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How student discussions during group work influence learners' performance when doing a Department of Education prescribed life sciences activity.

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CHAPTER 1
INTRODUCTION

1.0 Introduction

Since becoming a democracy in 1994 the South African Government has strived towards addressing the legacies of colonialism and apartheid in education (Chisholm & Leyendecker, 2007). Reform has been shaped by various influences including globalisation and pedagogical ideas emanating from Europe and the USA (Chisholm & Leyendecker, 2007; Nykiel-Herbert, 2004). Outcomes-based education (OBE) and learner centred education were seen as ways of promoting human rights and quality education. Education in South Africa moved from being traditionally authoritarian teacher centred to being learner centred. OBE has the student as its focus, making assessment an important component (Chisholm & Leyendecker, 2007) of education.

The OBE curriculum explicitly encourages an approach to learning which is activity based and learner centred. The National Curriculum Statement (NCS) for Life Sciences (DoE, 2003, p3) states that the critical outcomes students should achieve include being able to:

- *Identify and solve problems and make decisions using critical and creative thinking.*
- *Work effectively with others as members of a team, group, organisation and community.*
- *Collect, analyse, organise and critically evaluate information.*
- *Communicate effectively using visual, symbolic and or language skills in various modes.*

One way to achieve these outcomes is to use group work. Collaborative group work is an approach to teaching and learning which would allow students the opportunity to achieve the critical outcomes highlighted above. Brodie and Pournara (2005) define collaborative group work, as situations when students work together on a task, which results in learning gains which would not be achieved should the students work individually. Through the use of collaborative group work, activities are learner centred and students are encouraged to explain, listen, discuss (Sullivan Palinscar, Anderson & David, 1993) and argue various topics or opinions (Alexopoulou & Driver, 1996). Learning theories underpinning this approach draw on both Piagetian and Vygotskian perspectives on the construction of

knowledge (Brodie & Pournara, 2005). Construction of knowledge occurs when students working together, are placed in situations of cognitive conflict (Anderson, 2006; Driver, 1983). This approach to learning recognises that students come to class with their own language, beliefs, culture and knowledge, as well as their own ideas (preconceptions, misconceptions), (Anderson, 2006). Learning should be facilitated by allowing students to actively explore ideas, using everyday examples and discourses (Anderson, 2006; Driver, 1983). In so doing it is possible to determine the conceptions students hold on to (Anderson, 2006; Driver, 1983). Where misconceptions occur it would be necessary to create situations which would challenge the misconception. This would allow students to develop concepts which are intelligible, plausible and fruitful (Hewson, Beeth & Thorley, 1998).

Collaborative group work discussions provide students with the opportunity to actively explore the knowledge they bring to class: through explaining, listening and arguing. Students are able to develop concepts based on their "intelligence", "plausibility" and "fruitfulness" (Hewson *et al*., 1998). It is generally agreed that this approach to learning results in long term gains, as opposed to the superficial learning which often results with traditional teacher talk and chalk type lessons (Nussbaum, 2008; Brown, 2007).

Having discussed how collaborative group work supports learner centred teaching and learning approaches, I turn my discussion to look at how collaborative group work could be used in assessment activities, where the assessment is used as part of instruction to support and enhance learning (Shepard, 2000). Shepard maintains that for assessment to become part of the learning process it should be dynamic and ongoing; it should determine the prior knowledge of a student; provide constructive feedback which allows the student to self correct. In this way not only do students engage cognitively in their work but Shepard reports that students take responsibility for their learning. Assessment where the purpose is to both evaluate student achievement as well as to include learning, Carless (2007) refers to as learner-oriented assessment. It is assessment of this type that my research is about.

1.1 Background and rationale

Implementation of OBE in the classroom has in many instances not been successful (Stoffels, 2008; Nykiel-Herbert, 2004). Various reasons have been given for the failure to implement OBE successfully including: disregard for specific educational contexts, conflict with culture and teacher training or lack thereof (Stoffels, 2008). The OBE in service teacher training (INSET) was a 3-5 day course which left teachers with a rather superficial introduction to the new curriculum since the trainers themselves had been crash course trained (Stoffels, 2008). As a result teachers came away with an introduction to the new terms, design and structure of OBE (Stoffels, 2008). For instance, whilst teachers were made aware that teaching needed to be learner centred and group work could be used to achieve this end, teachers were not given guidance on how to effectively implement group work in their classrooms. Further, the DoE INSET was once off and there was no sustained instructional support as to how to implement approaches advocated in OBE in the classroom (Stoffels, 2008).

Whilst much research has been reported on the advantages of using group work in classrooms, it has also been noted that group work has become a procedural exercise rather than being used as an effective way of teaching and learning in some South African rural schools (Nykiel-Herbert, 2004) and schools in Gauteng and Northern Province (Brodie, Lelliott and Davis, 2002). Brodie, Lelliott & Davis's (2002) study included: both rural and urban, primary and secondary schools. Brodie *et al*., (2002) found that while some teachers were successful in implementing effective learner centred lessons in their classrooms many teachers did not. In their study Brodie, *et al*., (2002) gave the following reasons for this type of group work which lacked what these authors called 'substance', i.e. teachers give too much direction since they may be concerned about content coverage; lack of resources, when resources are available students may be unsure how to use them; little support from principals in implementing OBE; tasks are of too low a level and ineffective follow up following group work.

1.2 Problem statement

Research suggests group work is an effective learner centred approach to teaching and has been endorsed by the NCS. However, South African teachers struggle with its implementation and view this method ineffective (Nykiel-Herbert, 2004). My research

focuses on what Brodie, *et al*., (2002) refer to as the "substance" of group work. According to Brodie, *et al*., (2002) "substance" refers to an approach to teaching that promotes learning, i.e. an approach which takes up *"the spirit and content of learner centred practices'* (p. 542). The same authors found that two thirds of mathematics teachers in their study involving primary and secondary schools in Gauteng and Northern Province were using group work in ways which lacked "substance" i.e. students were not engaged in mathematical thinking, preventing the construction of knowledge. My research looked at how student discussions during group work influence learners' performance when doing a Department of Education prescribed Life Sciences activity.

1.3 Aim of study and research questions.

The aim of my study was to use group discussions as an approach to learning, when Grade 11 Life Sciences students were engaged in an assessment task. As students participate in discussions not only is it required that they verbalize their own thoughts requiring that they make meaning of the work (Bennet, Hogarth, Lubben, Campbell & Robinson, 2010), but also that they provide feedback to their peers aiding their understanding (Black and Wiliam, 1998). In this way the assessment task moves from being solely for measurement purposes but provides opportunities for students to be actively involved in their learning. The research questions this study sought to answer were:

1) How does student performance change following participation in collaborative group work on the DoE assessment task?
2) What is the nature of student-student interactions during collaborative group work on a DoE assessment task?
3) What are students' perceptions of the influence of collaborative group work on their performance in the assessment activity?

1.4 The theoretical framework

Brodie and Pournara's (2005) theoretical framework for collaborative group work as well as Carless's (2007) learner oriented assessment framework were used to guide this research. According to Carless, learner oriented assessment is both for certification and learning purposes. The student is actively involved in learning and feedback provides opportunities for students to make meaning of the work. Brodie and Pournara's collaborative group work framework includes the following:

- Constructivism as a theoretical perspective on learning.
- Tasks which are novel and carefully sequenced
- Student interactions result in individual construction of knowledge.
- Teacher acts as a facilitator.

Both these frameworks are discussed in more detail in Chapter three.

1.5 Organisation of the research report.

I have organised my research report to include a literature review, Chapter two, where I consider the social construction of knowledge and cognitive conflict. This is followed by a discussion on how research reports group work could be used to achieve this end. The discussion includes findings on some of the challenges encountered when implementing group work as a learner centred teaching strategy in classrooms. The literature review continues with a discussion on assessment and how assessment could be used as an opportunity for learning, and not merely for measurement purposes. The third chapter reports on the research design and methodology used in my study, looking at how student discussions during group work influence learner's performance when doing a Department of Education prescribed Life Sciences activity.

The results of the research and its analysis are discussed in Chapter four. In that chapter I report and discuss on the changes in student attainment following group work, when Grade 11 Life Sciences students were engaged in a prescribed Department of Education Life Sciences activity. Recordings of student discussions whilst busy with the group work have been quantitatively analysed using observation schedules adapted from Kutnick and Berdondini (2009). Responses from the questionnaire completed by the Grade 11 Life Sciences students who participated in the research are then discussed. I end my research report with Chapter five where I make concluding comments on the findings of how student discussions have influenced learner's performance when the students engaged in a Department of Education Life Sciences activity. I include suggestions for possible needs for future research into group work and its usefulness in South African schools in Chapter five.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Teaching and learning in the current OBE curriculum envisions students as active participants in the construction of their knowledge and where assessment forms part of the learning process and is more than a measure of right or wrong answers (DoE, 2003). This literature review starts by looking at Vygotsky's theory of learning as social construction of knowledge and cognitive conflict (Wertsch, 1985). This is followed by a discussion on group work as it affords students the opportunity to socially construct their knowledge. The discussion on group work looks at what group involves, concerns about its effectiveness, the roles and interactions of teacher and students as well as the type of task which results in learning. My research made use of a prescribed DoE assessment task for the group work, as assessment is seen to part of the learning process. The literature review continues with a discussion on assessment focussing on learner oriented assessment.

2.1 The social construction of knowledge and conceptual conflict.

The South African Curriculum is founded on a constructivist perspective on learning and encourages students to be actively involved in their learning (DoE, 2003). Constructivism is a theory of learning that suggests that the student actively constructs knowledge, it is not passively received (Driver, 1983).

According to the writings of Vygotsky, knowledge is socially constructed, i.e. it appears on two levels: first it occurs between individuals as an interpsychological process (where groups of individuals are engaged in activities) and then it occurs within the individual as an 'intrapsychological process' (Wertsch, 1985). The transition from the interpsychological to intrapsychological is through a process called internalisation (Wertsch, 1985). For the process of internalisation to occur within an individual there needs to be social interaction making use of language and signs to communicate (Wertsch, 1985). Through interaction, communication allows students to shift their understandings in a way that enables them to verbalize their

thinking, allowing for the process of internalisation as well as resulting in students moving through their zone of proximal development (Brodie and Pournara, 2005).

Vygotsky (1978, p. 86) defined the zone of proximal development as

> "The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers."

Constructivism acknowledges that students come to know as they organize their experiential world within their mind (Driver, 1983). From a Piagetian perspective, group work is seen to enhance learning, since, although this perspective places emphasis on how individuals construct knowledge; this construction is done through interaction between individuals and their experiences in the environment (Alexopoulou & Driver, 1996). For long term retention new knowledge needs to be anchored to prior knowledge (Souvignier & Kronenberger, 2007). When students discuss new information, each elaboration allows more anchors to be formed. Thus when students talk to each other the process of equilibration is aided (Alexopoulou & Driver, 1996).

Driver (1983) asserts that when students are placed in situations of cognitive conflict meaningful learning occurs. Situations of cognitive conflict are created when students are given opportunities to make their knowledge explicit and they are able to actively explore ideas (Anderson, 2006; Driver, 1983). Whilst working in small groups various points of view may become evident, creating situations of cognitive conflict (Brodie & Pournara, 2005.) Through discussions, arguments and disagreements, situations are created where various ideas are challenged allowing students to develop concepts which are "intelligible", "plausible" and "fruitful" (Hewson, *et al.*, 1998). The notion of cognitive conflict allows many students regardless of their backgrounds achieve levels of understanding which were previously only achieved by small elite (Anderson, 2006). Collaborative group work was used in my research to create opportunities for cognitive conflict as students verbalized their concepts allowing knowledge to move from the interpsychological plane to the intrapsychological plane through the process of internalisation.

2.2 Collaborative group work

2.2.1 What is meant by collaborative group work?

Group work generally involves students working together in small groups consisting of 2-6 students, (Bennett, *et al.,* 2010) where each individual is given an opportunity to actively participate on a delegated task and in the process knowledge is constructed (Brodie, 2010). Discussions are encouraged by teachers providing each group with a specific stimulus (e.g. prepared curriculum material, newspaper article) (Bennett *et al.,* 2010). My research made use of a prescribed assessment activity on animal diversity, where students were required to compare six animal phyla (Gauteng Department of Education, 2010). In their groups, students work together towards a specific purpose, for instance an oral, written presentation or even individual sense making. Students in my research project were required to construct a table comparing the six animal phyla and write an essay showing the evolutionary relationships between these phyla. When students engage in group work they are expected to carry out the task with little supervision from teachers, the teacher acts as a facilitator (Brodie & Pournara, 2005). In this way the hope is that each student becomes an active member of the group, working with their peers collaboratively to complete an activity.

Collaborative approaches to group work involve students working on a task which is better solved when students work together, allowing all students to make progress together (Brodie & Pournara, 2005; Dori, Yeroslavski, & Lazarowitz, 1995). Interaction with other students is important, since they become resources as well as partners in learning (Tanner, Chatman & Allen, 2003). Collaborative group work requires that students use and develop their communication skills, i.e. listening, explaining and sharing of ideas (Kutnick & Berdondini, 2009). As the student verbalizes his/her ideas the student is given the opportunity to reflect on what concepts make sense (Brodie and Pournara, 2005). Collaborative group work therefore encourages students to construct their own arguments and critique those of their peers (Nussbaum, 2008). This approach to learning results in a 'complex interplay between individual and social construction' of knowledge (Brodie, 2010, p57).

2.2.2 Group dynamics

Alexopoulou and Driver (1996) found that collaborative group work was influenced by the interrelations that exist between conceptual, contextual and social factors. Students were found to work more effectively in groups of 4, and when they selected their groups themselves. The same authors found that when students want to work together they negotiate meaning better in their groups. This is in contrast to how Colosi and Zales (1998) perceive collaborative learning, where they suggest that groups are deliberately chosen by teachers. The latter authors suggest that groups should consist of students which are heterogeneous with respect to gender, ethnicity and academic ability. However, Tolmic and Howe (1993, cited in Bennett *et al.,* 2010) found that when groups were mixed with respect to gender, the students behaved in a more constrained way. They also found that students from mixed groups achieved lower than those from all female or all male groups.

Taking the above into account I made the students in my study work in groups of four. The approach used by Colosi and Zales (1998) to determine group composition was used, where groups were deliberately chosen and ensuring their composition was heterogeneous, with respect to gender, ethnicity and academic ability. In view of our constitution it seems immoral to separate students on the basis of their gender or ethnicity. By placing students of different ability in the same group it was hoped would result in various opinions being made explicit as these students would tend to come from different friendship groups and therefore bring different ideas around which students can discuss and argue.

Having discussed what collaborative group work involves and some aspects of group dynamics, I will now discuss some of the advantages of using this approach to teaching and learning as reported in the literature.

2.2.3 Advantages of collaborative group work

Collaborative group work has been found to have many advantages including improving scientific literacy through language as well as allowing for learning from a constructivist perspective. Each of the above advantages will be discussed in more detail below, however it should be noted that other advantages to using collaborative include: students understand how a democracy works, as they develop tolerance and trust amongst themselves (Kutnick &

Berdondini, 2009; Brodie & Pournara, 2005). Studies by (Tanner *et al*, 2003; Zohar and Nemet, 2002) have shown collaborative group work allows for the development of life-long learning skills, for example learning how to argue. Finally, through collaborative group work Augustine, Gruber & Hanson, (1989) found that the psychological health of students with a low self esteem improved. My discussion now focuses on how collaborative group work aids in improving scientific literacy through language followed by a discussion on how collaborative group work allows for learning from a constructivist perspective.

2.2.3.1 Improving scientific literacy through language

Whilst 'doing science is an important aspect of science, 'talking science' is receiving more attention (Sullivan Palinscar *et al*., 1993). When students 'talk science' they are required not only to understand the concepts but also to look for relationships between concepts when communicating. When students 'talk science' there is a move away from traditional talk and chalk lessons, where teachers structure questions such that students respond with what the teacher wants to hear, to lessons where general communication and robust discussion results (Bennett *et al*., 2010). When placed in small groups McKeachie (1994) maintains that students feel more comfortable speaking and asking questions rather than whole class teaching. Small groups afford students the opportunity to explore their ideas and allow naïve understandings to develop towards more valid scientific explanations (Bennett *et al*., 2010). When students use the language of science they are therefore required not only to speak but also to interpret science (Bennett *et al.,* 2010).

2.2.3.2 Learning improves

Nussbaum (2008), comments that through collaboration, learning gains are more permanent than compared to traditional teacher talk lessons. Baines, Blatshford and Chowne (2007), found that year 4 and 5 students showed significant gains in science attainment when group work was used, compared to a control group of students using traditional teaching practices. Test results showed significant gains in both short and long term science attainment.

The gains in learning may be explained in terms of the learner centred approach group work provides. The student is expected to provide explanations and predictions rather than receive explanations and give answers, learning therefore tends to be more permanent (Nussbaum, 2008). Further, Augustine, Gruber & Hanson, (1989) and Kutnick & Berdondini (2009)

found that a collaborative approach to teaching results in students becoming responsible for their own learning.

Group work allows for the construction of knowledge by individuals of the group, when students work collaboratively and openly discuss opinions and conflicting ideas, out of the mix, a body of knowledge may be constructed that may be more complete and coherent than the knowledge of any one individual of the group at the beginning of the activity (Nussbaum, 2008; Sullivan Palinscar *et al*., 1993).

Whilst collaborative approaches to group work have many advantages, as just discussed its implementation in classrooms has not always been successful. I will discuss the reported disadvantages of collaborative group work in the section which follows.

2.2.4 Disadvantages of collaborative group work.

Disadvantages of using collaborative group work in the classroom include: the increased demands placed on teachers; peer group pressure; not everyone works equally within the group and concerns about how much learning is actually happening.

2.2.4.1 Demands on teachers.

Teachers may be enthusiastic towards allowing students to do group work; however, not all teachers know how to do group work (Bennett *et al*., 2010; Kutnick & Berdondini, 2009.) As a result many teachers do not feel confident in doing group work as they feel they lack the necessary skills (Bennett *et al*, 2010, Baines, *et al*., 2007). Brodie *et al*., (2002) report that many teachers embrace the 'form' of group work, yet this approach has been found to be lacking 'substance'. Reasons for this include poor content knowledge, lack of resources and lack of support from the principal with the implementation of OBE.

Baines *et al*., (2007) report that some concerns teachers have regarding the use of group work as a way of teaching and learning are: that teachers lose the control they have in traditional lessons; there appears to be increased off task behaviour which may lead to disruption; group work is time consuming and assessing students is difficult. Further, deciding and designing a task which is appropriate for group work involves a lot more thought, time and preparation

than what is needed when using traditional teacher methods (Baines *et al,* 2007; Colosi & Zales, 1998).

To overcome some of the concerns teachers have with respect to group work mentioned above both teachers and students should be explicitly taught to understand the dynamics and demands of collaborative group work (Kutnick & Berdondini, 2009; Sullivan Palinscar, *et al.*, 1993). If tasks are demanding and students are kept busy then it would be hoped that students would stay 'on task' (Kutnick & Berdondini, 2009). This was the reason why I chose to teach collaborative group work skills to my students.

2.2.4.2 Peer group pressure

Small groups have the disadvantage that peer group conformity may restrict students from raising objections, if they disagree with other group members. In an attempt to avoid arguments and solve disputes students may opt for 'majority rules' voting to arrive at quick decisions, rather than deal with each member's reasoning (Bennett *et al*., 2010). It is only when students are willing to openly listen and discuss conflicting opinions that progression in learning results (Bennett *et* al., 2010; Alexopoulou & Driver, 1996). Occasionally the dynamics of the group result in individual members of the group performance regressing, especially when group members are behaving in ways which are competitive as opposed to collaborative (Alexopoulou & Driver, 1996).

2.2.4.3 Division of labour

Whilst it is the intention that through group work all students become active participants in their learning, frequently there is no clear division of labour. This may be due to some students being shy or lacking confidence, preferring to be inactive (Knight, 2007). However, it should also be mentioned that these would be the same students who do not participate in whole class discussions anyway (Knight, 2007). Conversely, there are those students who are very outspoken and tend to take over the discussions and activities (Tanner *et al*., 2003).

2.2.4.4 How much learning is happening?

While students may be divided into groups and 'working' on an activity, how much learning is actually taking place? Group discussions are in many instances dependent on students' content knowledge, and if this is lacking discussions may be superficial or incorrect (Brodie *et al*., 2002). In their study involving year 1 and year 2 students, Kutnick and Berdondini

(2009) reported an increase in on task activity when students were explicitly taught collaborative group work skills.

To overcome these difficulties in my study, students were explicitly taught collaborative group work skills. The activity chosen for my research project included content research as well as problem solving where students were required to decide on a phylogentic tree showing evolutionary relationships between different animal groups. This particular assessment task was chosen to encourage all students to discuss, argue and critique each other's work as they engaged in the group work. Students were required to research the content using reference books or the internet, both of which were made available.

2.2.5 Type of activities that promote learning.

Brodie and Pournara, (2005) maintain that if it is expected that students construct new meaning using group work, the tasks which the students do, should be original and not routine. A reason given as to why students are less enthusiastic to work in groups and why little learning happens is because the task is often poorly designed or uninteresting (Weimer, 2007). Carefully thought out tasks could result in enthusiasm to the task and group work. Sullivan Palinscar, *et al.*, (1993) found that when students were given a more open-ended problem, students were able to generate a greater variety of alternatives to a problem. When problems were less well defined, students drew on relationships between scientific and everyday problems. According to Engle and Conant (2002), it is through problematizing subject matter that students become engaged in building on each other's ideas.

Engle and Conant (2002) suggest four principles to help foster engagement in tasks. Firstly, the content needs to be problematized. The content should be presented such that the task is seen as an inquiry, where teachers encourage questioning, and students challenge each other. Secondly, students should be given authority. Students should be allowed to conduct their own investigations. Teachers should allow students to be active participants and treat their contributions seriously. Thirdly, students need to be held accountable to others and they need to uphold disciplinary norms; students need to treat each other's contributions seriously. Finally, relevant resources need to be provided, including enough time.

With respect to my research, whilst the first part of the activity is mainly content driven it is required to allow the students to complete the second part of the activity. This activity was chosen, since the second part, explaining of evolutionary relationships between six animal phyla, makes this work an activity which requires problem solving skills.

2.2.6 Role of teachers

Traditional teacher centred lessons see the teacher's time being filled with instruction and as a result all authority in the classroom is given to teachers. This is in contrast to the role of teachers in learner centred lessons and especially during collaborative group work. The role of the teacher during lessons involving collaborative group work is to ensure that students' are given appropriate tasks and that the classroom culture is one where students' believe that they can construct their own knowledge (Brodie and Pournara, 2005; Tanner *et* al., 2003).Teachers need to be aware of the knowledge base the students are working from, (Brodie and Pournara, 2005), which is determined by listening to the groups conversations (Tanner, *et al*., 2003). This requires teachers to have a good understanding of the scientific content of the problem (Sullivan Palinscar, *et al*., 1993; Brodie and Pournara, 2005).

Having a sound understanding of the problem would mean that teachers would be able to recognise when a student makes an error of no significance, and should ignore such an error (Lepper, Drake and O'Donnell Johnson 1997, cited in Shepard, 2000). When teachers intervene it should be with a question which will allow the student to self correct. Sometimes a series of questions may be required, a process called 'debugging' where the student is guided through the solution (Shepard, 2000). This approach tends to keep students motivated and self confident whilst at the same time addressing the errors (Tanner *et al*., 2003; Cornelius and Herrenkohl, 2004). Thus, the effectiveness of a small group discussion is dependent on the guidance the students receive rather than any particular type of stimulus material. The role of teachers should be seen as one of facilitator scaffolding learning (Brodie 2010).

2.2.7 Student Interactions

Implementation of group work in the classroom in some instances has been found to result in students discussions being superficial and the work which students produce being of a low quality (Baines *et al*., 2007; Brodie *et al*., 2002). Teachers tend to plan for their interactions

with students, but not for interactions between students (Baines *et al*., 2007). Kutnick and Berdondini's (2009) study of year 1 and year 2 students showed that when teachers and students were explicitly taught collaborative group skills through their SPRinG programme students in the experimental group tended to be more 'on task' compared with the control group. The experimental students were found to participate and were more sensitive towards each other.

Further when students find tasks challenging, they seem to take responsibility for their learning, they tend to stay on task and real learning occurs as students construct their knowledge (Alexopoulou and Driver, 1996). The activity which my students worked through was the animal diversity research assignment prescribed for the Grade 11 Life Sciences, (Gauteng DoE, 2010). My hope was that as students worked through the assessment activity collaboratively, that the assessment would move from being traditionally used for measurement to assessment that promotes learning.

2.3 Assessment

Previously the South African curriculum was transmission based, content driven, teacher centred and exam focused (Brodie and Pournara, 2005). In the new curriculum assessment has moved away from placing emphasis on tests, exams, to including various tasks, for example hands on practicals, hypothesis testing and assignments (DoE, 2008). Assessment now involves far more than merely collecting marks; assessment now forms part of learning. In this section I will look at what is meant by assessment, why assessment is necessary, how assessment is carried out, and assessment for learning. I conclude with a discussion on learning-oriented assessment as this framework proposed by Carless (2007) includes various aspects which are considered needed, when the purpose of assessment is learning.

2.3.1 What is assessment?

Assessment has traditionally been used for certification and promotion purposes (Shepard, 2000). This type of assessment has been referred to as assessment for measurement (Hargreaves, 2005; Shepard, 2000) or for certification purposes (Carless, 2007). This type of assessment usually takes the form of objective tests to determine achievement (Shepard,

2000). The emphasis which has been placed on this function of assessment has been dominant in schools (Black & Wiliam, 1998).

More recently assessment has been seen as a means to support student learning, providing students with tasks which challenge their higher order thinking. Students are active participants in the evaluation of their work and assessment is integrated with instruction and is ongoing (Shepard, 2000). Assessment which allows for constructive feedback and opportunities that allow the student to follow up on the feedback is referred to as formative assessment (Black & Wiliam, 1998). It is this type of assessment activity that this research is concerned with, where the assessment is more than for measurement and certification purposes; rather it provides opportunities for the student to learn, using collaborative group work to achieve this end.

2.3.2 How is assessment carried out?

In the South African curriculum, continuous assessment is espoused and assessment integrated into the process of teaching and learning (DoE, 2003). Shepard (2000) maintains that a reformed vision of a curriculum acknowledges that all students can learn using assessment activities. Learning occurs as students are provided with feedback and given the opportunity to evaluate and correct their work. However, Sadler (1998) and Black and Wiliam (1998) found that these are not the practices found in the classroom.

Reasons why assessment does not form part of learning according to Black and Wiliam (1998) include: assessment tasks tending to be of a lower order e.g. recall. Secondly, teachers see assessment as a way of grading and not learning. Thirdly, assessment tends to encourage competition between students. Finally, with traditional approaches to assessment weaker students tend to become demotivated. The same authors found that teachers view assessment as a requirement of certification and this influences their assessment practices. Further, teachers lack of understanding of assessment for learning results in poor practices of formative assessment (Black & Wiliam, 1998). Implementation of assessment for learning requires much change with respect to the teacher's perception of their role with respect to their students and their own classroom practice.

Black & Wiliam (1998) and Sadler (1998) suggest that teachers who allow assessment to form part of the learning process show the following set of traits: good subject content knowledge; a desire for their students to improve and do well, are able to empathise with students; provide good quality feedback; develop tasks which reveal pertinent responses from students and are able to assess at an appropriate level or standard, relevant to a student's particular grade. For example the detail and understanding required by a Grade 11 student looking at animal diversity would be more than that required by a Grade 8 student working through the same topic. Whilst the role of teachers in the assessment process is crucial in dictating how much learning happens, the focus of my project was not on the role of teachers during assessment but rather on students. I turn my discussion now to explore some of the attitudes students have towards assessment.

Many students are reluctant to engage seriously with an assessment task for the following reasons: fear, low self-esteem, feedback is seen as unhelpful and some students see asking for help as a reflection of low ability (Black & Wiliam, 1998). In contrast when students believe they have the ability to tackle a task, the task is completed with enthusiasm. Secondly, students put more effort into tasks which are considered 'academic work' (Black & Wiliam, 1998). Many of these attitudes occur because of the emphasis placed on external exams, which therefore makes measurement a driving force in the purpose of assessment (Brooks, 2002; Shepard, 2000). Assessment needs to move past being for measurement purposes. I agree with Shepard (2000, p. 10) when she states that through assessment we need to create "a culture where students and teachers would have a shared expectation of finding out what makes sense and what doesn't", followed by a decision on the next step to take such that learning occurs. When the purpose of assessment is learning students become motivated and all students are given the opportunity to be successful (Shepard, 2000).

2.3.3 Assessment for learning

Assessment for learning has been defined as 'assessment which is used to inform the next steps in teaching and learning, with teachers giving feedback for improvement.' (Hargreaves, 2005, p. 213). Black and Wiliam (1998) defined assessment for learning as '... all those activities undertaken by teachers and by their students in assessing themselves, which provide information to be used as feedback by the teaching and learning activities in which they are engaged' (p. 2).

Taken together assessment for learning involves:

- monitoring a student's performance against learning objectives (Hargreaves, 2005)
- using the assessment to determine the next step in teaching and learning (Hargreaves, 2005)
- teachers giving feedback which enables improvement (Black & Wiliam, 1998)
- teachers understanding student's learning (Black & Wiliam, 1998)
- students taking responsibility for their own learning (Hargreaves, 2005; Shepard, 2000)
- students learning resulting in attainment of the learning objectives (Shepard, 2000)

The fifth bullet states that 'students need to take control over their own learning.' This is embedded in constructivist approaches to learning (Hargreaves, 2005), where knowledge construction involves students making sense of the world, by making connections between what they already know and that which is to be learnt. The construction of knowledge can be achieved individually or co-constructed collaboratively, when students work together on a task (Hargreaves, 2005). This type of assessment aligns itself with assessment as inquiry, since students are solving problems by relating new knowledge to existing knowledge and at the same time co-constructing using other student's knowledge (Hargreaves, 2005). It is this type of assessment that my research investigated.

2.3.3.1 Feedback

For assessment to promote learning students need to receive appropriate feedback allowing them to 'feed forward' into future work (Carless, 2007). 'Feeding forward' helps to ensure that students have grasped concepts correctly, reducing the risk of misconceptions, as students construct their knowledge. Black & Wiliam (1998) defined feedback as referring to information a student receives regarding any action about the performance. Black & Wiliam, (1998) state that feedback needs to close the gap between the actual level of performance and the level determined by a reference level. They contend that if the information provided does not narrow the gap then the information is not considered feedback. In essence, the feedback a student engages with should aid them in moving through their zone of proximal development.

Including feedback into teaching and learning practices is surely a fundamental practice which is expected of all teachers (Sadler, 1998). Black & Wiliam (1998) report that it is the quality of the feedback which determines the effect feedback has on learning. Feedback which is directed towards the task itself yields better results (Black & Wiliam, 1998). Feedback which merely indicates whether a response is correct or not, is less fruitful than feedback which gives details of a correct answer. Yorke (2001) suggests that feedback should draw the student's attention to specific errors and on poor strategy, then provide suggestions on how to improve.

Feedback which is concerned with the student him/herself, tends to negatively impact on learning (Black & Wiliam, 1998). For instance, whilst praise may increase a student's interest in a task, it was found to have little effect on performance (Yorke, 2001). When feedback places emphasis on grade achievement this has negative effects on learning (Black & Wiliam, 1998). My research was concerned with students actively engaging in an assessment task allowing fellow group members (peers), the opportunity to provide and receive feedback from each other, thereby allowing the assessment task to fulfil two purposes: certification and learning.

2.3.3.2 Peer assessment

Peer assessment is concerned with fellow classmates assessing work rather than the students assessing themselves or being assessed by the teacher (Brooks, 2002). Using collaborative group work to carry out peer assessment has the advantage that all group members benefit from discussions related to the work (Brooks, 2002). The critical evaluation of a classmates' work has the advantage as it may be a stimulus for improving the 'assessors' own work as well, since the class-mate is a source of new ideas (Brooks, 2002). Peer assessment has been shown to yield positive benefits, in that students have acknowledged that through this process they learn more (Black & Wiliam, 1998).

Brooks (2002) however warns of some potential problems which may be encountered when students are involved in peer assessment using collaborative group work: firstly students need to be sensitive and respect each other. Students should avoid rival competitive situations, as these types of interactions are destructive to the group dynamics. Some students query the validity of assessment tasks which are not assessed by teachers, resulting in less effort being

put into such tasks (Brooks, 2002). The same author suggests to avoid the above mentioned problems; students need to be taught the rationale of peer assessment, allowing them to understand the advantages for both themselves and their group members.

2.3.4 Learning-oriented Assessment

The reason for using a prescribed DoE assessment task was both for certification and learning purposes. Assessment which serves both these purposes is learning-oriented assessment (Carless, 2007). In my study the assessment task was seen as providing learning opportunities. As individuals worked in their groups not only were they actively involved in their own work but that of their fellow group members. The group discussions provided opportunities for engagement in feedback which allowed for the construction of knowledge based on its 'intelligence', 'plausibility' and 'fruitfulness' (Hewson, Beeth & Thorley, 1998). The assessment activity formed part of the student's term three Life Sciences mark.

2.4 Theoretical frameworks underpinning this research.

The research question my project was seeking to answer is: how do student discussions during group work influence learner's performance when doing a DoE prescribed Life sciences activity? The question was divided into three sub questions:

1) How does student performance change following participation in collaborative group work on the DoE assessment task?

2) What is the nature of student-student interactions during collaborative group work on a DoE assessment task?

3) What are students' perceptions of the influence of collaborative group work on their performance in the assessment activity?

Two theoretical constructs which informed my study are group work and assessment for learning, both of which are explicitly stated in the NCS as being part of OBE (DoE, 2003). I used the theoretical framework set up by Brodie & Pournara (2005) as an approach to researching collaborative group work in mathematics classrooms as the main theoretical framework in my study. I also drew from Carless's (2007) framework for learning orientated assessment to ensure that the assessment activity is useful to serve both certification and learning purposes.

2.4.1 Theoretical framework for a collaborative approach to group work.

If the intention of the group work is for students to interact collaboratively, i.e. students interacting on a task, which is better solved together, allowing each individual to make progress, the following four aspects of the group work need to be considered according to Brodie and Pournara (2005):

2.4.1.1 Theoretical Perspective on Learning.
2.4.1.2 Nature of task.
2.4.1.3 Nature of interactions, organisation of groups and allocation of roles.
2.4.1.4 Role of teachers.

2.4.1.1 Theoretical perspective on learning.

Collaborative group work draws on constructivist perceptions on how knowledge is constructed. Through discussion students may be placed in situations of cognitive conflict. Resolving this conflict results in conceptual growth (Brodie and Pournara, 2005). Where disagreements occur students need to avoid situations where 'majority rules' to decide on the 'correct answer' (Bennett, *et al.*, 2010), rather students need to be encouraged to openly discuss and listen to conflicting opinions. When students are actively involved in robust discussions they are likely to be placed in situations of cognitive conflict allowing for the construction of knowledge. It is through the verbalisation of ideas, disagreement and reflection that learning is supported (Brodie & Pournara, 2005). The first question my research sought to answer was concerned with how student's performance changes following participation in collaborative group work? The second research question was concerned with the nature of student-student interactions during collaborative group work. I explored whether student discussions were on task and did they provide opportunities for the construction of knowledge?

2.4.1.2 Nature of task.

Brodie & Pournara (2005) suggest that the task students engage in needs to be novel and not have been taught before. Further the task needs to be carefully sequenced allowing students to develop their knowledge in a logical manner. The activity which I selected was taken from the school based assessment document for Grade 11 Life Sciences (Gauteng DoE, 2010). It

was sequenced such that it begins with understanding of various characteristics of an animal's body plan (namely symmetry, number of tissue layers developing from the embryo, absence or presence of a coelom and the absence or presence of a through gut) to writing an essay discussing the evolutionary changes of six selected animal phyla (Porifera, Cnidaria, Platyhelminthes, Annelida, Arthropoda and Chordata). The first part of the task required students to explain what is meant by each of the above characteristics and then complete a table which indicates the characteristics for a particular phylum. (See Appendix 1.) Students were then required to use the information in their table to discuss the body plans of the different phyla in the context of evolution. The task was sequenced in way that should promote logical thinking in that students needed to consider how after having stated and defined various characteristics of the different animal phyla, they moved to a discussion on how these characteristics are related to each other from an evolutionary perspective.

2.4.1.3 Nature of interactions, organisation of groups and allocation of roles.

Students need to be encouraged to work together within their groups such that discussions support the individual construction of knowledge (Brodie & Pournara, 2005). Through explicit teaching of collaborative group work skills students in my study were made aware of how to interact in a manner which supports learning. Whilst Brodie & Pournara (2005) suggest that students of the same ability are placed in the same group to support mathematical learning, my study involving Life Sciences students deviated from this framework and students of mixed ability were placed in the same group. Colosi and Zales (1998), used groups of mixed ability in their study involving Life Science's students. The type of thinking required when completing a Life Sciences activity is different from the logical thinking required in mathematics classrooms, and students of differing ability should not be disadvantaged to the extent they would be when solving mathematical problems. Students of differing ability relate their discussions to everyday situations or previous experiences more easily when discussing Life Sciences problems, as compared to the abstract thinking required when solving mathematical problems which are often far removed from everyday experiences.

2.4.1.4 Role of teachers.

Whilst my research was concerned with what students are doing when engaged in collaborative group work, the role of teachers as facilitators (Brodie & Pournara, 2005) needs to be discussed as well. Here, teachers ensure that the classroom culture allows students to

feel free to explore their own strategies. When situations of cognitive conflict arise, teachers need to guard against invading the space where the student is constructing knowledge. Rather teachers should look to create situations of cognitive conflict by asking questions rather than "telling" students the answer (Brodie & Pournara, 2005).

Table 2.1 Collaborative approach to group work
(Adapted from Brodie & Pournara, 2005 p. 60)

Theoretical perspective on learning.	Learning is the construction of increasingly advanced knowledge schemes and conceptual development. .
Nature of task.	Novel unseen tasks carefully sequenced.
Nature of interactions, organisation of groups and allocation of roles.	Challenge and collaborate on a social level in order to support individual constructions.
Role of teacher	Facilitator: promotes cognitive conflict, nurtures appropriate classroom culture, selects and sequences appropriate tasks, no invasion of student's constructions by the teacher.

2.4.2 Theoretical framework for learning-oriented assessment

The purpose of the task which the students in my study participated in, was more than just for certification purposes; it was to include opportunities which would promote learning. This assessment activity forms what Carless (2007) calls learner-oriented assessment. The framework provided by Carless (2007, p.59,60) is based on the following principles :

1. *Assessment should encourage learning practices amongst students.*
2. *Students need to engage actively with the criteria and quality of their own performance and or their peers.*
3. *Feedback should be such that it is supportive and encourages future learning, therefore it needs to be forward looking and timeous.*

Figure 2.1 below shows how the various aspects of this framework are related. This figure indicates that the two main purposes of assessment are that of certification and learning. The assessment selected for my study included both elements. The students were individually

evaluated and this made up 25% of their grade for the term. However, this was not the sole reason for doing the task. By working in collaborative groups students had an opportunity to explain their work, ask about uncertainties and listen to fellow group members explanations; in so doing this task now provided opportunities for learning. Carless points out that when there is overlap between the certification and learning processes then the assessment is functioning efficiently.

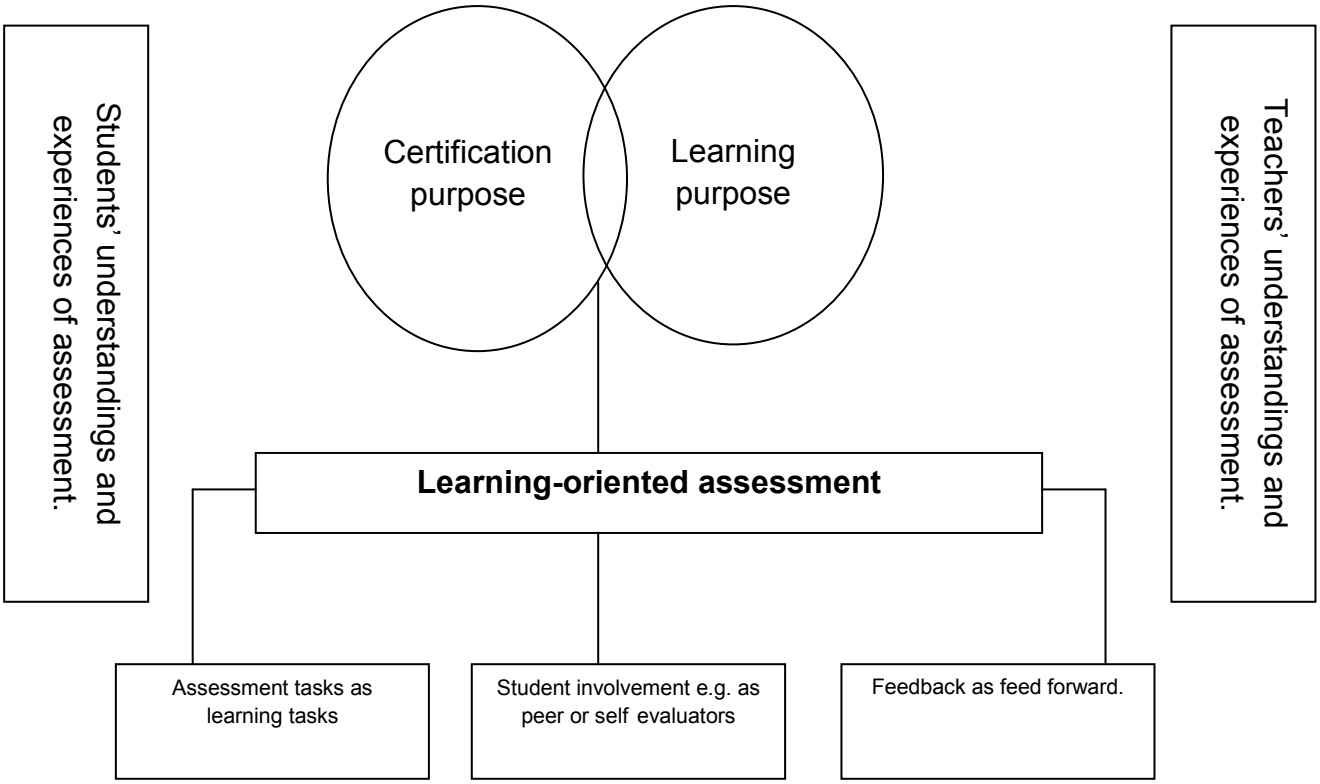

Fig 2.1 Framework for learning-oriented assessment (Carless, 2007, p. 60).

According to this framework the assessment should be designed in a manner that does not result in "short-term bursts of sustained study" (p. 59) as sometimes occurs when students prepare for end of term tests, where content which is learnt is soon forgotten. The content of the task selected for my research required students not only to understand what various terms mean, but to discuss them in an evolutionary context. Since discussions required explanations and not merely the regurgitation of copied down definitions, it was hoped that learning would be lasting.

Similar to Yorke (2001) and Black & Wiliam (1998), Carless's (2007) framework advocates the use of feedback for assessment that promotes learning. The feedback students receive should be relevant placing students in situations of cognitive conflict, resulting in "feeding

forward" where current and future learning is supported (Carless, 2007). Carless asserts that students need to be given the opportunity to engage with and respond to the feedback they receive. Group work provides such opportunities, as students provide explanations their group members, respond immediately. Carless recognises that although the teacher is the usual person to provide the feedback, peers can fulfil this function as well. My study made use of peers to provide the feedback.

2.5 CONCLUSION

My project focused on student learning and attainment of a prescribed DoE Gr 11 Life Sciences assessment task. The purpose of the assessment was more than for measurement but rather for inquiry, where it was hoped that assessment would form part of student learning (Hargreaves, 2005; Shepard, 2000). To achieve this end, students need become actively involved in their learning allowing knowledge to be individually and socially constructed and where students take responsibility for their learning. By working collaboratively in groups students become active participants in their learning. They are given the opportunity to verbalize their ideas as well as to receive feedback from their peers. Likewise they will be providing feedback to their fellow group members. Whilst such an approach is encouraged in department policy (DoE, 2003), Brodie *et al*., (2002) have noted that within a South African context, teachers are using group work approaches without much learning. Learning and gains in science attainment have been reported for students in primary schools in the United Kingdom (Baines *et al*., 2007): however no research has been reported where gains in learning and science attainment have been achieved once high school students participated in group work in South Africa.

Brodie *et* al., (2002) report that when students are made aware of how to work collaboratively in a group that this "form" of learner centred teaching will result in improvements in the quality of student discourse resulting in learning which has "substance. In this way students will be given the opportunity to socially construct knowledge as they engage with each others' explanations. Having students provide feedback has the advantages that students are actively involved in the learning process and secondly students are able to determine and understand the gap which exists between where their learning is and where it should be. My project investigated student- student interactions as students engaged in a DoE assessment activity as well as measuring learning gains due to group work.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

I conducted a case study of how student discussions during collaborative group work influence learning gains. By case study I mean that I worked with a single Grade 11 class that I teach to gain deep insights into the topic I worked with. I was able to probe deeply and analyse recordings of the interactions between students as they engaged in group work (Cohen & Manion, 1995). A case study was selected as it allowed me to focus on the interactions between students as they engaged in group work with the view to provide an in-depth account of these interactions as they occurred (Denscombe, 2007). This meant that I was a participant in my research as I was engaged with the students and context that was being researched (Cohen & Manion, 1995). Being a participant has the advantage from a researcher as observer approach; in that it allowed me to better understand the context of the learning (Simpson & Tuson, 2003). Further, I hoped that my research would be beneficial to both my students and the school, and that I was not merely "taking from the school with an air of detached ivory-tower research authority" (Simpson &Tuson, 2003, p. 13). Our school has on occasion been asked to complete various surveys and questionnaires yet, we have never been informed of the findings of the research. This approach to research has left members of the staff feeling rather 'used' by the researchers. At the same time I realised the possibility of potential bias in my research and that I needed to be as detached from the situation as possible so that the results from my research project are both reliable and valid. It is for these reasons that part of my research project is quantitative. Further, I emphasized to my students that they were not compelled to participate in this research; (this is discussed further under ethical considerations, section 3.4).

3.1 Context

The research was conducted in a suburban high school in Gauteng. The school has twelve hundred students mainly from the neighbouring suburbs. The rest of the students commute in from nearby townships and outlying areas. The school implements a policy where students

living in the area are enrolled first, before those who come from the three feeder primary schools. All students pay their own school fees at R9000 per annum. Due to financial constraints some 15 % of students are receiving a subsidy on their fees from the school.

The school is well resourced; each student is issued with his/her own textbooks. There is a functional library as well as five well stocked laboratories. Class sizes vary between 20-35 students. The classes are mixed with respect to gender and race. English is the language of learning and teaching.

3.2 Methodology

I taught two Grade 11 Life Sciences classes in the year of my study. I had decided from the start of my research project that both classes needed to be included in the research for the following reasons. First, it would seem that one class was favoured over the other if only one was selected to participate in the research creating a feeling of unfairness. Second, it was hoped from the start of the project that there would be learning gains when students were explicitly taught group work skills and given the opportunity to work collaboratively. Lastly considering ethical reasons both classes needed to be treated the same. Both classes completed all aspects of the task; however one class was involved in piloting my research instruments, while the other was the "research" group. None of the two classes was aware that they were the pilot or "research" group. All aspects of the project were identical for both classes except that the pilot class's group work activity was conducted a week prior to the experimental group allowing me time to rectify errors and or ambiguous statements in the research instruments. Following the recording and viewing of the pilot class's group work activity the "research" class was asked to:

1) Speak loudly during whole class and small group interactions in order for the recorder to capture their voices adequately. Sometimes in the pilot group recordings, what was being said was inaudible.
2) Name the phylum they were talking about and not merely point to their tables or refer to the phylum as "it". On occasion it was unclear which phylum students were talking about in the pilot recordings.
3) Take down notes of what was being said, as this would help them with their final write up.

The research method involved the following steps:

3.2.1. Explicit teaching of group work.

3.2.2 Class work

3.2.2.1 Explanation to students on how to complete the assessment activity.

3.2.2.2 Students' individual assessment activity completed at home.

3.2.2.3 Students work collaboratively on task in groups.

3.2.2.4 Students individual rework the first draft of the assessment activity.

3.2.3. I (teacher) mark the final draft of assessment activity.

3.2.4 Students complete a questionnaire evaluating the impact of the group work.

3.2.1. Explicit teaching of group work.

Much research (e.g. Kutnick & Berdondini 2009; Alexopoulou & Driver, 1996; Sullivan Palinscar, Anderson & David, 1993) has been conducted on group work and there is agreement that group work needs to be explicitly taught for it to be an effective way of learning. Following these authors suggestions, I explicitly taught the following aspects concerning collaborative group work to my students:

(1) All group members need to contribute to the group's efforts through sharing of ideas, discussions, bringing resources and taking turns with various jobs (Alexopoulou & Driver, 1996).
(2) Students need to think before they speak. When they are explaining they need to back statements with reasons and examples. Explanations may need to be stated differently to clear up confusion (Sullivan Palinscar, *et al*, 1993).
(3) Students should to listen to each other. They need to understand each other's ideas, by asking their peers to restate ideas. When unsure about what is being said students need to ask questions (Sullivan Palinscar, *et al.,* 1993).
(4) Students need to acknowledge good ideas and if they disagree they must explain why (Sullivan Palinscar, *et al*, 1993).
(5) To work effectively together, group members need to learn to trust and respect one another (Kutnick & Berdondini, 2009).

Throughout the year students were given several opportunities to engage in collaborative group work. Prior to each group work activity, students were reminded of the skills that enabled successful collaborative group work. It was hoped that by reinforcing collaborative

group work skills students would be familiar with what group work entailed so that this approach to teaching and learning was not novel at the time of the research. Further, it was hoped that a non threatening class culture as suggested by Kutnick & Berdondini (2009) would be created to make all students feel that their contribution would be taken seriously.

3.2.2 Class work

3.2.2.1 Explanation to students on how to complete the assessment activity

On the day the activity was handed to the students (on the 31st August 2011) I spent 40 minutes explaining the activity to them. The activity they were to complete involved an investigation into the body plan of six animal phyla. (Note that in this write up I will refer to the activity that the students completed as the assessment activity, the DoE refers to it as a "research assignment".) The assessment activity involved students investigating aspects such as: symmetry, number of tissue layers developing from an embryo, the absence or presence of a coelom and the absence of presence of a through gut. I explained to the students that they had to define each of the terms and research the characteristics for each phylum. They were then to construct a table comparing the body plans, which they would use to write an essay discussing the body plans of the phyla in the context of evolution (See Appendix 1.)

I explained that the assessment activity was initially to be completed as an individual exercise. Students were required to hand in a first draft of the assessment activity two weeks later. They would then discuss their work in groups of four. Following the group discussions students would write and submit a final write up of the assessment activity individually. The final write up would make up 25% of term 3's Life Sciences mark.

The students were given an opportunity to ask questions so as to understand how to complete the assessment activities. They were to refer to textbooks as well as the internet, both were available at the school. However, only two students made use of the textbooks and none requested to use the internet. The instructions and information given to the students regarding the assessment activity as well as the rubrics (which the students also received) that were used in assessing the assessment activity are given in Appendix 1.

3.2.2.2 Students' individual assessment activity completed at home.

Students handed in their first draft of the assessment activity two weeks after it had been given to them. Their work (the first draft) was photocopied and the photocopy was assessed

using the rubrics provided by the DoE (see Appendix 1). This mark, (for the first draft) was for the purposes of my project only, and was used as the pregroup work assessment activity score. The original first draft of the assessment activity was handed back to the students on the day the group work activity took place. The pregroup work assessment score was not made available to the students. I did not want to provide any feedback to the students as I did not want my feedback to influence any possible learning gains. The purpose of my study was to investigate learning gains (i.e. any change between the pre group assessment activity score and post group work assessment activity score) from the feedback received from peers during group work rather than feedback from me as the teacher.

3.2.2.3 Students work collaboratively on task in groups.

On the same day as the students participated in the group work, students submitted their final draft. The first half an hour of the lesson was used for the group work, directly afterwards students were given an hour to write and submit the final draft of their assessment activity. Whilst all groups were only given 30 minutes to discuss the work, students were not limited by time, when completing their final write up. Once students were satisfied with their final draft of their assessment activity they submitted it. All students completed their final draft within 60 minutes.

Most groups consisted of four students as recommended by Alexopoulou & Driver, 1996. The five students who indicated that they did not want to be part of the study were placed in group 1. The remaining twenty six students were split into two groups of five (group 6 and 2) and four groups of four (groups 3,4,5 and 7) (See Appendix 3). One student was away from school for the duration of the study. Following the work of Colosi & Zales (1998) the groups were predetermined, with groups being heterogeneous with respect to academic ability, gender, and ethnicity. To ensure that groups were academically heterogeneous I ranked students based on their term 2 Life Sciences results, from highest to lowest. The first six students were assigned a group, i.e. the highest ranked student was assigned to group 2 and the 6th highest ranked student was assigned to group 7. Student 8 was assigned to group 2 and student 12 to group 7. I continued with this method of assigning students until each student was assigned a group. Assigning students in this way was done to try and avoid potential bias which may creep in, since I know the students I teach and it was their position in the class which determined which group they were assigned to.

Placing students of different academic ability in the same group, might help bring different ideas to the groups since they would tend to come from different friendship groups, this would allow for more robust discussions. Assigning students based on their term 2 marks resulted in groups that were relatively heterogeneous with respect to ethnicity and gender (see Table 3.1).

Table 3.1: Student group allocation based on term 2 marks.
(Pseudonyms have been used to ensure anonymity)

	Pseudonym	Group Number	Term 2 marks	Gender	Race
1	T2	2	85	F	I
2	R2	2	72	F	W
3	G2	2	51	F	B
4	M2	2	50	M	B
5	S2	2	39	F	B
6	R3	3	80	M	I
7	N3	3	72	F	B
8	L3	3	65	F	C
9	M3	3	49	F	W
10	A4	4	76	M	B
11	S4	4	71	M	I
12	T4	4	64	F	I
13	H4	4	44	M	B
14	P5	5	75	F	B
15	B5	5	70	M	W
16	G5	5	62	M	B
17	D5	5	43	M	I
18	A6	6	75	M	I
19	S6	6	70	M	B
20	N6	6	61	F	B
21	F6	6	56	M	B
22	L6	6	49	F	B
23	N7	7	74	F	B
24	G7	7	67	F	B
25	Z7	7	52	M	B
26	R7	7	33	F	B

Gender: F = female M = male
Race: B = black C = coloured I = indian W = white

During the group work activity, I walked between the groups and listened to discussions. I avoided answering questions with statements but tried to answer questions with a question to

encourage students to think about what they were discussing (Brodie & Pournara, 2005). Since there were seven groups in the class I spent less than five minutes at each group.

3.2.2.4 Individual student's rework of the first draft of the assessment activity.

Immediately following the group work, the students returned to their desks, worked individually for an hour on their assessment activity and submitted a final write up for evaluation. All the students completed their work well within the one hour allocated for this.

3.2.3. I (teacher) mark the final draft of assessment activity.

The final draft was assessed using the rubrics provided by the DoE. Only one student in the experimental class did not submit a final draft of the activity. The marks obtained for the final draft were used as 25% of term 3's Life Sciences mark. These marks were used in my study as the post group work assessment activity score and were compared with the marks the students' individually obtained in their first draft: the pre group work assessment activity score.

3.2.4 Students complete a questionnaire evaluating the impact of the group work.

During the Life Sciences lesson, following the group work, the students completed a questionnaire on their experiences and attitudes towards the group work.

3.3 Research instruments

3.3.1 Rubric

The essay rubric provided by the DoE (See Appendix 1) was used to assess students: first draft and final write up of the assessment activity. The rubric was given to students when the assessment activity was handed out. The difference between the pregroup work assessment activity score and the post group work assessment activity score answered my first research question: how does student performance change following participation in collaborative group work on a DoE assessment task?

3.3.2 Observation schedules

Systematic observation schedules were used to answer my second research question: What is the nature of student-student interactions during collaborative group work on a DoE assessment task. Both Denscombe (2007) and Simpson & Tuson (2003) recommend using

and if necessary adapting observation schedules which have been used and published, by educational researchers. The systematic observation schedules I used were adapted from the work of Kutnick & Berdondini (2009). I used both their systematic observation schedules:

(a) 'Qualities of Communicative Interaction between Members of a Group'

(See Appendix 4.)

(b) 'Frames of Activities' (See Appendix 5.)

Observation schedules were completed using the video recordings of the group work exercise.

3.3.3 Video recording

During the group work activity each group was video recorded. The group work activity coincided with a day some of my matric students did not write a preliminary exam and seven matric students volunteered and were trained as video camera operators. I used the video to complete the two observation schedules for seven "targeted" students. Initially I had hoped to select targeted students based on the difference in their marks between their pre and post group assessment activity scores: two students whose learning gains were the highest, two students whose learning gains were the least (even possibly negative learning gains) and two students whose learning gains were unaffected by the group work (i.e. students whose pre and post group work assessment activity scores remained unchanged). I hoped that selecting students this way would allow me to determine if there was a relationship between what these students are doing in their groups and any learning gains. However, nine students from the class did not hand in a first draft of the assessment activity and, or, did not complete the questionnaire (see Table 3.2). Only seventeen students completed all parts of the research methods i.e.: granted permission to participate in the research, handed in a first draft and final write up of the assessment activity and had completed the questionnaire (see Table 3.2). Only these seventeen students were eligible to be selected as target students.

I decided to select all students from groups six and seven who qualified, as 'eligible' target students, i.e. A6, N6, F6 and L6 (group 6) and N7,G7 and R7 (group 7). These groups were selected because the quality of the video recording was good, all of the group work discussions were recorded, most group members had completed the requirements for the research (completed a first draft and final write up of the assessment activity; participated in the group work and completed a questionnaire) and each group had a student whose post

group work score showed little improvement and at least one student whose post group work score showed much improvement.

Table 3.2: Students who qualified to be target students.
. (Highlighted students did not qualify)

	Pseudonym	Group Number	Ethics	Draft 1	Final Draft	Quest
1	T2	2	Y	Y	Y	Y
	R2	2	Y	Y	Y	N
2	G2	2	Y	Y	Y	Y
	M2	2	Y	N	Y	N
3	S2	2	Y	Y	Y	Y
4	R3	3	Y	Y	Y	Y
5	N3	3	Y	Y	Y	Y
6	L3	3	Y	Y	Y	Y
	M3	3	Y	N	Y	Y
	A4	4	Y	Y	Y	N
7	S4	4	Y	Y	Y	Y
8	T4	4	Y	Y	Y	Y
	H4	4	Y	N	Y	N
9	P5	5	Y	Y	Y	Y
10	B5	5	Y	Y	Y	Y
	G5	5	Y	N	Y	Y
	D5	5	Y	N	N	Y
11	A6	6	Y	Y	Y	Y
	S6	6	Y	N	Y	Y
12	N6	6	Y	Y	Y	Y
13	F6	6	Y	Y	Y	Y
14	L6	6	Y	Y	Y	Y
15	N7	7	Y	Y	Y	Y
16	G7	7	Y	Y	Y	Y
	Z7	7	Y	N	Y	N
17	R7	7	Y	Y	Y	Y

I drew up a 'qualities of communicative interaction between members of a group' observation schedule to include all the categories described by Kutnick & Berdondini (2009). (See Appendix 4). Categories included: Co-regulation (where members of a group are active participants either verbally or nonverbally); unilateral (where one member of the group dominates the activity); disrupted (a group member causes the group to go 'off task') and disengaged (one member does not participate in the discussions). The co-regulation category is subdivided into symmetrical (mutual sharing of knowledge between group members) and asymmetrical (responsibility is shared with some members being more active and others more

attentive) categories. To complete the observation schedule frequency counts (every 10 seconds) were used to determine what a student was doing, during the course of the lesson, using the video recordings.

The categories which Kutnick & Berdondini (2009) used in their observation schedule to "Frame their Activities:" are: on task (active/passive); routine task preparation; social; off task (active/passive) and other (See Appendix 5). Whilst my second research question was concerned with what Grade 11 students are doing during group work, I was also interested to find out whether their discussions are formative, i.e. are peers providing feedback to each other. For this reason I expanded the "on-task" category to include whether the student is explaining his/her work or providing feedback to group members (see Table 3.3). This was done since it allowed for more detailed analysis of the group work in terms of the type of feedback the student's were giving and receiving. I have included both explaining and providing feedback as "on task formative". When students were 'on task' but were neither explaining nor giving feedback, for example when asking a question or agreeing I coded such activity as 'on-task not formative".

Table 3.3: "Frames of Activities" (adapted from Kutnick and Berdondini, 2009)

<table>
<tr><th colspan="5">On-Task</th><th rowspan="3">Task Prepare Routine</th><th rowspan="3">Social</th><th colspan="2">Off - task</th></tr>
<tr><th colspan="3">ACTIVE</th><th colspan="2">PASSIVE</th><th rowspan="2">Active</th><th rowspan="2">Passive</th></tr>
<tr><th colspan="2">Formative</th><th>Not Formative</th><th>Listening</th><th>Other</th></tr>
<tr><td>Explaining</td><td>Feedback</td><td>Other</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

To complete the observation schedules, frequency counts (every 10 seconds) were used to determine what a targeted student was doing, during the group work activity. Each targeted student was coded twice to improve the reliability of the results. Results were converted to percentages of the total number of "Frames of activities" for each targeted student.

3.3.4 Questionnaire

A questionnaire (see Appendix 6) was used to find out what student's experiences were with respect to collaborative group work. The results from the questionnaire answered my third research question: "What are students' perceptions of the influence of collaborative group work on their performance in the assessment activity?" Asking students what they think about the effect the group work introduces the student's voice as part of this research , for instance students will be able to attribute (or not) learning gains to the group work. By asking students what their experiences were with regard to group work the findings from my research are not merely recorded as categories on an observation schedule.

3.4 Ethical considerations

Ethics approval for this research was granted by both the Gauteng Department of Education (Reference Number D2012/78) and The Ethics Committee in The School of Education of the Faculty of Humanities at the University of the Witwatersrand, (Protocol number: 2011ECE063C.)

As the research involved the students I teach I made every effort not to abuse my position as 'teacher'. Letters requesting informed consent to do the research were given to: the Principal of the school, parents of students and to the students. These letters are included in Appendix 2. The group work formed part of the usual teaching and learning programme. Three students from the pilot class and five from the experimental class did not want to be part of the research. These students were placed in the same group (group 1in each class) and were not recorded, nor did they complete a questionnaire. The results from these students have not been used nor discussed in my study. The names of those students who participated in the study have been protected, in that I have made use of pseudonyms when discussing a response by a particular student.

CHAPTER 4

Analysis, results and discussion

4.0 Introduction

Only data from students who completed all aspects of the research were included in the analysis and only they are discussed in this chapter. As explained in chapter three there were 32 students in the class. One student was booked off sick for the duration of the study. Five had indicated that they did not want to participate in the research. Six students did not hand in a first draft of the assessment activity and three did not answer the questionnaire. Only one student failed to submit a final write up of the assessment activity, this student did not submit a first draft neither. As the assessment activity used for my study formed part of the school assessment programme, this student was given an extension in which to hand in the work which he failed to do. He did not form part of the sample for my study. The mark obtained for the final draft of the assessment activity for all students in the class was used towards term 3's Life Sciences mark, counting for 25%. However, for purposes of my study only seventeen students who completed all aspects of the research have been included.

Table 4.1 The distribution of seventeen students that completed all parts of the research.

	Pseudonym	Group Number	Number of students in group that completed all aspects of the research.
1	T2	2	3
2	G2	2	
3	S2	2	
4	R3	3	3
5	N3	3	
6	L3	3	
7	S4	4	2
8	T4	4	
9	P5	5	2
10	B5	5	
11	A6	6	4
12	N6	6	
13	F6	6	
14	L6	6	
15	N7	7	3
16	G7	7	
17	R7	7	

Although for the group discussion there were four or five students per group, Table 4.1 indicates the actual number of students who completed all aspects of the research and have been included in the discussion.

My discussion is guided by types of data collected using different research instruments as well as by my research questions that my project sought to answer: how do student discussions during group work influence learners' performance when doing a DoE prescribed Life Sciences activity?

1) How does student performance change following participation in collaborative group work on the DoE assessment task?

2) What is the nature of student-student interactions during collaborative group work on a DoE assessment task?

3) What are students' perceptions of the influence of collaborative group work on their performance in the assessment activity?

4.1 Analysis of changes in student attainment.

4.1.1 Comparison or pre and post group work scores.

The essay component of the assessment activity was marked out of 30 and was assessed according to the memo and rubrics provided by the Gauteng Department of Education (See Appendix 1). Table 4.2 shows the pre group work and post group work assessment activity scores. All students showed an improvement in the post group work score when compared to the pre group work score. This was consistent with the findings of Baines, *et al.*, (2007) as well as Kutnick & Berdondini (2009), where primary school students showed significant gains in test scores following group work. The highest score gains were achieved by student S2 (group 2) and student S4 (group 4), an improvement of 16 marks (53.3%). Five students showed score gains of 40% and higher. Six students score gains were between 20 and 26%. G7 (group 7) and A6 (group 6) showed the least gains between the pre group work and post group work assessment activity score. The mean score gain of all students was 7.53 marks out of 30 (25.1%).

Table 4.2: Pre group work and post group work assessment activity scores.

Group Number	Name	Pre Group work Score	Post Group work Score	Difference between Pre and Post Group work
2	S2	6	22	16
4	S4	12	28	16
3	R3	13	26	13
6	L6	13	25	12
5	P5	17	29	12
6	F6	6	14	8
3	N3	19	27	8
2	G2	14	21	7
3	L3	20	27	7
2	T2	24	30	6
7	R7	18	24	6
5	B5	25	30	5
7	N7	20	24	4
4	T4	22	25	3
6	N6	20	23	3
7	G7	22	23	1
6	A6	20	21	1

Students are ranked according to the difference between the pre group work and post group work assessment activity score.
(Students who were part of the same group have been coded with the same colour)

To ascertain if these were statistically significant gains, the hypothesis "the mean score of the pre group mean score will not be significantly different from that of the post group mean scores" was tested. A two tailed t-test resulted in t_{cal} =3.99 (*df* =16). At a significant level of $\alpha \leq 0.01$, $t_{cal} > t_{tab}$ (3.419 > 2.921). Hence, I rejected the null hypothesis. What this data is indicating is that there is a significant statistical difference between the mean pregroup work score of 17.12 (57.07%) and the post group work score of 24.65 (82.17%). This finding answers my first research question: How does student performance change following participation in collaborative group work on the DoE assessment task? This data shows that student performance improved by an average of 25,1% which was statistically significant at $\alpha \leq 0.01$, following group work discussions.

According to the rubric used to assess the essay (see Appendix 1) 21 marks were allocated for content, 5 for use of language and 4 for not plagiarising and referencing correctly. Table 4.3

gives a detailed comparison of student scores using the essay rubric of the pre group work assessment and the post group work assessment score.

Table 4.3: Comparison of assessment scores (pre group work and post group work assessment activity) from the essay rubric.

		Pre Group Work Assessment Activity Scores				Post Group Work Assessment Activity Scores			
		TOTAL	Content	Language	Referencing Plagiarism	**TOTAL**	Content	Language	Referencing Plagiarism
		30	21	5	4	**30**	21	5	4
Group	Student								
2	S2	6	2	2	2	22	16	4	2
4	S4	12	6	2	4	28	20	4	4
3	R3	13	6	5	2	26	18	4	4
6	L6	13	7	4	2	25	18	4	3
5	P5	17	11	4	2	29	21	4	4
6	F6	6	2	2	2	14	6	4	4
3	N3	19	12	5	2	27	19	4	4
2	G2	14	8	4	2	21	14	5	2
3	L3	20	9	5	3	27	19	5	3
2	T2	24	17	5	2	30	21	5	4
7	R7	18	15	1	2	24	17	4	3
5	B5	25	18	5	2	30	21	5	4
7	N 7	20	15	3	2	24	16	4	4
4	T4	22	17	3	2	25	16	5	4
6	N 6	20	14	4	2	23	15	4	4
7	G7	22	15	5	2	23	15	4	4
6	A6	20	13	5	2	21	13	4	4
Average /30		**17.1**	**11.0**	**3.8**	**2.2**	**24.6**	**16.8**	**4.3**	**3.6**
% Average		**57.1**	**36.7**	**12.5**	**7.3**	**82.2**	**55.9**	**14.3**	**12.0**

One of my concerns with respect to students knowing that their first draft was not for certification purposes was that students would not put in as much effort into the first draft, especially concerning aspects of language and referencing. The data (Table 4.3) shows that there was an improvement in both language and referencing, by 1.8% and 4.7% respectively, from the pre group work assessment activity score and the post group work assessment activity score. The 'content' showed an increase of 19.2% accounting for most of the improvement between the pre group work and post group work assessment activity scores. Thus the increase in post group work mean score can be attributed mainly to an increase in the content and less to increases in language and referencing. Further, recordings of the two

groups (group 6 and 7) which were studied in detail revealed that students spent most of their time focussing on the content; neither group mentioned referencing, so it is unlikely that the group work discussions in these two groups influenced referencing techniques. Perhaps students saw little point in referencing correctly for the first draft. An interview or questionnaire would be necessary to determine this. Most of the improvement in student's assessment activity score can therefore be attributed to improved 'content' scores. During the explicit teaching of group work students were informed that the more effort they put into the first draft, the more benefit they would derive from student discussions. It was hoped that this would encourage students to put in their best effort when completing the first draft of the assessment activity. It also needs to be recognised that improvement in 'content score' may be attributed to students being given the opportunity to redo their work, however when doing group work, a pre group draft of the activity and post group work final write up of the activity is required, if group work is to be meaningful.

Since groups were selected such that students within the same group should have varied academic abilities, it was expected that students from the same group would have varied pre group work assessment scores. Ranking students according to their pre group work assessment scores shows that students achieved varied results within each of the groups (see Table 4.4).

It is evident from the Table 4.4, that within a group students achieved differently, and except for A6 and N6 no two students from the same group achieved the same marks. This was as expected based on the method used to place students in groups, i.e. to have groups of heterogeneous academic ability

I expected the post group work assessment activity scores once ranked would show a similar distribution. However, Table 4.5 shows 'clumping' of students from the same group, around similar post group work assessment activity scores. This result suggests that improvement in post group work assessment scores was influenced by group work discussions.

Table 4.4 Distribution of students ranked according to student pre group work assessment activity score.

Ranking	Group Number	Name	Pre Group work Score
17	6	F6	6
16	2	S2	6
15	4	S4	12
13	6	L6	13
13	3	R3	13
12	2	G2	14
11	5	P5	17
10	7	R7	18
9	3	N3	19
5	6	A6	20
5	6	N6	20
5	7	N7	20
5	3	L3	20
3	7	G7	22
3	4	T4	22
2	2	T2	24
1	5	B5	25

From these results shown in Table 4.5 it would seem that in some instances the group work discussions influenced the post group work score, since members of the same group tended to score similarly in their post group assessment activity, for example members of groups three seven and five. However, this did not hold true for members from groups two, four and six.

Of the seventeen students who have formed part of the study, only four maintained their ranking position when comparing their rankings between the pregroup work score and post group work score (B5, L3, R7 and F6). Except for F6, the other three students were the highest post group work scorers in their groups. F6's post group work score was the lowest for all students. (Table 4.5). In group six student L6 ranked 13 (see Table 4.4) the lowest for her group based on pregroup work scores, moved up 12 marks and ranked position 8 in post group work scores (Table 4.5). Students in groups three and five showed either an increase in their rankings or kept their rankings from the pregroup work assessment activity score. Except for student T4 (group 4), all other students to lose rankings came from groups 6 (A6 and N6), group 2 (G2, S2) and group 7 (G7). Students A6 and N6 moved down in rankings,

(A6 moving down ten positions and N6 seven positions). In group 7 student G7 was a top scorer in the pregroup work assessment activity but did not move up to maintain the top scoring new position, while N7 did move up five positions.

Table 4.5 Distribution of students ranked according to student post group work assessment activity score.

Ranking	Group Number	Name	Post Group work Score	Change in ranking position from pre group work score
17	6	F6	14	0
15	6	A6	21	-10
15	2	G2	21	-3
14	2	S2	22	-2
12	6	N6	23	-7
12	7	G7	23	-9
10	7	R7	24	0
10	7	N7	24	+5
8	4	T4	25	-5
8	6	L6	25	+5
7	3	R3	26	+6
5	3	N3	27	+4
5	3	L3	27	0
4	4	S4	28	+11
3	5	P5	29	+8
1	2	T2	30	+1
1	5	B5	30	0

4.1.2 Summary of pre and post group work attainment.

The difference between the pregroup work assessment score and the post group work assessment score may be used to answer the first research question: How does student performance change following participation in collaborative group work on the DoE assessment task? If student performance is measured in terms of marks obtained from the assessment activity, the data from my study indicates then there was a statistically significant improvement in student performance following participation in group work. This confirms the findings of Baines, *et al.,* (2007) and Kutnick & Berdondini (2009) who reported gains in

science attainment in primary school science students. The increase in marks (pre group work assessment activity vs. post group work assessment activity) was due to increased scores obtained in the content, language usage, no plagiarism and referencing, of the post group work assessment activity. Increased scores in content accounted for 19.6% of the increased mean post group work assessment activity score. The total mean increase in the post group work assessment score was 25.1%. Whilst the pre group assessment activity scores were spread amongst students of various groups, three groups post group assessment activity scores tended to be similar for students coming from the same group. When pre and post group work scores are ranked, the students who showed the greatest improvements in rankings were the ones whose post group work activity score was the highest in their group. Students from three groups whose post group work assessment activity score was the lowest for their group dropped the most in rankings.

4.2 Analysis of Grade 11 collaborative group discussions.

4.2.1 Selection of target students for further analysis.

I used two observation schedules adapted from Kutnick and Berdondini (2009): (a) Qualities of Communicative Interaction between members of a group and (b) Frames of Activities of Group Work to follow selected targeted students. All 'eligible' students (i.e. students who had completed all aspects of the research) from group 6 and 7 were selected since the quality of the videos from these groups was good, that is, all of the group work discussions were recorded, most group members had completed the requirements for the research and each group had a student whose post group work score showed little improvement and at least one student whose post group work score improved substantially, (see Table 4.6).

These results show that in group six, student L6's post group work score improved by 12 marks (40%), this was the third highest improvement in results (see Table 4.2, page 39). Within the same group F6's post group work score improved by 8 marks (26.6%), whilst A6 and N6's improvement in post group work score was small, 1mark (3%) and 3 marks (10%) respectively. Students in group seven did not show as great changes in post group work score as students from group six. R7 showed a 20% improvement in her result whilst G7's post group work score only improved by 1 mark (3%), (see Table 4.2, page 39).

Table 4.6 Selected target students from group 6 and 7.

Group Number	Name	Pre Group work Score	Post Group work Score	Difference between Pre and Post Group work
6	F6	6	14	8
6	A6	20	21	1
6	N6	20	23	3
6	L6	13	25	12
7	G7	22	23	1
7	R7	18	24	6
7	N7	20	24	4

Students are ranked per group according to post group work assessment activity score.

Students in group 6 were seated as indicated in Figure 4.1 for the group work activity.

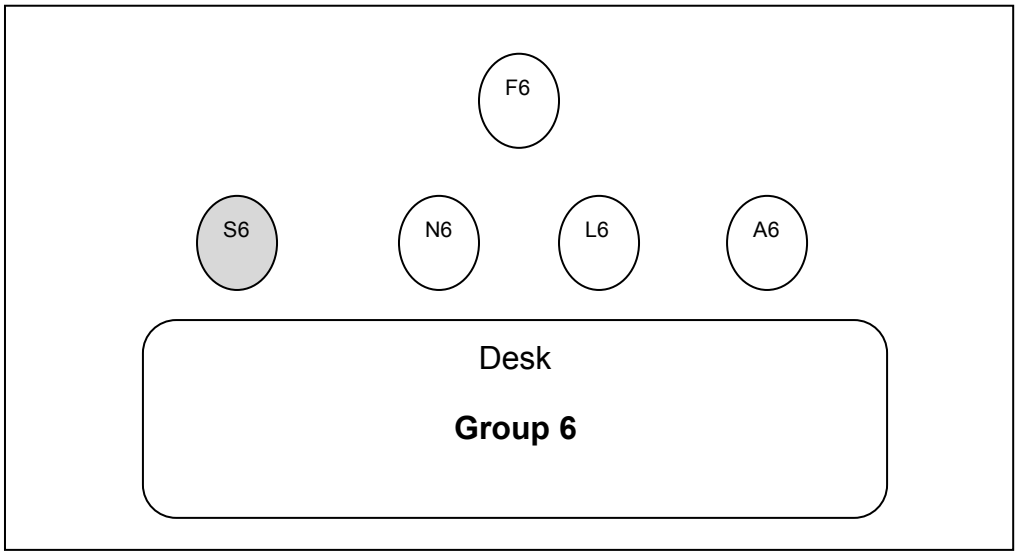

Fig 4.1 Seating plan of students in group 6.

Although S6 formed part of this group he did not submit a pregroup work assessment activity and was not part of the study. Student F6 was seated behind N6 and L6, when asked why he did not move to the desk, he said he was happier there. Student F6 was the hitch hiker in his

group, contributing little to group discussions; this will be discussed when looking at both observation schedules. Student L6 was the only student who indicated on the questionnaire that she did not speak English at home, it is interesting to note that her improvement (12 marks, 40%) between pre group work assessment activity score and post group work assessment score was the highest for this group.

Group 7 students were seated as indicated in Figure 4.2. Student Z7 did not submit a pre group assessment activity nor did he complete a questionnaire. He seemed unprepared for the discussions and hitch hiked his way through the discussions. At one point during the group work activity N7 passed her notes on to Z7 for copying.

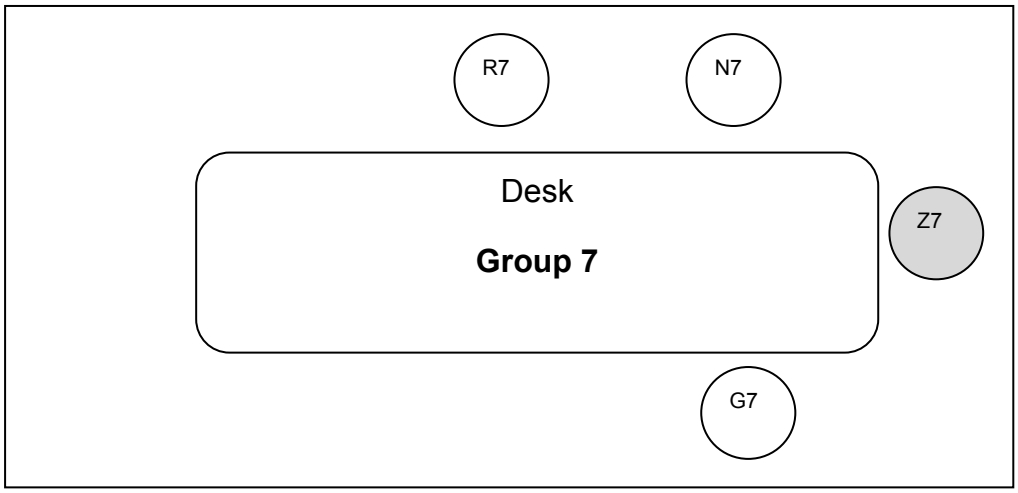

Fig 4.2 Seating plan of students in group 7.

The student who showed the most improvement between the pre group work assessment activity score and post assessment activity score was student S2 from group 2. The seating plan for group 2 is illustrated in Figure 4.3 below. I did not select student S2 to be a target student, since she (S2) was one of two hitch hikers in group 2. On viewing the recording it became evident that G2 had passed her work to S2 allowing her to copy. S2's improvement of 16 marks (53%) seems remarkable however: her pre group work was poor (20%) and her improvement could be attributed to her copying work and not her own understanding. G2 showed an improvement of 7 marks (23 %) when her pre group work assessment activity score (14, 47%) is compared with her post group work assessment activity score (22, 73%). S2 was not a very active group member. She seemed unhappy with her group's discussions as no one seemed to listen to her and she couldn't hear what other group members were saying

(see analysis of questionnaire 4.3.5). Group 2 consisted of five members: R2,T2,M2,G2 and S2. They were arranged as shown in Figure 4.3.

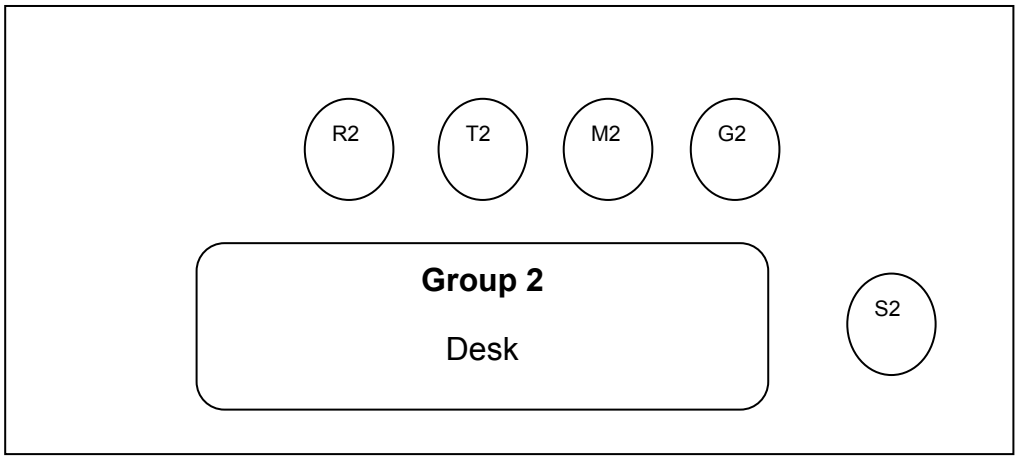

Fig 4.3 Seating plan of students in group 2.

During the group work discussion R2 and T2 tended to talk to each other rather quietly, excluding G2 and S2. This resulted in G2 and S2 being rather passive participants in the group. I did not analyze this group using the observation schedules since a lot of what R2 and T2 were saying was inaudible on the video recording. Students' experiences of the influence of group work on their post group work assessment activity will be discussed later in the chapter when results from the questionnaire are discussed.

Before completing the observation schedules I transcribed what the students had said in their groups using the recordings (See Appendix 7 for Group 6 transcript and Appendix 8 for Group 7 transcript). This was done to try and ensure that I heard what the students were discussing, providing a check against bias or misinterpretation (Opie, 2004).

4.2.2 Qualities of communicative interaction between members of a group.

4.2.2.1 Analysis of lesson observations to determine qualities of communicative interaction between members of a group.

The observation schedule "qualities of communicative interaction between members of a group" (See Appendix 4.) was completed twice for each group (i.e. groups 6 and 7). The reason for doing this was to try and improve the reliability of completing the observation schedule. Whilst viewing the recordings every 10 seconds I coded the type of communication

the students were involved with. Discussions were coded as being: Co regulated (symmetrical or asymmetrical); unilateral, disrupted or disengaged (See Table 4.7)

Table 4.7 Types of Communication between students in a group (Adapted from Kutnick and Berdondini, 2009)

<table>
<tr><th colspan="2">Types of communication</th></tr>
<tr><td rowspan="2">Co regulated:
Each member actively participates verbally or non verbally</td><td>Symmetrical:
Sharing of knowledge mutually amongst equals.</td></tr>
<tr><td>Asymetrical:
Responsibility is shared amongst group members, but some may be more active and others more attentive.</td></tr>
<tr><td colspan="2">Unilateral:
One group member dominates the activity ignoring other group members.</td></tr>
<tr><td colspan="2">Disrupted</td></tr>
<tr><td colspan="2">Disengaged</td></tr>
</table>

Results are presented in Table 4.8 as a percentage of the total number of recorded interactions. The data indicates that neither were there instances where students were disruptive, nor did one group member take over (unilateral) group discussions. However for a small percentage of the interactions (8.99% for group 6) and 10.55% (for group 7) students were disengaged with the group work. Such low percentages of students being disengaged, disruptive or unilateral discussions, may be due to the explicit teaching of group work, where students were encouraged to ensure that all members of the group contribute to the group's efforts through the sharing of ideas and discussions, supporting the findings of Alexopoulou & Driver (1996). When students work together they are all able to make progress collaboratively (Brodie & Pournara, 2005). The data for both groups shows that students worked in a co regulated way, i.e. 91.45% of the interactions of group 6 and 89.43% of the interactions for group 7 were co regulated. Further analysis shows that for both groups the co regulated interaction involved mutual sharing of knowledge, i.e. the communication was in more instances symmetrical (47.96% for group 6, 55.71% for group 7) as opposed to asymmetrical (43.05% for group 6 and 33.72% for group 7).

In depth analysis of each group interaction shows the following: In group 6 all students contributed in a co regulated way. Student S6 was the most active group member. He was well prepared and offered the most explanations. However, this does not mean that he

dominated discussions since he explained and the group discussed his explanations further. Although L6 had the highest post group work assessment activity score, she was not the most vocal as, only 12, 23% of the group's interactions were attributed to her. Student L6's contributions were co regulated. Student L6 was well prepared for this activity, she tended to answer questions, rather than ask questions herself. She listened to questions and explanations offered by peers. She was not disengaged during the group work activity.

Table 4.8 Summary of qualities of communicative interaction between members of groups. Results are presented as a percentage of total number of recorded interactions. (M = contributions by the teacher)

Co regulation				Unilateral:	Disrupted	Disengaged
Group	Names	Symmetrical:	Asymmetrical:			
6	**Total**	47.96	43.05			8.99
	S6	20.98	18.8			0.27
	N6	10.35	6.54			0
	L6	4.87	7.36			0
	A6	9.81	4.63			2.18
	F6	2.18	0			6.54
	M	0.54	5.72			0
7	**Total**	55.71	33.72			10.55
	N7	22.58	17.59			0.58
	G7	19.06	1.17			0.03
	R7	10.90	11.43			0.03
	Z7	10.09	3.51			9.38

In all of the groups, (not only groups 6 and 7), there was at least one hitch hiker, who seemed unprepared for the group work activity. In group 6 the hitch hiker was F6 and in group 7 it was Z7. These students did not contribute much to group discussions. Only 2.18% of group 6's co regulated interactions were made by student F6 and 13.6% by student Z7 in group 7. When these students offered explanation they were often ignored by other students or not

taken seriously. These students were the most disengaged in their groups, resulting in group members ignoring them.

The students who obtained the highest post group work assessment activity score for group 7 were students N7 and R7. Results show that N7 shared knowledge symmetrically amongst members of the group. She asked questions and provided explanations, much of the time, trying to include all members of her group (40.17% of the interactions). R7 spent 22.33% of the group activity time discussing with group members in a co-regulated way. She was hardly disengaged (0.03%), indicating that R7 remained focussed on discussions.

4.2.2.2 Summary of qualities of communicative interaction between members of a group

Students from both groups 6 and 7 discussions were for most of the time co regulated: group 6:91.01% and group 7: 89.43%. This may be due to the explicit teaching of group work advocated by many researchers e.g. Kutnick and Berdondini 2009; Alexopoulou and Driver, 1996. Although in both groups all members contributed to the discussions, some students tended to offer more than others. However, these students did not dominate discussions; rather they tended to be more involved in discussions. In no instance was a student disruptive. Often when doing group work a student may be found to move between groups. In this study all students stayed in their groups during the group work activity, this is may be due to the unnatural setting of having their group work being recorded. Each group had a hitch hiker, who was the student that was the most unprepared and was the most disengaged in the group.

4.2.3 Frames of activities of group work

4.2.3.1 Analysis of lesson observations to determine the frames of activities of group work.

The “Frames of activities of Group Work” schedule was completed twice for each of the seven targeted students from groups 6 and 7 and an average was recorded. I noted the ‘type of activity’ a student was busy with every 10 seconds of the group activity. The total number of times a student was coded for a certain ‘type of activity’ was calculated for the duration of the group work and then this was expressed as a percentage of the frequency of a type of

activity for each student. (See Table 4.9 and Table 4.10). Table 4.9 shows the results for the "On task" frames of activities whilst Table 4.10 page 53, shows the results for the frames of activities: "preparing for a task, social and off task". The data shows that student F6 (group 6) was "on-task" for 1.72% of activities recorded, that is he was explaining an aspect of the assessment activity. Only 2.3% of his activities were coded as "on task feedback", indicating that in these instances he was commenting on a fellow group member's explanation. When a student was asking a question or agreeing with an explanation provided by another student based on the assessment activity, it was coded as "On task, active, non formative, other". For student F6, 9.48% of the recorded activities were coded as "On task, active, non formative, other".

"On task passive, other" was the code used when a student was reading their own notes or making notes from discussions. Students' laughter was coded as "social". None of the target students were coded as "off task active", where their discussion was not related to the assessment activity, perhaps this was because of the explicit teaching of group work, or, that the group work was being recorded and/or that the assessment activity formed part the Life Sciences term 3 marks. When students appeared to be waiting for group members to finish making notes or when they were looking around the class, these activities were coded as "Off-task, passive". Whilst I included a column marked "other" for behaviours I might not have thought of, this column was not used as all student behaviours could be coded into those categories used by Kutnick & Berdondini, (2009).

The results indicate that for most of the time (at least 95% of the coded activities) students stayed on task (see Tables 4.9 and 4.10). This may be due to the explicit teaching of group work, the limited time to do the group work, the unnatural setting of being recorded and or the assessment activity counting 25% towards the life sciences term 3 mark.

Table 4.9 Results from the "On Task" part of the "Frames of Activities" Observation Schedule (Adapted from Kutnick and Berdondini, 2009)
Values for a particular activity are presented as a % of the frequency of that activity for a student during group work.

Name	Group	On-task							Total
		Active				Passive			
		Formative		Not Formative	Total	Listening	Other	Total	
		Explaining	Feed back	Other					
F6	6	1.72	2.30	9.48	13.51	43.39	41.38	84.77	98.28
A6	6	12.64	9.20	0.57	22.41	39.94	34.77	74.71	97.13
G7	7	15.28	7.78	4.72	27.78	68.33	2.50	70.83	98.61
N6	6	10.34	3.16	9.20	22.70	41.67	31.32	72.99	95.69
R7	7	25.28	6.39	1.11	32.78	38.61	28.06	66.67	99.44
N7	7	27.22	10.00	5.00	42.22	51.39	6.39	57.78	100.00
L6	6	7.47	5.46	4.89	17.82	35.92	41.67	77.59	95.40

Students are ranked according to post group work assessment activity score.

Since the students were explicitly taught that during group work discussions all group members should contribute through sharing of ideas and discussions (Alexopoulou & Driver, 1996), it was thus expected that students would participate equally. If this was true then students in group 6 should each contribute 20% of the interactions for the activity: "On task – active" Results are reported in Table 4.9 which shows the actual contributions of students in group 6 was A6 (22.41%). N6 (22.7%) and L6 (17.82%). These three students achieved within 1 mark of each other on the post group work score. F6 (the hitchhiker) was only active for 13.5% of the time. His post group work score was the lowest for Group 6. I expected that each student in group 7 would have a frequency of 25% for the frame "active and on task". The actual contributions of students in group 7 (see Table 4.9) was G7 (27.8%), R7 32.78% and N7 42.22%. The post group work scores of these three students were within a mark of each other.

Table 4.10 Results from the "Off task, task preparation, social and off task" part of the "Frames of Activities" Observation Schedule
(Adapted from Kutnick and Berdondini, 2009)
Values for a particular activity are presented as a % of the frequency of that activity for a student during group work.

Name	Group	Task Prepare Routine	Social	Off -task		Other	Pre and Post Improvement	Post groupwork score
				Active	Passive			
F6	6		0.29		1.44		8.0	14.0
A6	6	0.57	2.30				1.0	21.0
G7	7	1.39					1.0	23.0
N6	6		3.45		0.86		3.0	23.0
R7	7	0.56					6.0	24.0
N7	7						4.0	24.0
L6	6		2.59		2.01		12.0	25.0

Students are ranked according to post group work assessment activity score.

The second research question of my study was "What is the nature of student-student interactions during collaborative group work on a DoE assessment task?" My data analysis suggests that all students remained on task for most of the group work activity. I was interested to find out how the 'frames of activities' of students who achieved higher post group work assessment activity scores differed from those who achieved low post group work assessment activity scores. I expected that the higher the post group work assessment activity score, the higher would be the frequency of the "On-task Active" category. Figure 4.4 shows the frequency of "On-task Active frame" for all targeted students. Students were ranked from lowest post group work assessment activity score (student F6) to the highest post group work assessment activity score (L6).

Except for L6 in group 6, it would seem that there is a relationship between a student's "on task" activity in group work and the post group work assessment score. The results indicate that students in who achieved the highest post group work assessment activity score, were the ones that were active and stayed on task. The same cannot be said for student L6 from Group 6. Student L6's post group work assessment score was the highest and yet her percentage frequency count for "on task active" was only 17.8% , only 4% higher than F6 who achieved the lowest post group work assessment activity score. It would seem from the group discussions that L6 was the most prepared for her group, as she tended to provide answers to the questions of fellow group members. Her response to the questionnaire revealed that she was the only student in my study who did not speak English at home, perhaps this influenced her decision not to be as active. Brodie & Pournara (2005) report that students found participating in groups where the language used was not their home language, a challenge. An interview would be needed to ascertain whether this was the reason student L6 was did not have as many "on task active" episodes as expected.

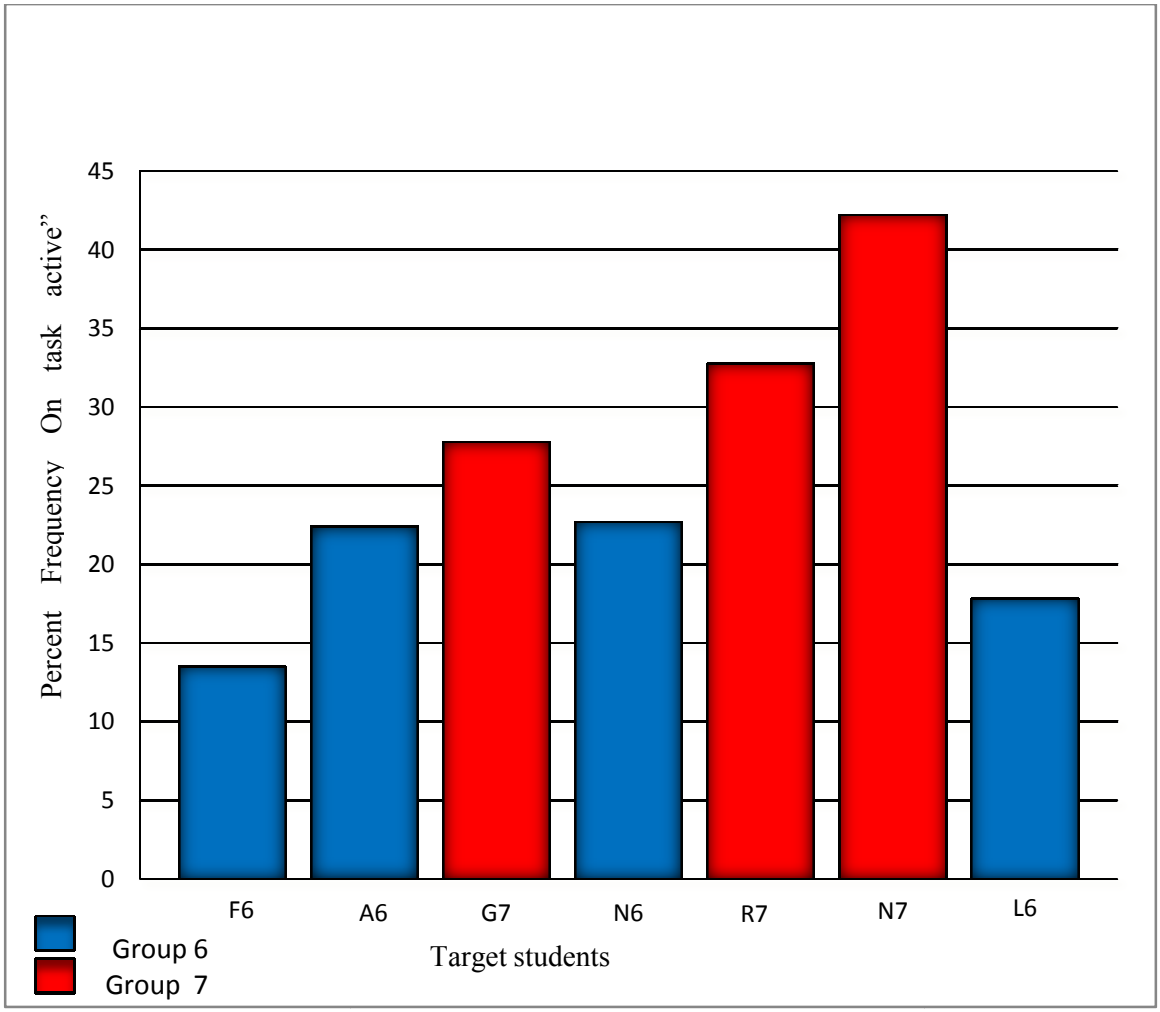

Figure 4.4 Percent "On task active" episodes for target students during group discussions.

Students N7 and R7 from group 7 achieved the highest post group work assessment activity score. From their discussions it would seem that both these students had prepared for the group work activity. Whilst R7 tended to provide explanations much like L6, N7 tended to ask questions. These results seem to indicate that students who achieved the highest in the post group work assessment score tend to ask for clarification on concepts they are unsure about.

Whilst students were explicitly taught to listen to each other, they were also made aware that all group members need to be given the opportunity to speak. The data shows (see Fig. 4.5) that within a group the more a student passively listened to discussion the lower the post group work assessment activity score. This held true for all students except N7 in group 7. R7 and N7 in group 7 achieved the same post group work assessment activity score. R7's percent frequency count for listening was 38.61% and N7 51.39%. However, R7 showed a 26.7% increase between pre group work assessment activity score and N7 a 20% increase. This data suggests the less passive the student is within a group the greater the improvement in post group work activity scores.

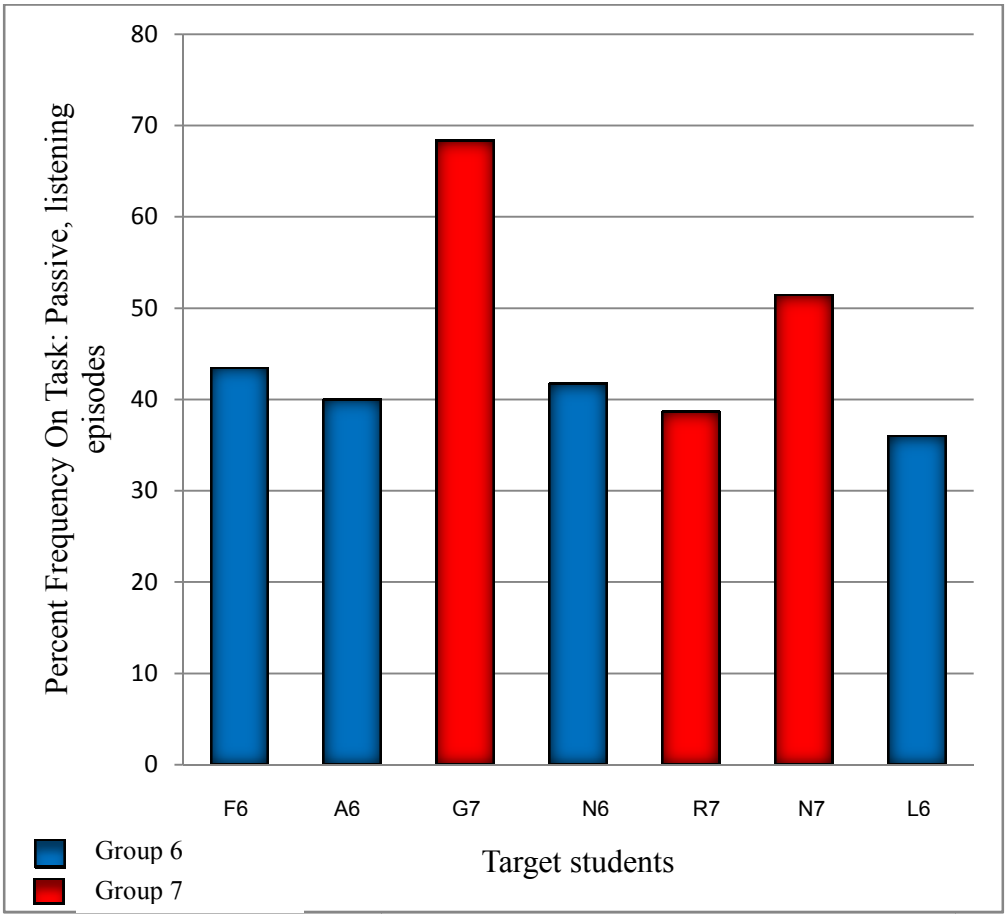

Figure 4.5 Percent frequency of "On task passive, listening" episodes for target students.

G7 and N7 in group 7, had a low percent frequency count for "On task passive, other"(see Table 4.9). Students were coded in this category if they were reading their notes or taking notes. These two students did not make notes during the group work discussions, which could explain their poor increase between pre group work assessment activity score and post group work assessment activity score.

4.2.3.2 Summary of analysis of lesson observations to determine "Frames of activities" of group work.

Results from the "Frames of activities" of group work (from Kutnick and Berdondini (2009) indicate that:

(a) All students were active participants in their groups. Students, whose percent frequency "on-task, active" count was high, tended to have higher post group work assessment activity scores. One student (L6) had a relatively low percent frequency "on-task, active' count, she was the only student who indicated that she did not speak English at home. An interview would be necessary to determine whether 'lack of confidence' in language was the reason she did not participate actively in discussions.

(b) The percent frequency count for "On task passive" showed that the more passive students were in group discussions, the lower their post group work assessment activity scores. This held true for all students except L6 in group 6. Students who referred to their notes and who made notes during the group's discussions showed higher improvements between the pre group work assessment activity score and post group work assessment activity score.

4.2.4 Analysis of the "substance" of discussions.

Whilst the observation schedules are useful tools in determining quantitatively the nature of communication and allow for coding of various 'activities' they do not provide any insight into the 'substance' of group work discussions (Denscombe, 2007). The purpose of this section is to look at the "substance" of some of the student discussions in more detail. I wanted to find out whether student discussions afforded students opportunities to socially construct knowledge, through cognitive conflict. Heeding the findings of Brodie *et al.*, (2002) that group discussions are dependent on student content knowledge. The assessment activity required students in my study to first complete the assessment activity as an individual activity using various resources, e.g. notes, reference books, issued text books and the

internet. I was hoping that having students complete the activity prior to the group work discussions would improve their content knowledge, allowing for discussions with "substance".

Discussions were indeed dependent on the content knowledge of students. In instances where the content knowledge was sound, discussions were in depth allowing for the construction of knowledge. However, where content knowledge was incomplete, the group may have opted for 'majority rules' to come to decisions, confirming the findings of Bennett, *et al.,* (2010). This is illustrated in the excerpt below taken 20 minutes into the group work discussions, of group 6 (turn 435 to 479). Learner N6 was rather confused about the symmetry of the Porifera:

435	S6:	What don't you understand about the different sponges?
436	N6:	Its symmetry.
437	S6:	Hey?
438	N6:	It's asymmetrical.
439	S6:	Ja.
440	L6:	Meaning that it doesn't have symmetry.
441	S6:	When you cut it, it looks different?
442	N6:	Ok with the irregular body containing an internal skeleton.
443	S6:	Internal skeleton?
444	A6:	What skeleton?
445	S6:	Gee.
		S 6 and A6 laugh.
446	S6:	Haai.
447	N6:	Listen, I don't know where I got this. It was either that book there; no it's not in our notes.
448	S6:	It doesn't have a internal skeleton.
449	A6:	Ja just.
450	N6:	That book says it has an internal skeleton. That book says that.
451	S6:	The book is lying.
452	A6:	No it doesn't. It doesn't even have a skeleton.
453	S6:	What does it need a skeleton for? It's on the floor. It's a sponge.
454	N6:	Sponge got something in it?
455	A6:	Like sticking bones in it.
456	S6:	Internally?
457	S6:	What are you talking about?
		S and A laugh.
458	N6:	Ok what they ?
459	S6:	Oh ja for the movement and they are in water.
460	A6:	Ja.
461	S6:	Because their movement that's why.
462	A6:	And they Ja
463	N6:	Because why?
464	L6:	Check.
		S6 and N6 laugh
465	S6:	It's right here. *(S6 points to N6's table.)*

		S6 and N6 laugh.
466	S6:	So now do you understand?
467	N6:	No guys. Why are they asymmetrical?
468	S6:	No matter where you cut it, it can be different.
469	N6:	I can't write that no matter where you cut it.
470	S6:	Let me show you. You see that half and you see this half. This is the reason they are
471	N6:	I need it for my table. You see from the other.
472	S6:	What table?
473	N6:	Like it must be proper. I can't write when you cut it there
474	F6:	Yes that's what explaining.
475	S6:	Ja, that is what I am explaining. This is the scientific. This is the scientific formula really and truly: no matter where you cut it is going to be different. Like bilaterally symmetrical, if you cut it in half it is going to be the same, the same on either side. When radial no matter where you cut it it's going to be the same. So with us it only we only we've got it like this it won't be the same?.It won't be, it won't be the same for us. Take the heart it is in the middle. Do you understand?
476	L6:	*Shakes her head.*
477	S6:	*Nah?* No understanding?
478	N6:	I do understand.
479	L6:	I understand all right. Ja.

From this excerpt (turn 435 to 479) student S6's explanation of various types of symmetry may have cleared up N6's confusion (turn 478), at one point the discussion turned to internal skeletons of sponges. During the discussion (turn442) N6 mentions the internal skeleton of the sponges which both A6 and S6 laugh off (turn 445). Even though N6 states that she got the information from a book (turn450), A6 and S6 use majority rules and reasoning to argue that sponges don't have skeletons (turns 452 to 457), which N6 seems to accept (turn 458). This was similar to the findings of Bennett, *et al.,* (2010) where it would seem that peer pressure resulted in N6 not raising an objection.

In other instances content knowledge was poor and the group tended to confuse themselves, with some students wanting the teacher to clear up the confusion. For instance in the next excerpt, group 7(turn 306 – 317) did not understand what a coelom is. One student understood the word "cavity" to mean a hole (G7) (turn 310). R7 seemed to understand that it is a body cavity, but couldn't develop it much further (turn311).

306	N7:	What is the coelom?
307	R7:	For all of them?
308	N7:	Ja.
309	R7:	Ok, the coelom isn't it like a body cavity. It is the actual body cavity. Right?
310	G7:	Isn't the coelom; I thought the coelom was a hole.
311	R7:	A hole! It is a body cavity.
312	N7:	It's a body cavity?

313 R7: It's a body cavity. Let's talk.
314 R7: Your niger? (*Referring to the Cnidarians).*
315 G7: Isn't a cavity a hole?
316 N7: No.
317 R7: No.

The students decide that a coelom is present in the soft bodied animals, acting as a skeleton (turn 325-335). The students discuss that a coelom is found in animals who have muscles (turns 347-349). The discussion then returns to the idea that the coelom gives structure but students realize this is inaccurate since the Chordata have a coelom (turn 385). One member (G7) then links it to a soft bodied chordate, the frogs (turn 388). However this results in much confusion and they link the coelom to lymph in the chordates (turn 407). In the end N7 opts to call the teacher to solve their dilemma as none of the group members understand what the coelom is (turn 408).

385 G7: Ok, the coelom is a liquid that gives you structure ne. So instead of bones you have
this liquid that you don't . Then what gives the shape inside?
And so the … The coeloms is .
386 N7: Then what do why do the Chordata have coeloms?
387 R7: Chordata they do . They do have it. We've done it. But just look at it. It's the animals that don't really need bones that have the hard covering outside like our crabs and oh other jellies.
388 G7: But it should, Chordata is like a frog. Like him.
389 Z7: Haai
390 R7: Haai wena. It is like a spider.
391 N7: Eish People.
392 Z7: It's like what?
393 R7: It's like what what?
394 Z7: It's like…
395 N7: Can't I eish …
396 G7: Let me show you the Chordata.
397 N7: Chordata even if it is that, guys I can tell you just want something. As you guys are copying.
398 N7: G7 got a coelom in the.
399 R7: Because mine says down here.
400 N7: Can I tell something? Your table and your essay is not gonna to because you said here.
401 R7: No I made a mistake. I made a mistake. Fine I will write it out.
402 N7: Please just call maám. Cause it' s …
403 Z7: I've seen here the coelom.
404 N7: You See. So can you please call maám?
405 G7: Mine also says it has a coelom.
406 R7: Mine says …
407 G7: No guys, isn't the coelom like the lymph fluid.
408 N7: Please call maám.
409 R7: Ok sure . Let's call her .

From this excerpt above (group 7 turn 385 to 409) it is evident that for students to make meaning of the work in their groups it is essential that they have a sound content knowledge from which to work. Group discussions tend to go around in circles with no real construction of knowledge happening, when no member in the group has an understanding of the content. The discussions did however make students think of terms in their everyday experience of those terms. For instance students understood that the coelom was a fluid filled cavity (Turn 385). Initially they linked it to a hydrostatic skeleton since this is also fluid filled; however, a student noted that coeloms are found in the Chordata (Turn 387), which have an endo skeleton. Now it would seem that students are looking for a possible fluid filled cavity in the Chordates, looking first at the soft bodied chordates for example a frog (turn 388) or the lymph system in humans (Turn 407).

4.2.5 Summary of analysis of Gr 11 collaborative group discussions.

To answer my second research question: "What is the nature of student-student interactions during collaborative group work on a DoE assessment task?" Group discussions were analysed. Results from the observation schedules show:

1. Members of groups actively participated in group work either verbally or non verbally (listening), i.e. students were interacting in a co-regulated way within their groups.

2. Each group had a hitch hiker, who received work from other group members, and copied it. The hitch hiker did not engage in the group discussions in any meaningful way. They seemed unprepared and their improvement in both groups was the poorest.

3. The persons in both groups whose post group work assessment activity score was high were the ones who were actively involved in the group discussions. These students did not necessarily dominate discussions, nor ask a lot of questions. Instead it would seem they were providing explanations or listen attentively.

4. The only student who did not have English as her home language was not very active in her group. She was however well prepared and tended to give explanations on occasion. She achieved the highest post group work assessment activity score.

5. The more passive the students in their groups the poorer their final post group score.

6. The "substance" of group work discussions were dependent on the subject content knowledge of members of the group.

4.3 Analysis of student's perceptions on the usefulness of group work from the questionnaire.

The answers from the questionnaire answer the third research question: "What are students' perceptions of the influence of collaborative group work on their performance in the assessment activity?"

4.3.1 Home language

Most of the students, 16 of the 17 claimed to speak English at home. Nine of the students indicated that they were bilingual whilst one indicated that she was trilingual. From these results the only student whose LOLT might influence learning would seem would be L6 from group 6, who stated that she did not speak English at home. Her post group score was the highest for this group 25 (83.3%), and the improvement she showed between pre and post group score was the most for that group. It would seem that English not being her home language did not influence her marks for this assessment activity; however as discussed in 4.2 she did not explain nor provide much feedback, compared to students whose post group work assessment scores were high for their groups. It seems that this student was somewhat challenged being required to communicate in a second language, confirming the findings of Rollnick (2000).

According to Statistics South Africa (2004) only 8,2% of the population speak English at home, whilst 23,8% speak IsiZulu, 17,6% IsiXhosa, 13,3% Afrikaans, 9,4% Sepedi, 8,2% Setswana and 7,9% Sesotho. When students are using a second language as language of science instruction these students are doubly challenged since not only is it expected that these students are proficient in the language of learning and teaching (LOLT), but it is also expected of them to become proficient in 'science language', a task which many first language speaking students struggle with themselves, as science terminology is different to the terminology used in everyday language (Rollnick, 2000).

Rollnick (2000) notes that in a Vygotskian social cultural approach to learning, language is a tool more capable peers use to move students through their zone of proximal development. Rollnick adds that when mother tongue is used alternative conceptions which the student holds onto may surface. Djite (2008) found that when the LOLT is the mother tongue teaching improves, and learners become active participants. It is generally agreed that the

LOLT is more than a medium of communication, it is the way students construct an understanding of the practices and concepts within science (Djite, 2008; Rollnick, 2000).

4.3.2 Student's perceptions of the purpose of assessment

The purpose of the assessment activity which students in my study participated in was more than just for certification purposes; it was to include opportunities which would promote learning. This assessment activity forms what Carless (2007) calls learner-oriented assessment. It was interesting that students in my study perceived the purpose of the assessment activity in much the same light (see Fig 4.6). Fourteen students stated that assessment needed to form part of certification process. Ten students felt that using assessment as an opportunity to learn was very important, whilst four felt that assessment for learning purposes was important. Only one student felt that assessment should neither be used for certification nor to provide learning opportunities.

From S2's responses to the questionnaire, it needs to be noted from the start of this discussion that her responses seem to conflict with each other. S2 (Group 2) was the student who did not see assessment for certification purposes as being important, and saw its primary purpose to be one of learning. She was one of two hitch hikers in her group. She did not offer much to the group as she felt that her contributions were not listened to (this will be discussed later). She could not hear the group discussions, and responded rather negatively to all the questions about her experience and group work. Yet, she concludes her questionnaire by recommending using group work for this same assessment activity next year, since it "can help students comprehend". Her argument seems somewhat flawed, in that her own experience of the group work was not positive, yet she recommends it. Further, her improvement between pre group work assessment activity score and post group work assessment activity score was the highest for students included in my study. Whilst she complained about group work experience, her marks did not reflect a negative experience. Perhaps she is still optimistic about the potential benefits of using group work and is not ready to give up on it just yet. An interview with S2 seems to be needed to find out exactly what she is thinking.

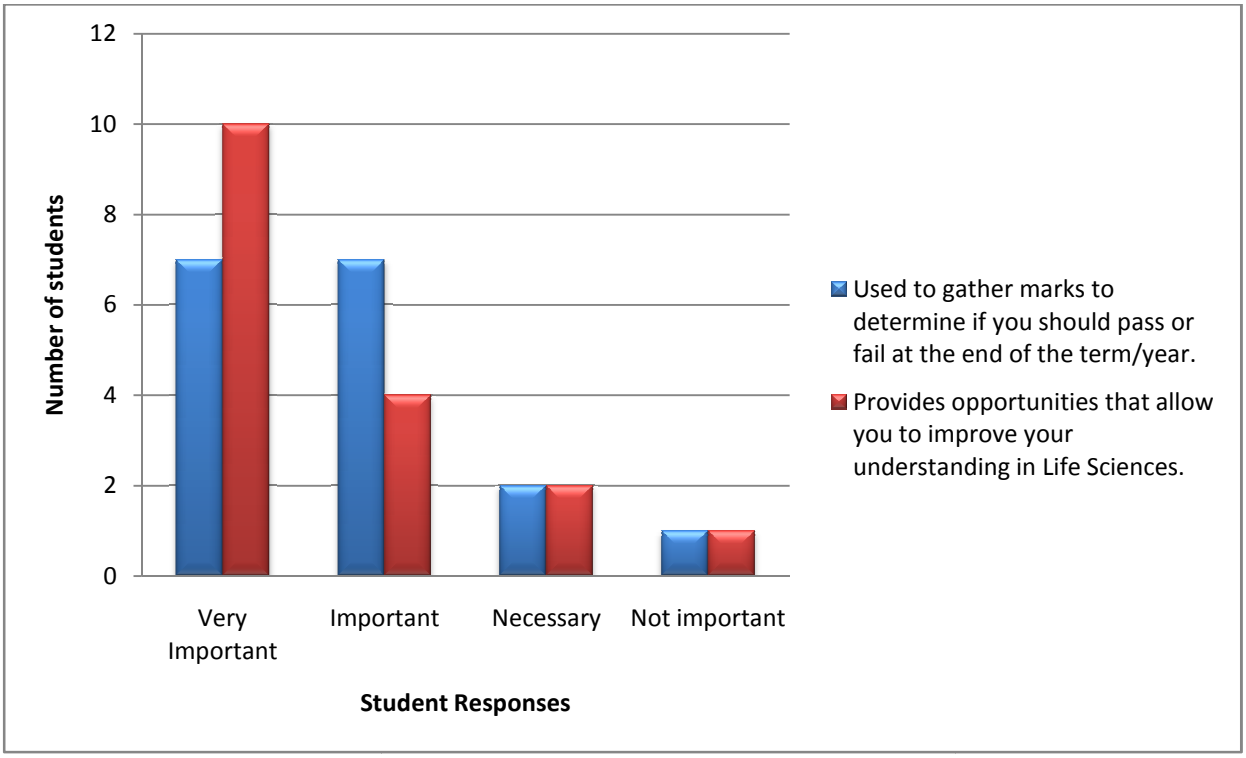

Figure 4.6 Student perceptions of purpose of assessment

P5 (group 5) did not see the purpose of assessment as an opportunity for learning. Whilst her experiences of the group work were rather positive "they (group members) gave valid input here and there", she seemed to prefer an approach where she is told what to do, researches the work and hands it in for evaluating. She did not see the opportunities afforded by peers in the social construction of knowledge and sees assessment as being purely for certification purposes. When looking at P5's pre group work assessment activity mark and post group work assessment activity mark, it is interesting to note that she went from 17/30 to 29/30 (see Table 4.3, page 40), having the second highest rankings move between the two marks (see Table 4.5 page 43). Perhaps her improvement in marks was because the first draft was not being used for certification purposes and she saw little point in putting much effort into it or perhaps contrary to what she thinks, the difference between her pre group work assessment activity score and post group work assessment activity score does indicate that the group work provided opportunities for learning.

4.3.3 Student's perceptions of the influence of group work on their performance.

Asked generally whether the group work helped in their understanding, 15, of the 17 students agreed, only 2 disagreed.

Further analysis showed that twelve students felt that it was the explanations provided during the group work which influenced their understanding. N6 (group 6) wrote "There were many sections I didn't quite understand, but after hearing points from other people in simple explanations I understood." Three students felt that verbalization of their thoughts aided their understanding. These students achieved over 80% for the post group work score and were all the top post group work scorers of their groups. T2 from group 2 wrote "The group understood what I was trying to say and helped my thoughts to be written down in words that made sense." It would seem that learning in these instances was through the social construction of knowledge. Further, as Brodie and Pournara (2005) note verbalization plays an important role in learning.

Two students felt that either they weren't part of the group or that group members were disinterested in the work resulting in only few group members participating in discussions. S2 from group 2 wrote "I couldn't hear them and they never discussed they only just said answers". Group 2 had one student T2 who found through her verbalization her own understanding improved and S2 who felt as though the group did not take her contributions seriously. Group 2's group dynamics were interesting in that there were two hitch hikers, M2 and S2. M2 did not submit a pre group assessment activity. S2's group work assessment activity was poor, 6 (20%). The group tended to split in two: M2, G2 and S2 discussing together and R2 and T2 together. T2's pregroup work assessment activity scores was 24 (80%) whilst G2's was 14 (47%). These groupings would seem to be down academic ability lines. Discussions between T2 and R2 were very quiet and it was difficult to make sense of what they were saying, confirming S2's comment that she couldn't hear what the group members were saying.

S4 (group 4) was frustrated by the hitch hiker in his group H4, who spent the group activity time playing catch up, using any resources he could. S4 expressed his concern as "Some of the group members weren't paying attention or they were doing work." His solution to this problem is that students should choose their own group members, that way they are able to avoid 'known' hitch hikers, this is in line with the suggestion of Alexopoulou and Driver (1996). This contrasts to B5's (group 5) suggestion that groups are chosen by the teacher to

avoid disruptive students forming a group. S4 (group 4) was the only student to complain of the frustration of working with hitch hikers.

I expected that if students thought group work helped their understanding (as fifteen did) that they would recommend group work with this assessment activity for next year's Grade 11s group. Fourteen students would recommend its use, whilst one student agreed and disagreed. This finding improves the reliability of this question, as over 80% of the students agreed that the group work should be used in future assessment activity exercises and it helped to improve understanding.

4.3.4 The perceived influence of listening to post group work assessment activity.

Students were explicitly taught to afford all group members the opportunity to express their ideas, meaning that most of the time would be spent listening to group member's explanation. This was indeed the case; fifteen students acknowledged that listening to group member's discussions helped them write up an improved post group work assessment activity. Only two students disagreed.

Students recognised that listening to group members provided opportunities for group members to give feedback, which was either through providing more detail or clearing up possible content confusion. Eight students explained that group members provided explanations which cleared up confusion which they may have had. F6 (group 6) wrote "Exchange of ideas and input from different group members helped shed light on what was going on". Five students explained that listening helped since the explanations provided by group members provided more detail than what they had. B5 (group 5) "Some of the other group members had interesting opinions and things to say which widened that scope of the information." Whilst thirteen students acknowledged the content feedback they received from their peers aided their post group assessment activity write up, two students found that the feedback they received was helpful in that it allowed them to better understand what the essay entailed. L3 (group 3) "I got more or less an idea of what we were expected to write."

The theoretical framework for learner oriented assessment (Carless, 2007) used in my study is based on the principles of the student actively engaging with the criteria and quality of

their own performance and peers as well as the feedback which is received is supportive and "feeds forward". The feedback which students received was used in various ways, viz. providing more content detail, and in changing essay format to improve the final write up, i.e. the feedback was used to 'feed forward' resulting in improved post group work assessment activity scores. L6 (group 6) wrote: "most of my work was based on what we have discussed."

However two students S2 (group 2) and R7 (group 7) wrote that listening to group discussions did not help their final post group work assessment activity write up since what group members were saying, they found confusing. R7: "I didn't know how they explained with each other, so it complicated my understanding." During the explicit teaching of the group work students were made aware that they should ask when they were unsure or didn't understand an explanation. However, it was noted that on at least one occasion N7 in R7's group explicitly ignored R7's suggestion. N7 does not allow R7 to complete her sentence. About two minutes into the group work activity the following discussion took place:

85	G7:	Ja, let's do symmetry over first.
86	R7:	But maám said we must it's better to …
87	N7:	Ok, its no. No, we want to finish one.
88	G7:	To analyze one thing.
89	N7:	R7 we have already analyzed symmetry, we, we discussed symmetry. And are we happy with symmetry? So just leave it.
90	N7:	So radial symmetry. What's the advantages?

For whatever reason (perhaps different academic ability, different friendship circles) N7 held the power not taking R7's suggestion was seriously. The group discussion then moved to the direction N7 took it. Results from the observation schedule showed R7's %frequency count for "On task active" to be 32.8% and N7's 42.4%. This data indicates that N7 was more active in on-task activities than R7. Although R7 had been taught to ask when she did not understand, it would seem that since she did not hold the power in the group, she failed to ask, "complicating her understanding."

S2's (group2) frustration with her group members was stated as follows: "Not precisely, because they never said something that I comprehend." In this instance it would seem that S2 did not ask other group members to explain what they had said. S2 was frustrated by group members not showing her trust and respect. This view is not shared by her fellow group

members G2 and T2. G2 wrote " I picked up the details and facts that helped me explain better." T2 explained "The different points of view made me change my write up." For S2 to have gained benefit from group members she should have used the skills taught to her regarding collaborative group work. Her pre group work assessment score was 20%, perhaps a poor content knowledge and or being unprepared for the group work prevented her from asking questions. An interview would be necessary to determine this.

As explained previously it would seem that group 2 did not work collaboratively and whilst T2 and G2 commented that listening to the group discussions influenced their post group work assessment activity write up, they also wrote the following about the feedback received by group members on their work: "We didn't comment much on each other's work" – G2. Looking at the post group work assessment activity scores for group 2, see Table 4.5 (page 43) two of the three research students S2 and G 2achieved below the mean of the class, whilst T2's score was well above the mean. All students who were part of the research, in group 2 expressed frustration about working together, which seemed to inhibit the social construction of knowledge. It would seem the power in this group was with students with a higher academic ability, as they spoke to each other R2 and T2, excluding those with a lower academic ability.

Responses from five of the highest six post group work assessment activity achievers, indicated that the feedback received from group members had minimal effect on the final draft of their work. P5 (group 5) wrote: "…Most of the information I had already researched but they gave valid input here and there." The concern here is whether students of higher academic ability should have been placed in the same group as suggested by Brodie and Pournara (2005). However, one of the highest post group work assessment activity achievers B5 (group 5) explained that the feedback he received allowed him to add on to his work as well as correct it. Of the seventeen students analyzed, most found the feedback received useful.

4.3.5 Student's perceptions of trust and respect amongst group members

As suggested by Kutnick and Berdondini (2009) students were taught that they needed to trust and respect each other. Results from the questionnaire showed that in most instances the majority of the students (16) felt that they were given an opportunity to talk and that their peers listened to them. Many (9) felt that this was because they were working collaboratively.

For instance N7 (group 7) explained: ‘I had a really nice group we handled our arguments quiet well and we gave each other time to speak and express our knowledge of what we know.’ Four of the five highest post group work scorers thought that the reason they were given the opportunity to talk was because their group members were using them to get information. P5 (group 5) said ‘I think they only listened to me because they actually didn't know what to do’. It is for this reason that Brodie and Pournara (2005) suggested that groups should consist of students of similar academic ability. However, my findings showed that students from the same group tended to achieve similarly. Placing students of the same academic ability in the same group might result in the top academic students achieving very high results. However, my concern is for the rest of the students in the class, it would seem that their achievement would be considerably less, with not much learning happening among the low academic achievers.

4.3.6 Student opinions of group work: should it be part of an assessment activity?

Most of the research students (14) agreed that group work should be used when doing this activity next year. I coded their reasons for doing so into the following categories: peers provide more information; helps with understanding; different points of view are expressed; and through verbalization understanding improves (see Table 4.11).

Student A6 (group 6) was undecided commenting on both advantages and disadvantages to using group work with an assessment activity. Two students (P5 group 5 and S4 group 4) thought the activity should be done individually. Whilst A6 (group 6) recognised that working in groups improves understanding he had a concern about hitch hikers “No some should not work together because some may not do the exercise properly at all which is unfair to those who did the work.” S4 (group 4) felt that if students could choose their own groups then this would result in students who do the individual activity properly choosing each other, and this would eliminate hitch hikers: “In my personal opinion I don't think group work will work if you (student) don't chose you’re own group because if it is allocated groups some people 'leech' off the other students. This is quite a nuisance if you feel you put in a lot of input. But if you choose your group you feel comfortable with your group”. This is in contrast to B5 (group 5) who was concerned that students who tend to be disruptive would form a group and would not benefit from the exercise: “the group work was a good idea which allows for more interaction and group building but the selection of the groups should

not be randomized as it would result in naughty people being in the same group therefore the teachers should rather control who goes in which group and this then could result in better group work".

Table 4.11: A students perspective: why the assessment activity should be done using group work.

Reason	Number of responses	Quote	Student
Get more information from peers	2	I would recommend group work instead of individual work because you have a chance to compare your findings and see what your worked lacked, you get different opinions and views on the exercise and therefore your information becomes more accurate.	T5 Group 5
Helps with understanding.	12	Yes but each learner must do it individually first, some group members did not have much to say but altogether we helped each other to understand the activity and the work was understood better.	T2 Group 2
Different points of view became evident.	1	I really think that it should be a group activity because it helps you see the activity in other people's views and you understand what you missed from what you could have known the arguing also helps because it allows more points to come to the table, everyone contributed when we were wrong we were helped and corrected but again it depends on the people in the group if they are willing to work or not but we worked well and had fun. (Yes).	N6 Group 6
Verbalization improves understanding	1	I recommend them to use group work as it helps you understand the phyla and their body parts better. The more you talk about something, the clearer it becomes. (Yes).	G7 Group 7

Most of the students agreed that the group work influenced their understanding and their post group work assessment activity write up. However, as Brodie, *et al.,* (2002) assert the group work is dependent on the content knowledge of the students. This was echoed by T2 (group 2) who recommends that each student must do it individually first. It was hoped having students complete the activity on their own first, would improve their content knowledge, eliminating the hitch hiker effect. The concern of hitch hikers was evident throughout the study, especially from students of higher academic ability. Only one hitch hiker (S2 group 2) expressed frustration about being excluded from group discussions. It would seem that this group lacked leadership of some sort, to ensure each group member was afforded an opportunity to speak. It is interesting to note however, that although S2 (group 2) expresses

much negativity towards group work from questions 3-6 on the questionnaire, when asked about whether she would recommend it for future use she says "I recommend that it should be done in groups as it can help student's comprehend and get better results too."

4.3.7 Summary of student perceptions of the usefulness of group work.

My hope was that the group work would provide opportunities for students to learn when doing an assessment activity. It therefore seemed necessary to ask the students involved how they found the experiences offered by the group work. It was encouraging to find that students perceived the function of assessment both for certification and learning purposes and not only as a means to get marks. Most students' perceptions were that the group work helped with their understanding. The feedback students provided within their groups created situations of cognitive conflict, allowing for the social construction of knowledge. Students acknowledged that in some instances the knowledge of individuals was incomplete, however through group work discussions various students brought with them various knowledge and understanding resulting in knowledge which was more complete.

Whilst most groups worked collaboratively concern was raised regarding trust and respect within groups. Groups were predetermined and were selected based on academic heterogeneity. In some instances this seemed to result in little trust and respect between group members. Those of higher academic ability sometimes held the 'power' in the group and overlooked contributions of students with weaker academic ability. Students of weaker academic ability felt that that their contributions were not listened to and that they were being 'told' answers rather than being part of discussions.

Students of higher academic ability expressed some frustration with the hitch hikers in their groups. These students were undecided as to how groups should be assigned. One student suggested that students should choose groups whilst another stating that they should be preselected, to avoid disruption.

It was the general consensus of the participants in this study that the group work discussions improved their understanding of the assessment activity and that it should be part of the assessment activity in the future.

CHAPTER 5

CONCLUSION

Grade 11 Life Sciences students participated in group work whilst completing a prescribed DoE assessment activity. Whilst some studies have reported that teachers in South Africa are concerned with the amount of learning that is actually happening whilst students engage in group work (Brodie, *et al.*, 2002), my study found that post group work assessment activity scores were significantly higher than pre group work assessment activity scores. The mean increase in post group work assessment score was 25.1%. Whilst the pre group work assessment marks showed variation within groups, probably due to the selection of academically heterogeneous students, post group work assessment scores, showed a trend that students from the same group tended to score similarly. This data suggests that group work discussions may have influenced what students wrote in their post group work assessment activity.

This study suggests that the "substance" of the group discussions to be dependent on student content knowledge, consistent with the findings of Brodie, *et al.*, (2002). In some instances where the content knowledge was sound, discussions were in depth allowing for the construction of individual understanding. Student discussions helped students make meaning of scientific terms usually with reference to everyday examples. However, where content knowledge was poor discussions resulted in students constructing knowledge incorrectly or opting to ask for help from the teacher.

Probably because of the explicit teaching of collaborative group work skills all students interacted in a co-regulated way: all members of the group actively participated in the group work. Students were not disruptive. The hitch hiker in the group was the group member who was the most disengaged. Except for the student whose home language was not English, all other students showed a trend where the more active they were in their group explaining and providing feedback the higher their post group work assessment activity score. The student whose home language was not English was well prepared for the group work activity, she did not ask many questions, rather explaining work and providing feedback. It would seem that

for this student having to discuss in English may have hindered her active participation in the group.

Every group had at least one member who hitch hiked through the group work. One hitch hiker perceived the group work as being unhelpful, since fellow group members did not take her contributions seriously. It is probably for this reason that Brodie and Pournara (2005) suggested that students of same academic ability be placed in the same group. However, post group assessment activity scores showed that students from the same group tended to score similarly. A concern is that should groups consist of students of similar academic ability it would seem that the 'high academic' groups would benefit most whilst those with weaker academic ability would benefit least.

Students agreed that group work discussions for the most part helped with the post group work assessment activity. As students had used various resources to complete their pregroup work assessment activity, students thought that this resulted in robust discussion, which allows for the construction of knowledge. Some students found that discussions aided their understanding in how to answer the assessment activity. Feedback received from other students was perceived to be helpful.

The concerns students raised were related to the heterogeneous make up of the groups. Some students who achieved high post group work assessment activity scores perceived that they benefited less from group work discussions. The presence of a hitch hiker in their group frustrated them.

Whilst the OBE curriculum encourages group work as an approach to learner centred teaching (DoE,2003), it has been found that implementing group work in South African classes was not always successful (Brodie, *et al.*, 2002). Results from my study suggest that group work could be used as an effective way of creating situations of cognitive conflict. This could lead to the social construction of knowledge provided that students were both explicitly taught collaborative group work skills and possessed sound subject content knowledge.

Following on from my study further considerations into group work interactions between students should consider the usefulness of group work for students whose LOLT is not their home language. Research considering hitch hikers would be useful in understanding their disengaged role in group work. Hitch hikers acknowledged their perceived unimportant role

in the group, whilst fellow group members expressed frustration that hitch hikers did not contribute meaningfully to the group work.

This research has informed my pedagogical knowledge in that I have become familiar with what to teach students when explicitly teaching group work skills. Previous research on how to effectively implement group work was more concerned with roles of various group members. My study can help other teachers to be made aware that effective group work is dependent on well prepared students and teachers, as well as not giving students too much time in which to do the group work activity. Further my study could inform programmes on providing workshops to teachers informing them on how to use group work in the classroom as an effective way of teaching and learning.

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