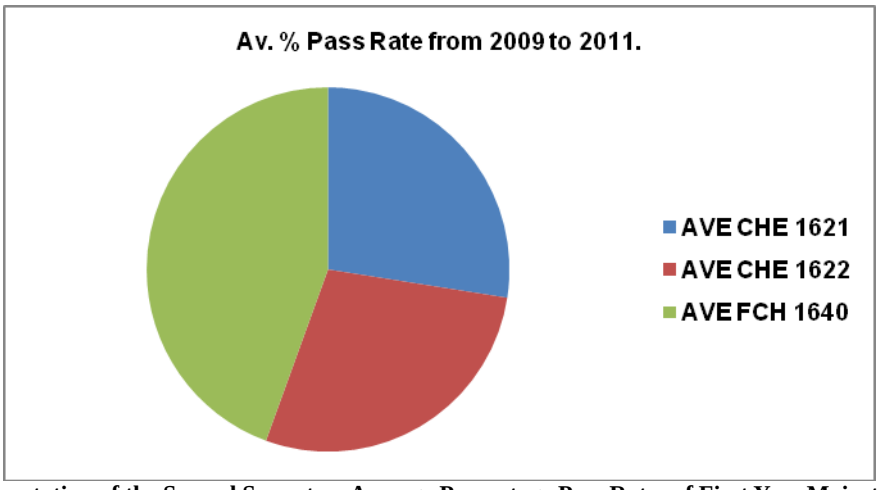

Figure 4 Representation of the Second Semesters Average Percentage Pass Rates of First Year Mainstream Chemistry, CHEM 1621 & 1622 and Foundation Chemistry, FCH 1640, for 2009 to 2011

4. Discussion of Results

Table 1 reflects the number of registered students together with the number of passed and failed students for the first semester first year mainstream chemistry, CHEM 1540 and 1545 and foundation chemistry, FCH 1540, for the period of 2009 to 2011. Table 2 compares the percentage of student passed and failure rates for the first semester first year mainstream and Foundation Chemistry; these results are graphically represented by Figure 1. Table 3 and Figure 2 represents the average pass rates over the 3 year period. Table 4 reflects the number of registered students together with the number of passed and failed students for the second semester first year mainstream Chemistry, CHEM 1621 and 1622 and Foundation Chemistry, FCH 1640, for the period of 2009 to 2011. Table 5 compares the percentage of student passed and failure rates of the second semester first year mainstream and Foundation Chemistry; these results are graphically represented by Figure 3. Table 6 and Figure 4 represents the average pass rates over the 3 year period.

Based on the information represented in the above tables and graphs, it can be observed that the pass rates of the Foundation Chemistry students far exceeds those in the first year mainstream Chemistry. This can be attributed to the teaching and various assessment methods used in the Foundation Chemistry modules. The high failure rates in the first year mainstream Chemistry could be attributed to (1) the language of instruction which is English and not Tshivenda, (2) the resistance of some of the lecturers in implementing various assessment methods and (3) the method of instruction which is lecturing and not teaching which the students were used to in secondary schools.

5. Conclusion

This study has shown that the simultaneous use of teaching and lecturing methods together with the use of

various assessment methods, can reduce the high failure rates and student drop outs in first year mainstream Chemistry. The use of various assessments methods by the first year mainstream Chemistry lecturers will aid the students in passing Chemistry successfully. Lecturers, however, should keep in mind that (1) some students can and will learn in spite of bad teaching or lecturing and (2) some students will not learn even with the best teaching and lecturing.

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