Assessment Change in Omani Post-Basic (16- 18) Biology Education: evaluating the journey from policy as written, to policy as enacted and policy as experienced.

A thesis submitted for the Doctor of Philosophy (Integrated) in Education

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Abstract

This study explored the phenomenon of changes to Biology assessment in Omani secondary education with a focus on formative assessment (FA). The recent changes in curricula, following the implementation of the new post-basic education system in Oman (for students aged 16- 18 years old) in the academic year 2007/ 2008 required new assessment practices. This research study investigates how the Biology assessment was written by assessment policy makers, how it was enacted by Biology teachers and how it was experienced by Biology students using a qualitative dominant case study approach. Data was collected via two semi-structured interviews with assessment policy makers, four with Biology teachers and six focus groups with students; a 30-item questionnaire to 96 students; 11 non-participant lesson observations and assessment document analysis.

The research explored both the benefits and challenges of implementing assessment change in the Biology classroom. This study provides an insight into the understandings of the assessment practices of four Biology teachers. The impact of a top-down policy approach on teachers' perceptions and the enactment of both formative and summative assessment is explored. The findings revealed the importance of dialogue with Biology teachers during the planning or design phase of changes to assessment policy for its implementation to succeed. The teachers had not experienced any support or further training in assessment practices. The study also valued the voices of students regarding assessment, which considerably affected their approaches to study. The findings suggest that participating students could see the benefits of talking with their peers to understand some topics related to Biology problems. It is recommended that the Ministry of Education and local educational authority should support Biology teachers in their assessment practices through dialogue and professional development activities to ensure the successful implementation of the assessment system.

Keywords: FA, SA, Post-basic education, Assessment policy.

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Thank you all.

List of abbreviations

AW	Assessment Writer
BE	Basic Education (aged 6- 15)
CA	Continuous Assessment
FA	Formative Assessment
MoE	Omani Ministry of Education
PA	Peer Assessment
PBE	Post-Basic Education (aged 16- 18)
PM	Assessment Policy Maker
SMTs	End-of-Semester Tests
SA	Summative Assessment
Fb	Feedback

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Chapter 1. Introduction to the study

1.1 Overview

Educational assessment is an important and complex phenomenon in educational settings and an integral component of everyday classroom activities. It is used to evaluate and improve the quality of school provision as well as to provide reliable information about students' learning progression (Aydeniz, 2007; Gronlund, 2006; Brookhart, 1999; Brookhart and DeVoge, 1999; Leighton et al., 2018). With the advent of the 21st century, assessment and examinations were commonly used to provide certification, for selection, for accountability and for international comparisons of educational standards. The coming of the 21st century also heralded the use of assessment as a tool to support learning itself (Broadfoot, 2009). This is reflected in growing interest among educational researchers regarding the impact of assessment strategies on motivating learning and enhancing educational attainment (Fan, 2014; Miller and Lavin, 2007; Harlen, 2005; Ecclestone and Pryor, 2003).

This study explored the phenomenon of changes to Biology assessment in secondary education in the Sultanate of Oman (hereafter called Oman), with a focus on formative assessment (FA). The recent changes in curricula, following the implementation of the new post-basic education system in Oman (for students aged 16- 18 years) in the academic year 2007/ 2008 required new assessment practices. This research study investigates how Biology assessment was written by assessment policy makers, how it was enacted by Biology teachers and how it was experienced by Biology students using a qualitative dominant case study approach.

1.2 The Omani context:

1.2.1 Geographical setting:

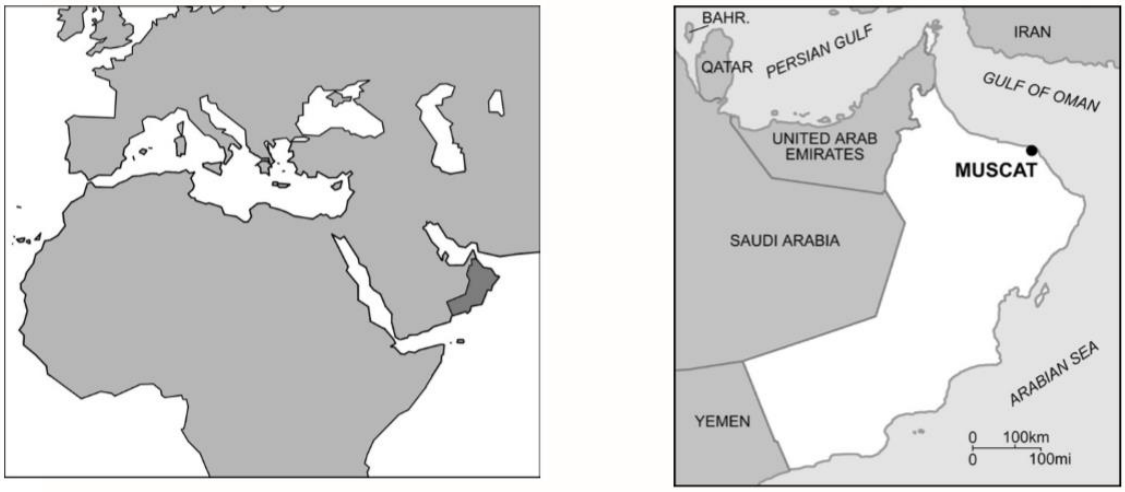


Figure 1.1 The site of Oman (source: Pierce, 2008, p. 231)

The Sultanate of Oman occupies the south-eastern coast of the Arabian Peninsula. It borders the United Arab Emirates on the northwest, Saudi Arabia on the west and Yemen on the southwest. Oman is surrounded by the Arabian Gulf (or Persian Gulf), the Arabian Sea and the Gulf of Oman (Al-Hashimy, 1994; Pierce, 2008) and is separated from Iran by the Strait of Hormuz (Shehadeh, 1992), a waterway through which approximately 20 per cent of the world's oil production flows (Mina and Serwer, 2014).

Migration is at the heart of Oman's socio-demographic framework. Indian merchants settled in Omani ports during the fifteenth century and migrants travelled between Oman and its territories in search of livelihood contributing to the state's multicultural society. For instance, many Baluchis (from the Indian subcontinent) were enrolled into Oman's armed forces (De Bel-Air, 2015; Shehadeh, 1992). In addition, labour-oriented migration enhanced the mobility of people from and to the country after the discovery of oil in the neighbouring Gulf countries in the 1930s and in Oman in the 1960s (De Bel-Air, 2015).

Unlike the other countries in the Arabian Peninsula, Oman has its own historical and cultural features derived from a minority Islamic doctrine; Ibadi Islam and Imamate system, which upholds the principles of the consultation and the free election of the imam leader (Ghubash, 2006; Eickelman, 1985). Consultation is a formal discussion with all those who have won recognition for their ascendency, their judgment and their learning before making a decision. This established the system of authority. The imamate system,

has provided a good example of an Arab-Islamic democracy (Ghubash, 2006). Ibadism, a branch of the third great division in Islam caused by the civil war 25 years after the death of the Prophet, survived as a full Imamate in Oman until 1955 (Al-Kharusi, 2015; Wilkinson, 2010). This gave the country a sense of national identity. Moreover, the strategic situation of Oman has imposed different roles on its people for example, during the colonial period, the Omanis had to confront the challenges and expansions of the imperialists (Ghubash, 2006, p. 9; Kechichian, 1995).

Since the mid-eighteenth century, Oman has lived through a period of decisive socio-political change: the transition from the Imamate system to that of the Sultanate (Ghubash, 2006; Haron, 1993). Thus, the internal political context has changed and a new cultural and national identity has taken shape. However, the conflict between these two forms of rule in Oman continued until 1970 (Ghubash, 2006; Al-Salimi, 2011; Landen, 1967). After the development in oil-producing activities in 1955, the Imamate system was ended (Eickelman, 1985; Ghubash, 2006; Al-Salimi, 2011; Landen, 1967) and consequently, the division between the two systems ended. The period from that date to 1970 was to be known as "the Omani Middle Age". In that era, the educational system was based on traditional methods such as classes in mosques and, private study with scholars (Al-Salimi, 2011; Ghubash, 2006). It was not until the 1970s that the country began to experience rapid and profound changes in economic and political plans leading to educational development.

1.2.2 Educational context

This section provides background information on the educational context of this study. It provides data about the site of science assessment in the educational system in Oman. Since 1970, when Sultan Qaboos rose to power, the government has put in place economic projects that enabled the country to construct its infrastructure and launch development in education at all levels (Ghubash, 2006; Haron, 1993; Al-Salimi, 2011, The World Bank, 2012; Shehadeh, 1992). School building became an urgent priority and the first university was established. His Majesty Sultan Qaboos said:

> "Since we assumed responsibility for this country, we have assigned major priority to education … We aimed to establish an educational system as fast as we could, because we knew that Knowledge is Light … Not one of us can perform his duty properly unless he is armed with … 'genuine knowledge,' … deep knowledge …. about things, matters and affairs." (Ministry of Foreign Affairs, 2000).

The first Ministry of Education in Oman was established in 1971. At first, the Lebanese curriculum was adopted. Then it was replaced by the Qatari curriculum until, in 1977, the Omani curriculum was gradually developed (Al-Salimi, 2011). In a media interview with a previous minister of education (from 1976 to 1979), the minister said:

> "The interest of our master [HM the Sultan], from the beginning, was the issue of the Omanisation of the curricula. The curriculum was varied: books from here and there. He was very interested in the issue of curricula. He had some pedagogical guidance." (Al-Wasal Channel, 2018).

Today's society is technologically centred and the ability to understand how to improve the learning of students in science is vital for teachers as well as educational policy makers, head teachers and parents because a strong science foundation is essential for students in their academic and professional life and crucial to the prosperity of the global community (IEA, 2013).

There are 11 educational governorates (local authorities) in Oman with responsibility for the public education of 724,395 students (NCSI, 2016) receiving free education (Issan and Gomaa, 2010). My research focused on the Interior Governorate, which (until the oil era) was preserved from outside political influences and overseas trade. Hence, the Interior had been of little economic interest to outsiders. In contrast, the coastal areas remained open to overseas trade via the Indian Ocean and the Gulf. Omani shipping and merchants have linked the ports of Iran (on the other side of the Gulf), Iraq and Bahrein to the eastern wing of the Indian Ocean trade network, such as India. In turn, the community of the Interior region has depended on the outside trading network of the coastal regions (Muscat) to survive and flourish. That openness to outsiders gives rise to an obvious tolerance that all have remarked on (Wilkinson, 2015). During the nineteenth century Oman exerted a strong influence on coastal parts of East Africa, including the areas around Zanzibar and Kenya. These links between Oman and East Africa are evident today in the use of Swahili in Oman and in the African features of some Zanzibari Omanis (Poole, 2006; Ghubash, 2006; Landen, 1967).

The relationship between Oman and Britain has a long history since the mid-seventeenth century when the British were given trading rights at the Omani port of Sohar (An ancient capital of the country that once served as an important Omani port town (Agius, 2008)), and from the nineteenth century the English maintained a residence in Muscat (Poole,

2006). In the modern era, Oman has maintained a longstanding military and political relationship with the UK (Poole, 2006; Ghubash, 2006). These factors have played a role in shaping the varieties of English used in Oman. Moreover, in these days, there have been cultural influences from India because Indians hold many middle-ranking positions in private sector employment in Oman, for example in car sales, insurance, banking, and the retail sector generally. Trade and commercial links between India and Oman are strong (Poole, 2006). This explains why the Indian varieties of English predominate. However, those used by British and other native-speakers and by Omani citizens who have received education in East Africa also contribute to the mix. The MoE accepted English as the only official foreign language and allocated huge budgets and resources for its implementation through education (Al-Issa and Al-Bulushi, 2012). English language is taught in Oman's public schools in grade 1 and in private schools in the first year of kindergarten (Al-Farsi, 2004; The World Bank, 2012).

In 1970, there were only three primary schools, all male, in Oman. The Ministry of Education prioritised improving the education system to reach all parts of the Sultanate and rapid growth followed (Wyatt, 2013; The World Bank, 2012). Since 1998/ 99, the Ministry of Education (MoE) adopted the basic education (BE) system that follows a student-centred approach (MoE, 1998; 2001, cited in Al-Maskari, Noorani and Al Ajmi, 2012; MoE, 2016a; The World Bank, 2012). In this system, the students' level of achievement is determined by continuous assessment CA (Al-Maskari, Noorani and Al Ajmi, 2012; Al-Tubi, 2014, Alkharusi et al., 2014b) as well as by final semester examinations for grade 10 (MoE, 2015). The BE reform aims at the development of curriculum, pedagogy and assessment to provide a student-centred education and prepare students for the requirements of further education and the labour market, for example by introducing English language from grade one compared to grade four in the previous system.

The rapid development of the educational system during the reign of Sultan Qaboos has resulted in higher literacy rates, the recruitment of Omani teachers and the provision of modern technology, facilities and student-centred curricula (Wyatt, 2013; The World Bank, 2012). Schools have been equipped with resource centres which include educational technological aids and new textbooks relevant to the needs of students have been written. Tests and other assessment tools focus on learning goals rather than the content of the course materials themselves (Al-Issa and Al-Bulushi, 2012; Issan and

Gomaa, 2010; UNESCO, 2010; UNESCO-UNEVOC, 2010). In the 2007/2008 academic year, the post-basic education (PBE) system was introduced. It is a two-year system aiming to prepare students either for the labour market or for higher education (The World Bank, 2012; Issan and Gomaa, 2010). The state schools follow four years of BE cycle one, six years of BE cycle two and two years of PBE (World Bank, 2012) (see Figure 1.2).

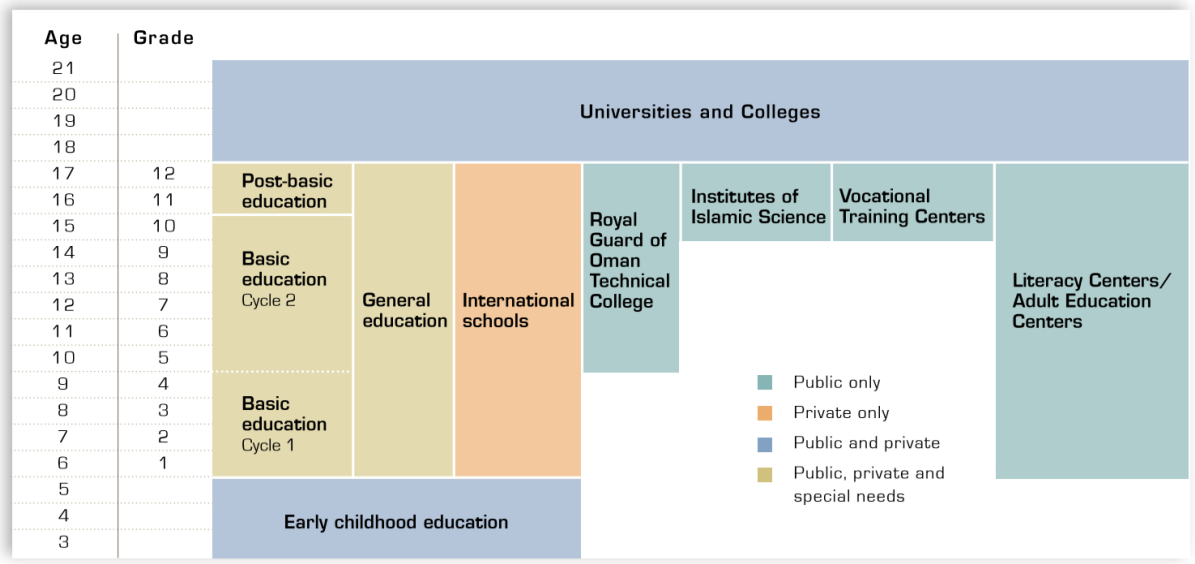


Figure 1.2: Structure of the Education System in Oman

Sources: (The World Bank, 2012, p.34).

1.2.3 Science teaching in the Omani post-basic school context

There has been significant investment in science and mathematics education in the country (Mansour and Al-Shamrani, 2015). In the academic year 2007/ 08 the MoE adopted a national programme for enhancing the learning of science and mathematics, known as the 'Cognitive Development Programme' for students in grades 5- 10 (MoE, 2016a). There are many activities and events related to this initiative including oral competitions, scientific projects, and tests (MoE, 2016a). Science education in Oman is closely associated with laboratory and experiment work (Al Musawi et al., 2015; Ambusaidi and Al-Balushi, 2015). The PBE system, discussed in greater detail in 1.24 below, has set goals for the teaching of science, emphasising science process skills, and problem-solving skills, for example experimentation, classification, prediction, observation and inference. In PBE, the science subjects (Biology, Chemistry and Physics) are taught separately and students can choose the subjects according to the major

specialisations they aim to study at university level. The number of lessons allocated to each science subject is illustrated in Table 1.1.

Age	*Grades*	*Subject*	*No. of lessons weekly*
6- 8	1–3	Science	3
9- 11	4–6	Science	5
12- 13	7–8	Science	6
14- 15	9–10	Science	7
16	11	Biology, chemistry, physics and science & technology	Each subject is allocated 4 lessons
17	12	Biology, chemistry, physics and science & environment	Each subject is allocated 4 lessons

Table 1.1 Number of lessons allocated to science in each grade

Source: (Adapted from Ambusaidi and Al-Balushi, 2015, p. 191)

With regard to the teaching and learning of science, two main teaching methods, which reflect a student-centred approach, are used. They are enquiry-based learning and cooperative learning (Ambusaidi and Al-Balushi, 2015, p. 194). The enquiry approach is aligned to the nature of science and requires that students combine "process of science" skills and problem-solving skills (Hassard, 2005). Cooperative learning can help to implement enquiry-based learning and has many added advantages for students such as equipping them with scientific knowledge, collaborative problem-solving skills and social skills. Post-basic classrooms should involve students in a wide range of enquiry-based and problem-solving activities in which students learn together by using observation, measurement and data to develop conclusions (Hassard, 2005).

1.2.4 Post-Basic education (PBE)

PBE (Grades 11-12) is a link between the Basic education (BE) stage and higher education. It is defined as a two-year programme of education following a unified ten-year system of compulsory BE (MoE, 2016b; Issan and Gomaa, 2010). The MoE emphasises the general characteristics of the post-basic programme. First, curriculum and assessment standards are based on learning outcomes and genuine assessment of performance. Second, the student-centred approach is based on learning activities. Third, problem-solving ability can be applied in a variety of real-life circumstances. Fourth,

individual differences are considered. Fifth, the development of employability skills is considered as a basic requirement for life and work (Issan and Gomaa, 2010, p.23, MoE, 2016b; UNESCO-UNEVOC, 2010). In order to satisfy the diverse needs of all students, a flexible range of courses are included and the opportunity of choice is allowed so that students can explore different aspirations before making a commitment to a particular graduate occupational target (Issan and Gomaa, 2010). A specialist vocational guide has been produced to help students discover their abilities and ambitions in a professional way and to direct them to potential careers (MoE, 2016b; UNESCO-UNEVOC, 2010). One of the most important aspects of the new system is changes in curriculum content and textbooks. In this regard, the content of the curricula and the teaching and assessment methods have been given particular attention, for example it has been suggested that teaching and assessment should not be based on memorization and rote learning. Furthermore, the possibility of strengthening science courses was created through the addition of information technology and computer skills (MoE, 2016b).

Assessment of students' learning is a central aspect of the state PBE. The outcomes are assessed by using two main methods of assessment: CA throughout the school year and End-of-Semester Tests for grades 5-12 (MoE, 2015; The World Bank, 2012). CA utilises four tools for gathering assessment information: Homework, Lab Performance Test, Quizzes and Oral work, that is, presentation and discussion (for Grade 11 in science subjects only). The second section is End-of-Semester Test, which is a formal exam conducted centrally at the end of the semester (MoE, 2015).

Science teachers are responsible for implementing CA and FA in the classroom according to the science learning goals (Ambusaidi and Al-Balushi, 2015). However, a study conducted by Ambusaidi and Al-Rashidi (2009) shows that the science teachers face many difficulties in applying FA in the classroom. These challenges include time to check students' projects and work; the large number of assessment tools; the large number of students in each class; and teachers' lack of knowledge and skills in using FA.

1.2.5 The challenges of PBE

Although the PBE system in Oman has several advantages, it is evident that it has faced challenges and there is still scope for further improvement at national level (Issan and Gomaa, 2010; UNESCO-UNEVOC, 2010; The World Bank, 2012). A key issue is that teachers are not well trained and prepared to implement the new programme, especially to

respond to computerization and cope with the new technologies. The importance of teachers should not be underrated, and teacher training and ongoing professional development is an important and fundamental issue to be addressed at both the in-service and pre-service levels (UNESCO-UNEVOC, 2010). Teacher development can happen relatively slowly, and needs to be sustained through professional dialogue and programmes of professional support and development (Black and Wiliam, 2003). A further issue to be addressed is the need for new approaches to teaching and learning to reduce the number of post-basic school leavers who are unemployed and looking for work who have no vocational or professional qualifications. There is also a need for school buildings and facilities such as workshops and laboratories to be developed to meet the demands of the implementation of the new system (The World Bank, 2012; The New Zealand Education Consortium, 2017).

To sum up, this section has provided an overview of the context of teaching Science and Biology in Omani schools today, particularly post-basic schools. The introduction of some programmes designed to raise the levels of students' attainment in science such as the 'cognitive development programme' has also been noted. However, the need for professional support and development for those teachers opposed the introduction of a new system of imposed standardised assessment in these programmes has also been highlighted.

1.2.6 Assessment context

The changing nature of the modern world as a result of the processes of globalisation and economic development present challenges to current education systems (Lingard, Mills and Hayes, 2006; Issan and Gomaa, 2010). These global trends have a considerable impact on policy and education has become a site of interest (see Griffiths, Vidovich and Chapman, 2008). A global trend can be seen towards demand for increasing accountability in assessment in public examinations in secondary education (Sadler, 1994). The OECD's (2011) Review on Evaluation and Assessment Frameworks for Improving School Outcomes provides a description of the design, implementation and use of assessment procedures in several countries and examines the strengths and weaknesses of different approaches. The review makes recommendations to improve student outcomes in primary and secondary education, such as promoting the use of assessment for learning and training teachers in this process. For school evaluation to be effective in

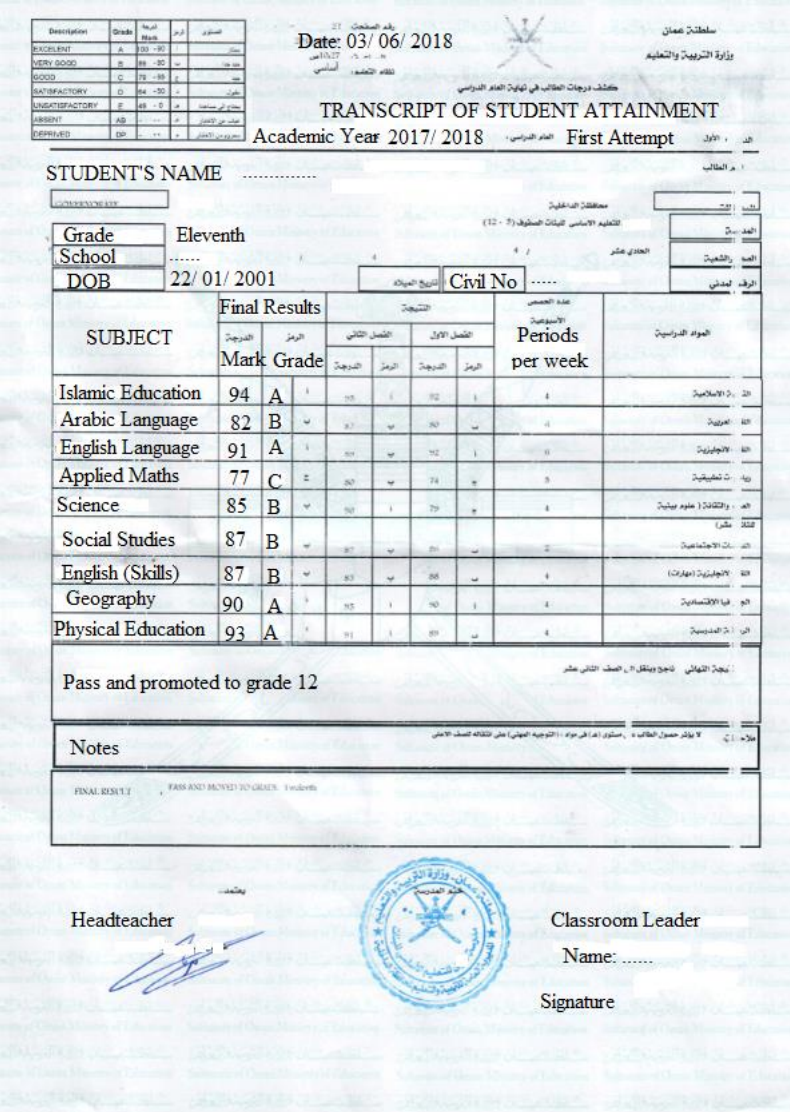
promoting excellence and improvement, it is essential that all schools have a clear understanding of common goals and expectations; strengthen consistency and coherence of different elements of school evaluation; and devise ways to improve the public use of inspection results (OECD, 2011, pp. 112- 116).

Globalisation has also dramatically altered "many of the ways in which states mediate power at both the sub state and transnational levels." (Morrow and Torrance, 2000, quoted in Griffiths, Vidovich and Chapman, 2008, p.162). This issue is considered important by the Omani government for students to understand the interconnectedness and interdependence between diverse societies and cultures. It has had a noticeable effect on science education (Al-Salimi, 2011; Mansour and Al-Shamrani, 2015; Nguyen, 2014; Lingard, Mills and Hayes, 2006). As Stromquist (2002) notes, globalisation places education at the centre. For example, in the STEM (Science, Technology, Engineering and Mathematics), fields of science, technology, and mathematics are considered fundamental for the societies shaped by the global economy. Globalisation shapes education through policies regarding curriculum, funding and teacher education (Clothey, Mills and Baumgarten, 2010).

The MoE has conducted a series of national assessments and participated in international competitions such as TIMSS (The World Bank, 2012) and PIRLS (Al-Maskari, Noorani and Al Ajmi, 2012). In the previous Omani General Education system, assessment was traditionally linked with high stakes formal examinations and school-leaving end of year exams. In the new basic and post-basic education system, in addition to the end-of-semester tests, the MoE has introduced a CA system, which is conducted by teachers throughout the school year. Based on CA, teachers are expected to use a variety of assessment methods such as quizzes, short written or oral tests, projects, laboratory performance tasks (practical exercises), and homework. Students in grades 1–4 progress to the next grade automatically. Students in grades 5–10 need a total mark of 50 percent in each subject to pass and be promoted to the next grade. However, if a student fails an examination in any given subject, up to a maximum of three subjects, they can resit it at the end of the school year. If the student fails the exam again, he/ she must repeat the grade (Alkharusi et al., 2014c).

Furthermore, there are two types of examinations in PBE (Grades 11 and 12) in Oman: school and external (central) examinations. School examinations are written by the

teachers in the school. The latter are made and administered by the Directorate General of Educational Evaluation (DGEE) of the Ministry of Education (MoE, 2015). At the end of each semester, students in Grades 11 and 12 receive a report card, which includes the marks obtained in each subject, their overall level of performance and comments related to students' learning process (Figure 1.3).



Description	Grade	Mark
EXCELLENT	A	100 - 90
VERY GOOD	B	89 - 80
GOOD	C	79 - 65
SATISFACTORY	D	64 - 50
UNSATISFACTORY	E	49 - 0
ABSENT	AB	- - -
DEPRIVED	DP	- - -

Date: 03/ 06/ 2018

سلطنة عمان
وزارة التربية والتعليم

كشف درجات الطالب في نهاية العام الدراسي

TRANSCRIPT OF STUDENT ATTAINMENT

Academic Year 2017/ 2018 العام الدراسي First Attempt

STUDENT'S NAME .....

Grade Eleventh

School .....

DOB 22/ 01/ 2001 تاريخ الميلاد Civil No .....

SUBJECT	Final Results Mark	Grade	Periods per week
Islamic Education	94	A	4
Arabic Language	82	B	4
English Language	91	A	5
Applied Maths	77	C	5
Science	85	B	4
Social Studies	87	B	3
English (Skills)	87	B	4
Geography	90	A	4
Physical Education	93	A	4

Pass and promoted to grade 12

Notes

FINAL RESULT : PASS AND MOVED TO GRADE Twelfth

Headteacher

Classroom Leader

Name: .....

Signature

Figure 1.3 A report card

These report cards are given to parents to inform them about their students' performance in the school.

However, as I have noted, classroom assessment practices tend to be connected to the examinations. FA is frequently neglected by teachers. Much of what Biology teachers do is actually summative. Furthermore, most of the training in educational assessment in Oman has been devoted to developing, administering, and scoring exams (Alkharusi et

al., 2014c). Although FA can be very effective, it is not actually implemented very often, so in this research, the relationship between these factors is investigated further. This current educational assessment situation in Oman needs to be explored to determine how the curriculum reform can be more comprehensively enacted.

The current assessment system has attainment targets and success criteria for students that are specified by the assessment policy in Oman (See Figure 1.4). The system has had a notable influence on the practice of Biology teachers in terms of how they understood, accepted and implemented the top-down approach to the teaching of Biology.

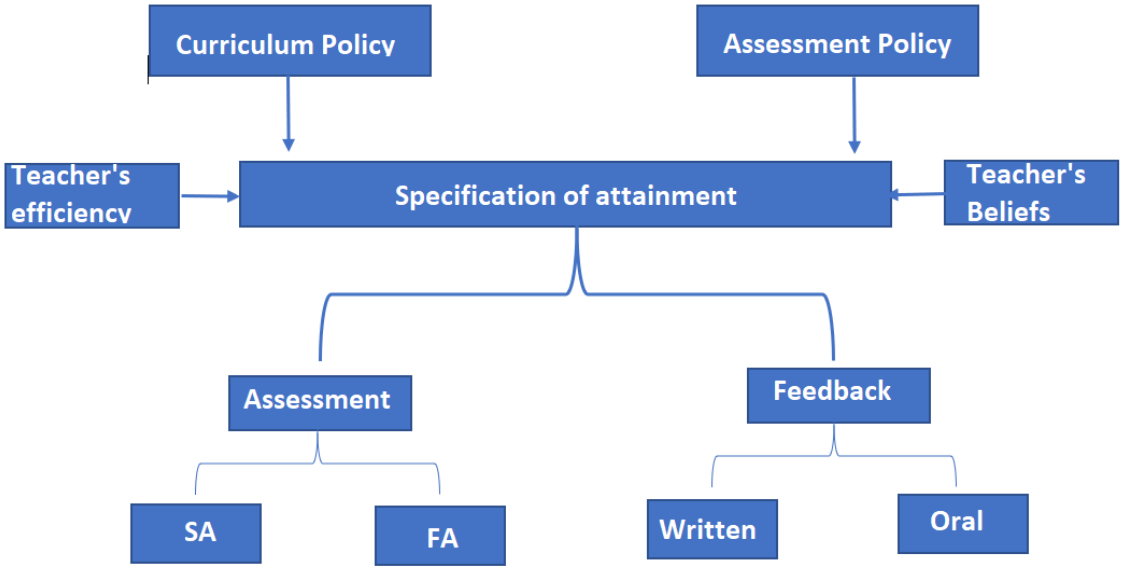


Figure 1.4 assessment model in Oman (summative assessment: SA; formative assessment: FA) (Source: Author's research)

Figure (1.4) illustrates that the success of assessment and feedback processes in the classroom depends on specific factors, such as teachers' understanding of the strategy of the national curriculum and assessment policies, teachers' efficacy as practitioners and their pedagogical beliefs which will be influenced by their understandings of national strategies and policies and previous training and teaching experience. Figure 1.4 demonstrates the position of educational assessment (FA and SA) in the system and the interrelationship between the top-down context in which the Biology teachers are involved, their beliefs and experiences and the interplay these have with regard to assessment and feedback provided by participating teachers.

Therefore, Figure (1.4) indicates that a 'top-down' model of Biology teaching leads teachers to specify attainment to students. In doing this, teachers reflect on their beliefs

and teaching experience (efficiency or skill) to decide which assessment strategy to use. Then some form of feedback takes place. This could be written or oral feedback. Hence, although the teachers are completely involved in a top-down approach to Biology teaching, their efficiency and beliefs impact upon their strategies for specifying attainment, using assessment and providing feedback.

My interest in Biology assessment in Oman stems from my professional background. I have served as a Biology supervisor in Oman for more than ten years. Supervisors are employed by the Ministry of Education to monitor the quality of schools and teachers. Subject supervision requires the possession of certain skills and knowledge to plan, observe and assess the processes of teaching and learning as well as advising, assisting and supporting the teachers. My role as an external supervisor is to visit schools regularly and work with the internal supervisors such as principals and senior teachers.

1.2.7 Teaching and assessment of Biology in Omani PBE

This research is a case study of the assessment of Biology in two post-basic schools in the Interior Governorate of Oman. Issues related to the purposes and tools of assessment have gained the attention of educational policy makers in Oman where there is national interest in the results of public tests and international competitions. At the same time, the challenge of improving standards of assessment and the quality of students' performance must be met by schools. In Oman, as in other countries such as England (Alexander, 2011), the drive to raise standards has been the cornerstone of recent education policy. For example, a programme of cognitive development has been implemented for students to underpin their learning of science, mathematics, and certain geographical and environmental concepts of important educational programs implemented by the Ministry of Education since the academic year 2007/2008, based on the direction of His Majesty Sultan Qaboos (Moe, 2012). Recent government initiatives including post-basic curricula, CA procedures and international competitions in science and mathematics have encouraged me to conduct this research.

Assessment is a complex phenomenon in educational settings and to study it within its contexts, qualitative case study methods can be appropriate (Ragin, 1992). This research focuses on the benefits and challenges of implementing assessment policy in Omani PBE. Research in a particular geographic place requires consideration of the positionality according to race, gender and class of the researchers and their relationship with the

research subjects (Bachmann, 2011; McDowell, 1992). In my research, subjects include the Directorate General of Evaluation, Directorate General of Education in the Interior Governorate, with the primary focus on targeted schools and their teachers and students.

I was born and raised in Oman. I was educated in Arabic-medium boys' schools for 12 years and obtained my first university degree in Oman. In 1998, I moved to Jordan for my master's degree (in an Arabic-medium university). In 2014, I moved to England (a Western Culture) for doctoral studies, where I conducted the research discussed in this thesis. Based on my sociocultural upbringing, I always think of myself as too Eastern to be Western, so I reflect on my Eastern culture and ways of thinking. This influenced later development of the research process during which I reflected upon the data collection and interpretation process. My reflections on the knowledge systems and my experiences with the local and global educational contexts consciously influenced the development of my research problem.

1.3 Statement of the problem

Despite the education reform in Oman since 1998/1999, national and international assessments of learning show that students' performance is below the expectations of the Government and below the standards reached in many countries in the world especially in the critical fields of mathematics and science (IEA, 2013; Alkharusi et al., 2014b). The low-level performance of Omani students in the Trends in International Mathematics and Science Study (TIMSS) in 2007, 2011 and 2015 and in the Progress in International Reading Literacy Study (PIRLS) in 2011 showed that the outcomes of students' learning are below the international average (IEA, 2012a, 2012b, 2012c; IEA, 2016). Furthermore, national assessment of learning revealed that Omani school graduates lack higher-order thinking skills. This may be related to the fact that the classroom assessment practices in Oman tend to be connected to examinations (Al Kharusi et al., 2014b). Although the Student Assessment Handbook for Science (assessment policy document) emphasises the importance of continuous FA (MoE, 2015), the political desire for outcomes accountability and fiscal constraints stress the importance of testing of student achievement across the system (Lingard, Mills and Hayes, 2006). Furthermore, in Oman, as in other countries, pressures for more accountability in testing of outcomes are present in terms of multiple nation comparisons of educational indicators such as (TIMSS) and (PIRLS) indicators. Educational research shows that classroom assessment, especially FA

has powerful direct and indirect impacts on student outcomes and thus deserves very thoughtful implementation and planning (Crooks, 1988). This issue encouraged me to research what is going on in the hierarchical order of the assessment system at all levels; policy makers and the writers of assessment rules; teachers who enact the written assessment in practical applications; and students who reflect on and respond to assessment in practice. This case study investigates the reality of assessment in post-basic Biology education in Oman by exploring the perceptions of those who use and experience classroom assessment- teachers and students (Tittle, 1994, Hayes et al., 2006; Billett, 2006). The teachers' practices of assessment are explored through interview and classroom observation, whereas students' perceptions are explored by a questionnaire and interview. I have focused on Biology in PBE as the domain of the study because of my previous background as a Biology teacher and supervisor.

Relying on my personal experience in education as a teacher for five years and a Biology supervisor for more than ten years, I noticed that a considerable amount of classroom time is consumed in assessment. This is supported by research in other contexts (Green, 1992). As part of everyday teaching and learning, teachers' perceptions of classroom assessment reflect their understanding of teaching and learning, while students' perceptions can reveal their attitudes and feelings about the learning process and what they have learned. Classroom assessment practices have an effect on the way that students perceive classroom assessment, classroom assessment environment and achievement goals (Al Kharusi, 2007).

Within the Omani PBE context, where single sex education is practiced (MoE, 2016a), gender might affect teachers' beliefs and practices of assessment as they respond to the assessment standards proposed by the assessment policy makers. Similarly, students' gender and stage level could affect their perceptions of assessment. Female students have been found to do better in international exams than male students (IEA, 2012a, 2012b, 2012c; IEA, 2016). Therefore, the factor of gender was taken into account when conducting the study. The impact of classroom assessment and external testing on student motivation has become increasingly controversial. Classroom assessment practices can enhance or undermine student motivation to learn (Harlen and Deakin Crick, 2003; Hickey and Zuiker, 2005, Ball et al., 2012; Lingard, Mills and Hayes, 2006). As experiences of success may allow novices to be motivated, the careful design of assessment and testing is important to motivate engagement in authentic domain

knowledge practices (Hickey and Zuiker, 2005, Ball et al., 2012). Furthermore, the whole way in which assessment is conducted can have an important washback effect, either positively or negatively impacting on the strategies that the teachers and students adopt for Biology-learning (Ostovar-Namaghi, 2013; Booth, 2018).

The importance of this case study is that it serves as a lens through which to see the assessment process in Oman from different levels or dimensions. Indeed, the assessment system is embedded within its own social context as well as within state educational policies (Sadler, 1994, p.116). This research was funded by the government of Oman in 2014- 2018 to offer a constructive critique about how learning can best be assessed, summatively and formatively, and how the share of responsibilities between policy-makers and the assessors of learning outputs should be balanced to improve both curriculum and pedagogy. The study offers recommendations to improve the assessment of post-basic Biology.

1.4 Purpose*:*

The purpose of this study is to examine the phenomenon of Omani assessment of Biology in the Post-basic sector. The study sought to understand Biology assessment in its context with the aim to provide recommendations on how to improve educational assessment practices. The study incorporates:

1- A case study method that explores the practice of Biology assessment in two of the PBE schools in Oman.
2- Teachers' and students' perceptions of this assessment process.

1.5 Research Questions

In order to achieve the above purposes, the research addressed the following main research question and sub-questions:

Main question:

How is the 2015/ 2016 written Biology assessment policy in PBE in Oman enacted by Biology teachers and perceived by students?

Sub-questions:

1.1 How do teachers in Nizwa schools in Oman enact and perceive assessment?

1.2 How do students in Nizwa schools in Oman perceive assessment?

1.6 Summary

Chapter 1 provides an overview of the Omani context for this study and my understanding of the political context of education in Oman. It discusses the key features of changes to educational assessment policy and provides a specific perspective on the opportunities and challenges for implementation of new assessment policies in PB Sciences. This leads to discussion of the rationale for this research on Biology assessment and an outline of the research problem, and the specific research questions.

1.7 The structure of the thesis

The thesis is structured to reflect the purpose of the study and is arranged in six chapters. The current chapter provides an introduction to the study and the following outlines the structure of the remaining chapters.

Chapter Two: Literature Review

The literature review engages with the literature on various issues connected with concepts related to Biology assessment in Omani schools. The key topics discussed in this chapter are FA, SA, teachers' and students' engagement in feedback and theories relevant to assessment practices such as motivation and learning theories.

Chapter Three: The Methodology

This chapter presents the rationale for the research methodology, the research instruments and analytic procedures. It includes discussion of the use of a case study design, describes the methods that were used to collect and analyse the data and provides detailed information about the selection of participants and important ethical considerations.

Chapter Four: Data Analysis

Chapter Four presents the analysis and interpretation of findings gathered through semi-structured interviews, classroom observations, focus-groups, questionnaires and documentary analysis.

Chapter Five: Final Discussion

In this chapter, the findings of the study are discussed in relation to the research questions and the reviewed literature.

Chapter Six: Conclusion

This chapter provides a summary of the research focusing on those who have real influence over assessment practices, policy makers and teachers. Furthermore, it identifies the limitations of this study and offers important recommendations to improve the Biology assessment system in Omani schools.

Chapter 2. Literature Review

2.1 Introduction

The purpose of this chapter is to review literature that is relevant to the study of assessment and contributes to a conceptual framework for the study of the Biology assessment phenomena in the Omani context. However, while the current literature on formative and summative assessment involves extensive conceptual and empirical studies on the learning benefits, the empirical research on this issue is still scarce and insufficient at PBE in Oman, where SA is dominant. To address this research gap, this study is focused on exploring the nature of Biology assessment initiated by the MoE in the PBE, as enacted by four secondary Biology teachers and perceived by students, in two post-basic schools in Oman. The chapter critically engages with the literature on various concepts, theories and issues connected with assessment, and specifically with literature relevant to Biology assessment in Omani schools. The key topics discussed in this chapter are FA, SA, teachers' and students' engagement in feedback and theories relevant to assessment practices, such as motivation and learning theories.

The process used to review literature was searching on the Newcastle University 'Library Search', 'eTheses', British ETHOS and ERIC databases. The key words used were: 'educational assessment in Oman', 'assessment policy', 'Omani post-basic education', 'basic education in Oman', Omani teachers' 'enactment of assessment' and 'Omani students' perceptions of assessment'. The research process excluded terms such as curriculum, pedagogy and instruction. As a result, the following related sources were found: more than 30 articles, eight PhD and EdD theses, more than 17 books, one conference paper, approximately 15 Omani government publications and three publications by international organisations.

This chapter is divided into eight sections:

Section 2.1 provides an introduction to the review.

Section 2.2 reviews the concepts of assessment and discusses theories related to assessment practices including theories on FA, SA, feedback, convergent and divergent assessment and links between assessment and motivation.

Section 2.3 examines learning theories including Kolb's learning cycle and Vygotsky's Zone of Proximal Development (ZPD).

Section 2.4 considers Bernstein's pedagogic theory of classification, framing, recognition and realization.

Section 2.5 considers different levels of assessment analysis within policy and practice.

Section 2.6 discusses the research gap and how this study aims to addresses this gap.

Section 2.7 provides a conceptual framework for the Biology assessment phenomena in Oman.

Section 2.8 draws some conclusions from the literature review.

2.2 Educational assessment

Assessment is a fundamental aspect of schooling processes because it drives instruction. Accordingly, a growing body of interest has recently been seen among policy makers, teachers and assessment researchers in Oman. This section includes definitions of assessment and theories of assessment. It explores formative and summative assessment and feedback, convergent and divergent assessment and links between assessment and motivation.

Educational assessment is an integral part of teaching and learning and "a continuous process, part of day-to-day classroom activities" (Hayward, 2007, p.255). Some writers (Lingard, Mills and Hayes, 2006; Corrigan et al., 2013) suggest that assessment should be a pedagogical tool for learning. It is important to systematically align assessment practices and pedagogies with curriculum purposes to enhance student learning. Teacher practices are a significant factor influencing student learning outcomes (Lingard et al., 2006). Hence, inclusive pedagogies can embed assessment practices into everyday classroom experiences (Corrigan et al., 2013). In the present study the distinctions between different forms of assessment and their purposes are acknowledged and recognised.

2.2.1 Defining educational assessment

Assessment is a central component of the three messages system of formal school education: curriculum, pedagogy and assessment (Bernstein, 1971; Hayward, 2007; Grainger, Crimmins and Burton, 2019) because assessment of learning Biology gives preliminary indications of the outcomes of Biological education. While educational assessment is a central feature of curriculum and teaching and can frame what students

learn and how they learn, there are many different conceptualisations of the term depending on the researcher's perspective. Lang, Stanley and Moore (2013, p. xi), for example, focus on the FA process and its potential to accelerate student achievement and help predict the results of students' performance on standards-based tests. They define assessment as a process "given periodically, designed to help the teachers to shape or form their instructions". Their definition of FA offers a purposeful rationale for the assessment of students' learning that can inform the teaching and learning process (see also Grainger, Crimmins and Burton, 2019).

Other educators regard classroom assessment as a process that can play a key role in attempts to improve learning, for example, by providing a special context in which teachers can influence or support students' learning (Aydeniz, 2007; Kickert et al., 2018; Wiliam, 2018; Brookhart, 2006; Black and Wiliam, 1998; Wiliam, 2017). Whereas, national assessment systems focus on improving the efficiency of educational systems for example by evaluating the effectiveness of a particular curriculum by using international assessments results (NAS, 2006; Bell and Cowie, 2001; Cheong, 2018). To meet this purpose, standardised assessments are designed, so that policy makers have the means to evaluate the effectiveness of curriculum and instruction (Bell and Cowie, 2001; Aydeniz, 2007; Steel, 2019). In these summative purposes of assessment (sometimes called standardised assessments), teachers have been held responsible for the quality of education in their classroom and, in some cases, teaching to the test is strongly correlated with factors controlled by assessment policy (Copp, 2018; Smith and Kubacka, 2017). A concern regarding the increasing focus on high-stakes assessment is that test scores may be used to pressurise teachers, reducing the role of assessment to accountability purposes (Harlen, 2005). There is danger that the content and mode of delivery of teaching is targeted at students' acquisition of only the skills and knowledge necessary to pass the test. In order to reduce the negative effects of high-stakes assessment, the distinction between summative and formative aims of assessment should be maintained, while assessment systems should be planned and implemented to make greater use of teachers' continuous assessment (CA) to evidence students' ongoing learning for both formative and summative purposes (Harlen, ibid).

In relation to possible educational assessment definitions, I incline to Harlen's (2014) further developed, clear and useful definition of assessment of learning as a process of generating and interpreting evidence for a purpose. It involves decisions about what

evidence to use, the collection of that evidence in a planned way, the interpretation of the evidence to produce an indication (judgement), and the communication and use of the judgement. Recognising that the assessment system needs to work with policies that aim to improve learning outcomes, a wide range of different kinds of practice can be used for assessment, such as students being engaged in some activity; the gathering of information from that activity; the judgement of the data by comparing them with some standard; and some means of communicating the results (Harlen, ibid).

It is useful to distinguish between the terms: assessment and evaluation as they are often used interchangeably, thereby resulting in some confusion over their meanings. In North America, some writers prefer to use the term evaluation instead of assessment (Sadler, 1989; Taras, 2005). Whereas, others (Bloom, 1968; Dunn and Mulvenon, 2009; Stef-Mabry, 2018) regard evaluation as something distinct, i.e. the specific use of assessment data (be it summative or formative data). Bloom (1968), Cizek (1997) and Guskey (2010) for example, proposed important distinctions between assessment and evaluation. Assessment refers to a planned process for gathering and combining information and interpreting this information in order to discover students' strengths and weaknesses, enhancing instruction that is relevant to student's learning needs, or making decisions about educational objectives for a student (what is now called assessment for learning or FA- Note that FA and assessment for learning are used interchangeably). In the UK, the Assessment Reform Group (ARG) attempted to differentiate 'assessment of learning' for grading and reporting, from 'assessment for learning', which is part of instruction (Daugherty, 2007; James, 2017). Assessment for learning or FA is discussed in greater detail in section (2.2.2) and is a key concept in this research study.

In contrast, some researchers (for example, Cizek, 1997; Guskey 2010) suggest that evaluation refers to the summative act of attributing merit to the results of gathering information, such as awarding marks on a test. National assessment systems aim to improve the efficiency of education through accountability, often by using summative international assessments results. The educational assessment of students' performance is embedded in a specific educational governmental system and influenced by international trends in educational assessment (NAS, 2006; Imlig and Ender, 2018). SA is also discussed in greater details in section (2.2.2).

As this study investigates the assessment system in Oman, it is useful to take the definition of assessment stated by the Directorate General of Educational Evaluation (DGEE) of the Omani Ministry of Education into account:

> "Assessment is a range of procedures designed by a teacher or an external professional body to collect useful information about students' achievement of learning outcomes in a certain period of time" (Student Assessment Handbook, 2015, p.2).

This definition describes the procedure and purpose of the assessment system in Omani schools. Moreover, this definition suggests some central issues that should be addressed in the Omani assessment system such as *how* to gather helpful information and *what* constitutes helpful information about student learning, learning outcomes and achievements. For Omani schooling, the formative potential of assessment has become particularly important and noticeable since 1998 in tandem with the introduction of basic education (MoE, 2015) and 2007/2008, when the PBE system was introduced. The Student Assessment Handbook (MoE, 2015) defines FA as:

> "assessment for student learning. Its purpose is to improve students' learning. Typically done through adaptation of teaching, giving feedback, student self-assessment and peer assessment" (p.2).

The above definition focuses on student learning outcomes not on 'monitoring'. Thus, the issue is more to do with "how the processes of assessment might assist learning" (Torrance and Pryor, 1998, p.1). Assessment for learning revolves around the power of teachers to provide feedback and the ability of students to use feedback and to assess themselves. Assessment for learning methods can be used to better understand the current skills and knowledge that a student possesses, while the information gathered can also be used to identify a student's strengths and weaknesses and any adaptations that may be required to curriculum design and delivery or instructional needs.

At a policy and strategy level the assessment system in Oman is supported by practical guidance in the form of a Student Assessment Handbook. The Ministry's definition of assessment splits the evaluation of student performance based upon the purposes that the outcomes should be used for (this will be unpacked in Section 2.5). The Student Assessment Handbook provides guidance on a wealth of techniques for CA but fails to explicitly acknowledge the importance of FA. In practice, as a Biology supervisor I have noted that in the classroom context there is currently a much higher priority given to marking than feedback. There are several ambiguities in the guidance that need to be

reviewed to clarify what is meant by CA in relation to the intention of improving teaching and learning, such as using FA and informal feedback mechanisms. This argument provides a rationale for my study for exploring FA in greater depth in the following section.

2.2.2 Formative and summative assessment

Assessment conducted by teachers is variously called continuous or ongoing assessment. Teacher assessment can serve both summative and formative purposes. Understandings of FA have developed over time (Brookhart, 2007) suggesting that FA should be integrated throughout instruction with the express purpose of improving student learning and guiding instruction (Torrance and Pryor, 1998; Boyd, 2011; Miller and Lavin, 2007; Popham, 2008; Pryor and Crossouard, 2008; Stefl-Mabry 2018). The interaction between classroom learning and assessment has now been recognised by Omani policy makers with the hope of improving learning outcomes in Oman (The World Bank, 2012; MoE, 2006). The positive impact of FA on student learning has been long recognised by educational researchers (see, for example Scriven, 1967; Sadler 1989; Popham, 2008; Black and Wiliam, 1998).

Assessment can be formative if it provides evidence to improve decisions about learning, whether these decisions are taken by teachers, students or peers (Black and Wiliam, 2009; Harlen, 2014; Parsons, 2017). When evidence-based decisions about student learning are used by teachers, students, or their peers, to determine the next steps in instruction, they will be better than the decisions taken in the absence of the evidence (Black and Wiliam, 2009; Filderman and Toste, 2018). The connection between FA and the function of feedback can be used to close the gap between a student's actual performance and where the student needs to be (Sadler, 1989; Hattie, 2012) by engaging in an appropriate action which leads to some closure of the gap by accelerating student achievement (Brookhart, 2006; Black and Wiliam, 1998; Aydeniz 2007; Wallin and Adawi, 2018). This can help to predict students' performance on standards-based tests (Lang, Stanley and Moore, 2013, p. xi). The process is often teacher-controlled, with teachers providing feedback to students. On the other hand, students can be formative decision-makers when they have information they need in order to make productive decisions about their own learning (Brookhart, 2011; Charteris, and Smardon, 2019). When FA involves using assessment information to feed back into the teaching/learning process students can reflect on their achievement by means of self and peer assessment to inform how they are doing relative

to classroom or their own learning goals (Brookhart, 2008; Black and Wiliam, 2009; Hoo, Tan and Deneen, 2020). This powerful, integrated and student-centred method has been described as assessment for learning or FA, where learning objectives describe the intended learning outcomes to raise learning outcomes (Dixon, Hawe and Parr, 2011; Miller and Lavin, 2007; Ball et al., 2012; Ochuot and Modib, 2018).

Black and Wiliam (2003) worked with teachers to develop formative practice in classrooms and generated convincing qualitative evidence that standards of achievement in national tests would be raised by improving the quality of FA. Their 'intervention' with teachers suggested the value of two main components. Firstly, a series of in-service education and training sessions, during which teachers were introduced to their view of the principles underlying FA, and were given the opportunity to develop their own plans. Secondly, visits to the schools, during which the teachers would be observed teaching by project staff, and have an opportunity to discuss their practice and their ideas; feedback from the visits helped the researchers to attune the in-service education and training sessions to the developing practice and thinking of the teachers. This type of intervention can support teachers in developing their own professional practice. These findings are important because they suggest that innovations which worked in research studies in other nations might also be successful in classrooms with students of a similar age range. However, it is important to note that simply gathering accurate information on student learning through well-designed FA is not enough. What teachers and students do with that information is what counts the most (Guskey, 2010) e.g. purposefully generating and interpreting evidence to inform a judgement, and to communicate and use the judgement (Harlen, 2014).

Educators pay more attention to FA in classrooms as a powerful lever for raising student achievement and exploring their scientific ideas to push for deeper understanding (Cisterna and Gotwals, 2018). Exploratory studies can shed light on the opportunities and challenges of employing FA in day-to-day teaching. Miller and Lavin's (2007) study gathered information from participating teachers via standardised questionnaires, individual interviews and group discussions. Their findings indicate that FA techniques bring benefits to children in terms of self-esteem and enhancing their beliefs about their competence.

With respect to SA, it differs from FA in that it is undertaken at the end of a programme of study or a course, or at the completion of an instructional span of time (Duke and Weinliein, 1995; Broadbent, Panadero and Boud, 2018; Buchholtz et al., 2018; Alt,

2018). It uses tests in order to measure student performance or summarise their attainment for purposes of certification and accountability, or to evaluate the effectiveness of the curriculum (Torrance and Pryor, 1998; Sadler, 1989; Pryor and Crossouard, 2008; Australian Learning and Teaching Council, 2010). The increasing focus on ensuring high test scores may pressurise teachers into reducing the role of assessment to accountability purposes and focusing their teaching on students' content acquisition of only the skills and knowledge necessary for passing the test (Harlen, 2014). However, a balance can be struck between FA and SA (Torrance and Pryor, 1998). Distinct SA and FA aims can be planned and implemented to enable evidence of students' ongoing learning to be recorded and communicated (Harlen, 2005). A wide range of different kinds of practice can be used for assessment, such as evaluating students' engagement in learning activities; gathering information from those activities; comparing that information with some standard; and communicating the results. SA does not usually have an instant impact on learning. However, it frequently influences decisions which may have profound personal and educational consequences for the student (Sadler, 1989; Yates and Johnston, 2018). Thus, the primary distinction between SA and FA relates to their effect and purpose (how the information is used).

It has been noted that in SA teachers show little variation in their pedagogical practices. SA is generally used only to mark the end of a unit and the pattern of student performance in assessment. SA often leads to a normal distribution of achievement (Guskey, 2010), as shown in Figure 2.1.

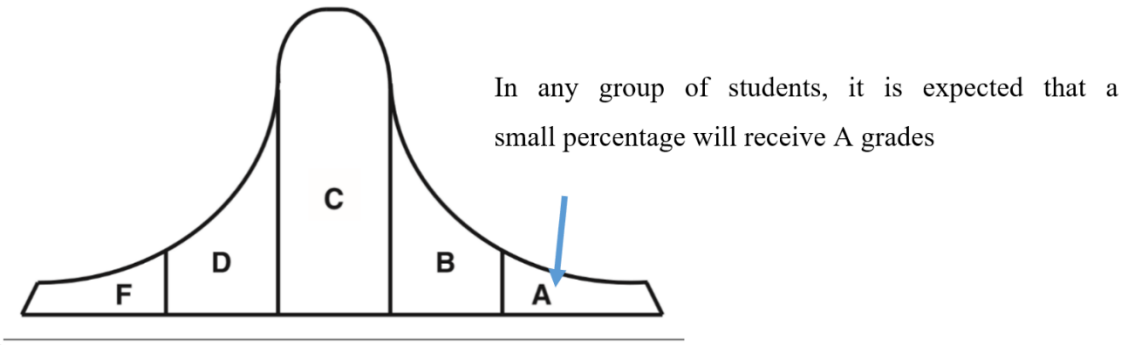


Figure 2.1 Distribution of grades in SA. Adapted from Guskey (2010, p.107).

Bloom (1968) noted that in SA, students are classified according to their ability to achieve higher grades or marks. Indeed, individual differences in students should be understood. In this respect, FA, Bloom stated, can be provided at an appropriate level to support individual students to reach their potential through strategies that take individual

differences into account. Concerns about the use of SA for accountability purposes can be avoided if teachers master FA (Zimmerman and Dibenedetto, 2008) to reduce the tension between FA and SA in educational contexts. For SA to benefit students, it should contain FA elements (Broadbent, Panadero and Boud, 2018) such as assessing students own learning and providing constructive feedback to them in order to improve their next learning. Indeed, when FA and SA are combined, they have powerful pedagogical elements (Jonsson and Svingby, 2007) that complement each other and result in a more powerful learning environment (Panadero and Jonsson 2013).

There is little research into how to deliver SA feedback effectively (Harrison et al., 2013). This issue is still a subject of debate in academic programmes (Rand, 2017). Formative use of summative tests is complex but achievable (Black and Wiliam, 2009) as a method of eliciting evidence of student progress and prompting feedback to improve learning. Midterm exams, for example, can be used to provide FA as an effective means to improve student learning (O'Connell, 2015). Tests can be used by students as a guide to planning their own revision.

Any reform in educational assessment should be preceded by a careful analysis of the schooling background variables, such as the class sizes, student performance or ability and the subject areas. Stakeholders may hold a variety of assumptions about the primacy of SA (Harrison et al. 2017). A lack of prior experience of alternative assessment cultures hampers the adoption of radical change and therefore, intuitive beliefs about SA may need to be challenged. This is important as SA feedback has the potential to be one of the most powerful influences on student learning and growth (Rand 2017; Zhao, Huen and Chan, 2017; Jolly and Boud, 2013; Ellery, 2008). Testing of students' attainment of predetermined aims gives rise to summative and norm-referenced assessment methods (Biggs and Tang, 2011). Summative results are used to grade students at the end of a course or to provide accreditation at the end of a programme. There are seldom opportunities to act on feedback and students tend to ignore any comments (Ellery, 2008) because such feedback provides little opportunity for effective learning. The rationale of summative feedback is to provide a summary of students' achievements or performance, with or without a grade (Sadler, 2010). SA is a fundamentally passive process which may not have any long-term impact upon learning (Sadler, 1989), and therefore summative feedback remains controversial (Beaumont, O'Doherty and Shannon, 2011; Boud, 2007).

Feedback is not effective in promoting real learning unless it is read or heard and acted upon by students (Ramaprasad, 1983). If feedback is offered as judgement, it is less

effective at promoting learning than when it is provided formatively (Weaver, 2006). As Biggs and Tang (2011) have noted, the ability of teaching methods to produce a successful result is directly related to the ability to provide formative feedback on students' activity, either from teacher or from peers. Students also need to learn to assess themselves, to detect and then correct errors by reflecting critically on the quality of their own work. The value of an assessment activity depends on its implementation and how teachers and students interpret and react to it (Huang, 2011).

According to the above studies, with regard to SA, students do not take responsibilities in the learning process through peer assessment and self-assessment practices. This type of assessment is teacher-centred. The role of teacher is to transmit knowledge and assess the outcomes. This approach contains a rather convergent view of assessment. The next section discusses this notion and compares it with divergent assessment.

2.2.3 Convergent and divergent assessment

This section examines two types of classroom assessment, the more closed convergent assessments versus the more open-ended divergent assessments, and considers their influence on students' motivation and learning. The previous section suggested that FA can have a positive impact on students' learning. In CA, the same assessment task may be used for both formative and summative purposes. Depending on the purpose of assessment, students can decide how they will handle the task to their best advantage (Biggs and Tang, 2011; Wakefield et al., 2014). Approximately two decades ago, researchers in education (Leung, 2004; Cumming, 2009; Connor-Greene, 2000) recognised that convergent and divergent assessment methods offer an opportunity to integrate and align curriculum, pedagogy and assessment. More recently some educators (For example, Van der Kleij, Cumming and Looney, 2018; Ninomiya, 2019; Ateh. 2015) have indicated that convergent and divergent assessment form part of a useful continuum with FA and suggested that teachers utilize both forms of assessment to elicit the full range of students' knowledge.

FA can be convergent or divergent, based on the type of questions teachers ask during the teaching process (Torrance, 2012b). Torrance and Pryor (1998; 2001) suggest that these two types of assessment can be used to plan approaches to a high-quality assessment. (see Table 2.1).

Convergent Assessment		Divergent Assessment
The aim of assessment is to discover *whether* the student knows, understands or can do a predetermined thing. This is characterised by:		The aim of assessment is to discover *what* the student knows, understands or can do. This is characterised by:
Practical implications		*Practical implications*
a. precise planning and an intention to stick to it;		a. flexible planning and or complex planning which incorporates alternatives;
b. tick check lists and can-do statements;		b. open forms of recording (narrative, quotations etc.);
c. an analysis of the interaction of the student and the curriculum from the point of view of the curriculum;		c. an analysis of the interaction of the student and the curriculum from the point of view of the curriculum and of the student;
d. closed or pseudo-open tasks and questioning;		d. open tasks and questioning;
e. quantitative assessment;		e. descriptive feedback;
f. involvement of the student as recipient of assessment;		f. involvement of the student as recipient of assessment and as initiator;
Theoretical implications		*Theoretical implications*
g. a behaviourist view of learning;		g. a constructivist view of learning;
i. an intention to teach or assess the next predetermined thing in a linear progression;		i. an intention to teach in the zone of proximal development;
j. the assessment and its feedback focus on criteria normally closely related to SA.		j. the assessment and its feedback focus on criteria normally closely related to FA.

Table 2.1 Convergent and divergent assessment (adapted from Torrance and Pryor, 1998, p. 153)

As Table 2.1 shows, the important thing in convergent assessment of the student by the teacher is to discover whether the student knows, understands or can do a predetermined thing. This kind of assessment can be seen as a type of scaffolding through which the teacher played an essential role in enabling the students to do, with help, what they have not been able to do alone (Vygotsky, 1978a). The crucial issue is the extent to which the students can be involved in the lesson activities and their ability to understand and to interact with the curriculum (Pryor and Crossouard, 2008). Divergent assessment allows teachers to pose 'helping questions' rather than 'testing questions'. It encourages students to reflect on their own thinking in line with contemporary learning theories and terms of FA (Torrance and Pryor, 1998; Pryor and Crossouard, 2008). Within western cultures, particularly in higher education where 'criticality' is privileged, divergent assessments

requiring collaboration between the student and both the teacher and peers maybe more desirable (Pryor and Crossouard, 2010). In divergent assessment, teachers require a stronger sense of responsibility for designing assessment activities that can facilitate learning.

A formative pattern in which divergent and convergent are not seen as separate categories but positioned at each end of continuum of learning could address many of the sociological issues of learning (Pryor and Crossouard, 2008; Huang, 2011). Understanding the possibilities of both divergent and convergent assessment and developing the ability to manipulate them would seem to be a prerequisite for teachers to make the most of FA (Torrance and Pryor, 1998, 2001). This can enable teachers to achieve a balance between divergent and convergent approaches to structure students' learning paths and experiences and to provide feedback to address the essential requirements of the curriculum. Teachers' considerations may take account of the available resources and time, the nature of the task and knowledge being assessed, and the possibilities for providing feedback (Torrance and Pryor, 1998; Kira et al., 2013).

2.2.4 Feedback in assessment

Feedback is information that provides students with an understanding of the quality of their work, as well as what they might do in the future to enhance their performance and knowledge (Randel and Clark, 2013). Giving students detailed feedback about the strengths and weaknesses of their work, with suggestions for improvement has a positive impact on their learning gains (Sadler, 2010; Black and Wiliam, 1998; Cowie and Bell, 1999) and it can enhance and promote critical pedagogy in teaching and learning (Torrance and Pryor, 1998; Cowie and Bell, 1999; Brookhart, 2008; Pryor and Crossouard, 2010; Guskey, 2010; Ochuot and Modib 2018). Formative feedback is a key component of assessment for learning and can act as a catalyst for students' potential learning change (Kurtoglu-Hooton, 2015). About a century ago, behaviourists, such as Thorndike (1913) considered how feedback affected learning, regarding positive feedback as "positive reinforcement," and negative feedback as "punishment". Similarly, Bloom (1976) divided feedback into positive feedback, such as encouragement, praise and other rewards that can be used to sustain learning, and negative feedback, for example blame and punishments. However, the problem with those explanations is that not all feedback actually is effective.

Students need to know how they are progressing to improve their performance (Torrance and Pryor, 1998; Kourgiantakis, Sewell and Bogo, 2018). It is, however, inadequate for students to depend only on evaluative judgements made by their teachers (Black and Wiliam, 1998). Authentic and direct feedback experiences with explicit performance criteria are necessary for the development of intelligent student self-monitoring (Sadler, 1989), self-assessment and mastery learning (Black and Wiliam, 1998; Brookhart, 2008).

Thus, feedback should be provided by and for two main audiences, students and teachers (Hattie and Timperley, 2007; Brookhart, 2008) to close the gap between performance, current understandings and the learning goal. Students can be supported to use feedback to monitor the weaknesses and strengths of their performance; to recognise features associated with high quality or success; and to improve or modify unsatisfactory aspects of their learning. Feedback can involve two stages: one while learning is ongoing (Where am I going? How am I going? and Where to next?) (Hattie and Timperley, 2007) and after it is completed (How did I do?) (Hattie, 2012; Fisher and Frey, 2011). Reducing the gaps in student achievement is partly dependent on the level at which the feedback functions. These include the level of task understanding, the level of process of performance, and the level of self-regulation (Sadler, 2010, 1989).

Students can learn from assessment and feedback to be aware of errors or alternative solutions and to correct them by reflecting critically on the quality of their own work, evaluating themselves (self-assessment) or by being evaluated by their teachers or peers (Higgins, 2012; Nicol 2010). Feedback on self-assessment encourages students to generate relevant information and internal regulation. Students' knowledge, thinking and beliefs jointly mediate the effects of external feedback (Butler and Winne, 1995; Brookhart, 2008). Teacher feedback can have a powerful impact on student motivation. Teachers can be encouraged to reflect upon their knowledge of their students and provided with practical experience of how and when to provide timely formative feedback (University of Cambridge, 2013; Hailu et al., 2017). Timely feedback that addresses each component of FA will allow students time to adjust while are still interested and engaged in the task (Ambrose et al., 2010; Biggs and Tang, 2011; Hailu et al., 2017').

Effective feedback can guide students towards the next developmental steps through advice and information about how good or useful their work is (Orsmond and Merry 2011). This is sometimes termed feed forward (Sadler, 2010; Robson et al., 2013; Hughes, 2017) or developmental feedback (Hattie and Timperley 2007). Educators (e.g.

Nicol, 2010, 2013; Hattie and Timperley, 2007) have argued that for feedback to make a profound impact on the student it must contain some form of dialogue, for example students must find out why a piece of work was weak and why a new change or improvement is recommended. Such dialogue, as Nicol and Macfarlane-Dick (2006) point out, can encourage students to question themselves and therefore become self-regulatory in their work.

The power of formative feedback lies in its ability to address both cognitive and motivational factors at the same time (Brookhart, 2008). Cognitive gain happens when feedback gives students information they need (to understand what to do and why) and to develop a sense of control of their own learning, which is a motivational factor (Sarsar, 2017). External assessment, for example through the provision of formative feedback by peers or teachers (Brookhart, 2015), may be perceived differently by members of different student groups (Yeager et al., 2014). When students harbour a measure of distrust towards the school system, a social-cognitive barrier can emerge that conceals the meaning of constructive feedback and prevents students from learning from it. Yeager et al. (2014) suggest that creating a climate that fosters trust and engagement is important for feedback to be effective.

The key to formative feedback is the chain of two actions: students' perceptions of a gap between their present state and a desired goal; and their response to a call to action to close that gap (Harland, Wald and Randhawa, 2017). In order to provide useful feedback, students should be allowed to take risks and make errors without fear of penalty, so that teachers understand and facilitate their students' thought processes (O'Connell, 2015). This literature review informs my study because it reinforces the importance of FA as a potentially powerful factor in enhancing the quality of teaching practice and student learning outcomes. Feedback is used to address the gap between the actual achievement and the desired achievement (the intended outcome), and to help teachers to orient students towards improving their work. Teachers who reflect on and use the results of SA formatively can also review the effectiveness of what and how they are teaching to meet the intended learning outcomes. Teachers who employ reflective practice, or informed practice, utilise critical intellectual capabilities and powers of analysis to review the learning environment (Argyris and Schon, 1974; Thompson and Thompson, 2008; Thompson and Pascal, 2012). This can be regarded as a form of self-assessment (Beveridge et al., 2014) which can help to plan effective feedback that impacts on student

learning behaviours (Gibbons, 2019) by increasing student engagement, effort, or motivation.

2.2.5 Motivation and Assessment

The need for students to be supported in developing qualities or mindsets for successful lifelong learning has been brought to the forefront of educational thinking. There is a growing interest among educational researchers in the importance of enhancing motivation for learning in education at all levels (Harlen and Deakin Crick, 2003) and the impact of assessment strategies on motivation (e.g. Miller and Lavin, 2007, Harlen, 2005; Ecclestone and Pryor, 2003; Black and Wiliam, 1998). FA can yield considerable learning gains (Black and Wiliam, 1998), and act as a motivation for study (Munzur, 2014; Boud and Falchikov, 2007). SA also can play a motivational role when applied as a tool for success in state-mandated tests or the national examination systems (Munzur, 2014). In addition, some researchers (Butera and Darnon, 2017; Higgins, 2012) suggest that examining individuals is concomitant to striving to achieve valued outcomes or desired results. These outcomes can be regarded as essential components of social support in that individuals are made to feel like valued members of the group (Wentzel, 2017). Peers can play a powerful role in defining socially valued outcomes at school by rewarding specific behaviours. Most students want to be accepted by their peers and have positive relationships with their classmates. Gestalt thinking identifies motivation as "energy" where a goal or need changes into a goal intention, creating tension within the person, producing a tendency to move towards the goal (Higgins, 2012). When the need is satisfied (the goal is reached), the tension is released (Lewin, 1952). Motivation for an activity can grow from the satisfaction people have when their performance generates 'perceived self-efficacy' (Bandura, 1982, 1986). Self-referent thought mediates the relationship between action and knowledge and regulates performance (Bandura, 1982).

The impact of SA and external testing on motivation has become increasingly controversial (Harlen and Deakin Crick, 2003; Hickey and Zuiker, 2005, Ball et al., 2012; Lingard, Mills and Hayes, 2006). Although feedback can be a valuable source of information to support learning and motivate learners to integrate learning into real-life activities, tests can have a negative effect on motivation for learning (Harlen and Deakin Crick, 2003; Torrance and Pror, 1998). This impact is greater for less successful students and, therefore, tends to widen the gap between lower and higher achieving students.

Moreover, studies indicate that tests can affect motivation by limiting what is learned from the school curriculum as both teachers and students shift away from real learning towards preparing for the test (Corrigan et al., 2013; Ostovar-Namaghi, 2013; Lingard, Mills and Hayes, 2006; The World Bank, 2012). A top-down testing system, integrated with high-stakes pubic examinations, reduces the space for teachers to make professional judgments about learning (Lingard, Mills and Hayes, 2006).

Earlier studies (Marton and Säljö, 1976; Marton and Säljö, 1979; Marton and Säljö, 1984; Säljö, 1979) have noted that extrinsic motivation can emphasise surface-level learning, or grasping the main ideas and memorizing them so that students are more or less strongly influenced to keep to a rote-learning strategy. Similarly, Crooks (1988) has pointed out that many of these processes have only temporary relevance to the students because they are readily forgotten. More recent studies (Harlen and Deakin Crick, 2003; Ryan and Deci, 2000; Partanen, 2020; Trenholm et al., 2019) suggest that extrinsic motivation is dependent on and oriented towards the outcomes of our action (which are separate from the action itself) and contingent rewards or punishments. Unlike surface-learning, real learning extends the concept of learning with understanding to propose that it entails interaction with events, things, ideas and people in the real world (Marton and Säljö, 1976; Marton and Säljö, 1979; Marton and Säljö, 1984; Säljö, 1979). In a deep learning approach (real learning), students are intrinsically motivated and try to understand what is being studied (Marton and Säljö's, 1976). It is suggested that deep learning can be encouraged by problem-based learning, in which students learn by discussing and solving relevant problems and applying information to new situations (Dolmans et al., 2016; Crooks, 1988; Wijnen et al., 2017). As efficient learning frequently involves a combination of both deep and surface learning (Harlen and James, 1997; Feyzioğlu, 2019), the adoption of deep learning is crucial to impact on the level of understanding reached (Entwistle and Entwistle, 1991; Pugh et al., 2010).

In conclusion, the way in which assessment is conducted can positively or negatively influence teaching, learning and motivation (Salehi, Yunus and Salehi, 2012; Bailey, 1999; Ostovar-Namaghi, 2013). Motivation has been recognised to have close links with FA and plays an important role in students' academic achievements. Improving our understanding of student motivation can help us understand and design effective activities and experiences in classrooms that will facilitate learning. Motivation can be affected by the constraints operating in the classroom or cultural context (Pintrich, 2003). The

development of empirically supported understandings of motivation can support the scientific foundations for educational practice to improve the teaching and learning processes.

Educationalists interested in building supportive learning environments can strengthen academic performance and improve student motivation, engagement, autonomy, well-being and persistence (Fortus and Vedder-Weiss, 2014; Bronson, 2016). Autonomous motivation can be promoted by agentic engagement in self-directed learning activities (Maulana et al., 2016; Hagger and Chatzisarantis, 2016) that are intrinsically rewarding (Luginbuhl et al., 2016) rather than externally referenced pressures and demands such as rewards, deadlines and criticism (Maehr, 1976; Hagger and Chatzisarantis, 2016; Fortus and Vedder-Weiss, 2014). Crucial to autonomous motivation is whether students are able to apply the knowledge and skills that they have attained in the classroom to everyday learning outside of the school context. The transfer from classroom learning to meaningful learning in real world environments can lead to adaptive outcomes such as academic attainment and persistence and adaptive skills, individual knowledge awareness and self-directed learning (Pholboon et al., 2015; Hagger and Chatzisarantis, 2016; Mayer, 2012). Within educational contexts, autonomous motivation and continuing motivation are related to adaptive outcomes such as academic attainment and persistence, individual knowledge awareness and self-directed learning (Pholboon et al., 2015; Hagger and Chatzisarantis, 2016).

Motivation is a complex concept, closely aligned with 'the will to learn' involving self-efficacy, self-esteem, self-regulation, effort, goal orientation and locus of control (Harlen and Deakin Crick, 2003; Butler and Winne, 1995; Brookhart, 2008; Alkharusi et al., 2014c). Extrinsic and intrinsic factors can be used to optimize academic motivation (Hidi and Harackiewicz, 2000; D'Lima, Winsler and Kitsantas, 2014). Motivation for learning can be enhanced by considering both internal factors, that is, internal to and under the control of the student, and external factors in the student's natural and social environment, interacting with each other (Harlen and Deakin Crick, 2003; Hoffman, 2015). Intrinsic motivation results from students finding satisfaction and interest in taking responsibility for their own role in learning (Garon-Carrier et al., 2016; Harlen and Deakin Crick, 2003; Hidi and Harackiewicz, 2000), leading to continued and self-motivated learning when students freely engage in an activity for its own sakes (Harackiewicz and Sansone, 2000). On the other hand, extrinsic motivation occurs when

students engage in learning because it is a means to achieve external incentives for learning such as merit marks and certification (Harlen and Deakin Crick, 2003; Sansone and Harackiewicz, 2000) that give meaning to learning (Molden and Dweck, 2000).

Contextual manipulation can change the way in which students respond in an achievement situation. When achievement is viewed in terms of fixed intelligence this may lead to the perception of limited opportunities for success which can decrease intrinsic motivation and performance (Dweck, 2006; Haimovitz and Dweck, 2016). When achievement is viewed as effort, on the other hand, and students are supported to achieve learning goals through a process of effort or strategies and abilities developed over time, this can lead to positive results and high levels of intrinsic motivation. This can be helpful for students who lack motivation and interest in academic studies (Harlen and Deakin Crick, 2003). Motivation is necessary for sustained learning and may be encouraged through the use of positive reinforcement of successful learning behaviours (Bandura, 1986; Woolley, and Fishbach, 2018). Vygotsky's theory of the Zone of Proximal Development (ZPD) emphasized the importance of providing appropriately challenging learning experiences, facilitated by peers or teachers, to enhance motivation (Vygotsky, 1978a). (See section 2.3.2). This can facilitate the motivation necessary for sustained learning.

2.3 Learning theories related to assessment

As a Science educator working with Science teachers it is important to support teachers to design assessments and interpret them 'in ways that align with current theories of learning' (Lyon, 2011, p.432). In the section below Kolb's learning cycle, which emphasizes the importance of experiential learning, is discussed. Vygotsky's notion of the zone of proximal development (ZPD) is also considered since it suggests the importance of analysing what is in the range of the student's development level, i.e. functions that have matured but also those that are in the process of maturing (Vygotsky, 1978) in order to provide appropriate learning challenges.

2.3.1 Kolb's learning cycle

In 1984, David Kolb published his book *Experiential Learning.* Kolb's learning theory considers individual differences in maturation, allows for the impact of context and culture and recognises learning as multidimensional, including behavioural and perceptual aspects in addition to cognitive development (Kolb, 2015). Kolb suggests a

holistic integrated perspective on learning, which merges experience, perception and behaviour (Elkjaer, 2009, pp.74-89). A number of researchers agree about the importance of experiential learning. The theory has a wide range of applications in education, for example using Kolb's learning cycle to write an essay (Harrop, Casey and Shelton, 2018; Murphy, 2007a), study assessment stages among university students (Rahiminia, Rahiminia and Sharifirad, 2017), and to improve students' practical and creative skills (Baker and Robinson, 2016). Kolb's theory has been used as a useful tool for helping students move beyond superficial learning and to add critical analysis to their writings. Reflection on the knowledge that students' have obtained, especially by evaluating the actions that occurred in a learning situation, can help students to consider what did or did not work, what they learned, and how they would approach the same situation differently to have a more successful outcome (Murphy, 2007a). Without reflective learning, students may continue to repeat their mistakes (Kolb, 2015). Hence, Kolb's learning theory can provide students with useful information to organize what they have learned.

Kolb's (1984) model arose from the constructivist paradigm and was influenced by the theories of Jean Piaget (Merriam, Caffarella and Baumgartner, 2007; Harrop, Casey and Shelton, 2018). The premise of his theory is more student-centred than teacher-centred (Murphy, 2007a). It describes four phases (or processes) that must be present in order for learning to occur: having an experience (concrete experience); reflective observation (reflecting on this experience); abstract conceptualisation (learning from the experience) and active experimentation (trying out what you have learned) (Boyatzis and Kolb, 1991; Ord and Leather, 2011; Koole et al., 2011) (see Figure 2.2). These four elements are the features of a learning spiral that can begin with any one of the four elements or phases, but usually begins with a concrete experience (Kolb and Fry, 1975).

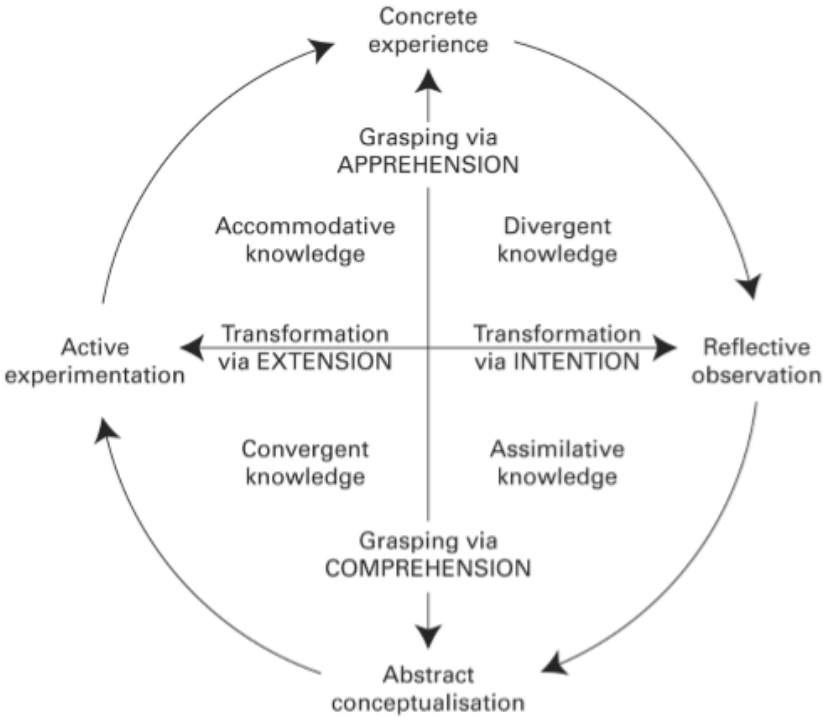


Figure 2.2: Structural dimensions underlying the process of experiential learning (Kolb, 2015, p.68).

Figure 2.2 illustrates the structural dimensions of the process of experiential learning. The first dimension contains two opposed ways of grasping experience, one by means of direct apprehension of concrete experience, the other via indirect comprehension of abstract conceptualisation of experience. The second is a transformation dimension whereby knowledge is created through the transformation of experience (Kolb, 1984) through intentional reflection or through external action (Kolb, 2015).

Kolb's theory of experiential learning suggests that as students reflect on the knowledge obtained through a learning situation, they need to have a notion of the desired goal in order to be able to close the gap between their actual performance and the desired performance. Their teachers can provide them with feedback and scaffolding (support) to move through the zone of proximal development (ZPD). This issue is discussed in detail in the next section.

2.3.2 Vygotsky's Zone of Proximal Development (ZPD)

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

Vygotsky argued that to assess the relationship between the development process and learning capacity, at least two developmental levels must be simultaneously considered: the actual developmental level, that is, what the students can do independently as a result of already completed developmental cycles, and what students can do with the support of their teachers or peers i.e. in their ZPD (Vygotsky, 1978a). This is significant to educators seeking to design successful learning and assessment experiences, as Vygotsky noted that the potential of a student with assistance is not unlimited. Individuals can only assimilate what is in the range of their ZPD (Vygotsky, 1978a; Newman and Holzman, 1993). This can be assessed when students perform a task they could not do before and complete it independently to the required standard (Sadler, 2007). Teacher-student interactions are an important part of FA where the teacher can help the student to understand and engage with problems and new ideas. Thus, FA should identify: "the level of task that a student is ready to undertake on the basis of what he can already do, as long as he received the best possible help from an adult" (Wood, 1987, quoted in Torrance and Pryor, 1998, pp.15-16).

Vygotskian notions connect the socially constructed nature of learning with the need to encourage student autonomy, so students in collaboration with more 'expert others' are seen as the generators of feedback about the quality of their own work and the work of their peers (Dixon, Hawe and Parr, 2011, p.366). Accordingly, self-assessment helps students to become self-monitoring and to improve aspects of their educational attainment to close the gap between current and desired performance. Peer assessment affords the knowledge and skills necessary to engage in self-monitoring (Dixon, Hawe and Parr, 2011).

For Vygotsky (1978b), the process of cognitive functions is not simply a matter of natural aptitudes growing into a mature state, but rather the emergence of new ways of thinking and acting that result from an individual's engagement in activities. Learning and knowledge-building in the ZPD is given meaning by the social and cultural contexts in

which it occurs (Hedges and Cullen, 2012) where the student is helped by interaction with others and by cultural artefacts, such as tables, charts and graphs that allow students to begin to think and to approach problems in new ways (Poehner, 2008). Cultural artefacts are signs, that create new relationships between the stimuli and the responses. These signs or psychological instruments become part of the process and are converted into the immediate causes of psychological behaviour. Thus, through the use and incorporation of cultural artefacts, behaviour is controlled (Subero, et al., 2018). Cultural artefacts can be used as the media of meeting the standard of educational contextualisation 'There is uniform advocacy for instructional use of cultural artefacts as the media in which goals … are contextualized' (Dalton and Tharp, 2002, p. 187).

Some educational researchers (for example, Engeström, 2015; Feuerstein et al.,1998; Poehner, 2008; Lidz, 1995; Agheshteh, 2015; Lidz and Gindis, 2003).) have used the concept of the ZPD as a rationale for different versions of dynamic assessment of intelligence. In this interpretation of Vygotsky's theory teaching and assessment processes are integrated interventions embedded within assessment practices in order to assess and understand students' abilities and potential to learn, guide them to internalise problem solving and solution-oriented approaches which can optimise their performance and development potential. For Vygotsky, abilities are emergent and dynamic (Lidz and Gindis, 2003). This means that abilities are the result of individuals' social interactions in the world, i.e. through participating in various activities, and through being mediated by those around them. Feuerstein et al. (1988) suggest that many children thought to have mental retardation were in fact culturally impaired in that they had received an insufficient amount and kind of mediated interventions. They emphasise the importance of the individual's interactions with his/ her environment, particularly with adults who mediate his/ her learning.

Vygotsky's theory addressed the acquisition of knowledge from more knowledgeable others (White, 2011), acknowledging the function of talk in organising the student's understanding of the world (Barnes (2008). Talk is a critical component in FA, for example in group work, when using peer assessment or divergent assessment and discussing peer feedback (Falchikov and Goldfinch, 2000). Vygotsky valued the various discussions that comprise student learning (White, 2011) and the ideas generated in the processes of reflection between dialogic interactions. Collaborative effort has 'benefits on cognitive development over learning in isolation' (Vygotsky, 1978a, p.186) as a less able

student can enter a new ZPD through working with more competent peers (Boud and Lee, 2005).

2.3.2.1 The potential of ZPD to help students to reach their learning potential (or propensity)

Vygotsky (1978) suggested that in relation to the student's actual level of development, there was a small window of ideal stimulation within which to provoke further development (Foster, Van Eekelen and Mattes, 2008). Teaching below the ZPD provides few gains as it is within the student's actual grasp. In the same way, teaching above the ZPD would also provide little enhancement as the student would fail to see the path between his/ her actual level of development and the teaching process. Therefore, some researchers (Kuhn, 2002; Lehrer and Schauble, 2000) suggested the notion of guided discovery, whereby progress is optimal when students are encouraged to reflect upon their work. This process channels the student's interaction with the environment and highlights the importance of proactivity from the student (Pressley and Hilden, 2006). Good discovery learning occurs as students interact with each other, teachers and wider society (Rogoff, 2003).

Tudge (1992) suggested that students can and do assist each other's thinking in the course of collaborative problem solving, as predicted by Vygotskian theory. His study provided some support for the Vygotskian position, in that less competent student could indeed benefit from working with a more competent peer and that arriving at shared meaning or understanding in the course of discussion was a highly effective means of bringing about changes in thinking. Similarly, Davin (2013) explores how a primary school teacher utilised the frameworks of the ZPD and the instructional conversation within a Spanish as a foreign language classroom. Her findings suggest that a teacher can utilise the instructional conversation to construct a group ZPD and introduce new concepts, inviting all students to participate in the discussion.

With regard to assessment in the ZPD, Feuerstein et al. (1998) introduced a dynamic assessment tool, namely the Learning Potential (or Propensity) Assessment Device (LPAD).

> "The LPAD shifts the focus from what the individual is able to do (at a given moment in time) to what the individual can become able to do in the immediate

time frame and in subsequent, future interactions" (Feuerstein, Falik and Feuerstein, 1998, p. 101).

During the LPAD process, changes can be attributed to both the individual's ability to benefit from the intervention (or modified and adapted interventions) and what can be done at the particular moment. Feuerstein's programme is based on Vygotsky's theory about development potential. It builds on two theoretical principles: cognitive modification and learning mediation (Elliott, 2003; Vedovelli, 2014; Elliott, Resing and Beckmann, 2018). The aim of the LPAD is to find the hidden potential (propensity) of the student, which has not been discovered by earlier assessments of learning (Feuerstein, Falik and Feuerstein, 1998). Hence, the LPAD programme deals with the mental construct of cognition as a propensity to adapt and change.

ZPD is relevant to my study as supporting the student in moving through the ZPD is necessary to close the gap between the actual and envisaged Biology assessment situation. Omani schools, teachers and students are embedded in a dynamic network of personal identity, understanding and values. Knowledge is constructed through interaction between a student and the environment (Vygotsky, 1978a). Dialogic feedback during group work is an important tool for progression (Vygotsky, 1986), leading to a student's ability to complete tasks that were previously only possible through mediation from others (Aljaafreh and Lantolf, 1994; Davin, 2013).

The work of Bernstein is also relevant to highlight the part that assessment plays in this dynamic network and suggests that when assessment is dynamic it informs pedagogy and has the potential to enhance the relationship between students and teachers. The following section will discuss these issues more fully.

2.4 Bernstein's Pedagogic Theory

Bernstein's (1996) concepts of classification and framing assist understanding of the pedagogical practices, related power issues, and socially constructed meanings for the analysis of the biology assessment environment in this study. Bernstein's theory of classification and framing applied in the educational setting can "attempt to understand the inter-relationships between symbolic orders [and] forms of social organization …" (Bernstein, 2003a, p.156). Bernstein (2003a) agreed with the social constructivist notion that learning occurs in social contexts, creating collaborative and dialectical relationship between students and teachers. He argues that an 'educational knowledge code' regulates

the classification and framing of knowledge. This is evident in the interactions that occur in the Biology classroom environment, where power relations create strong or weak boundaries between teachers and students (power in classification) or between different curricula contents (or school subjects). “In this way power relations gave rise to boundary rules and so to classificatory principles” (Bernstein 1996, p. 101). As Bernstein suggests, pedagogical practices could be conceptualised as a series of principles used for understanding the production and reproduction of knowledge associated with relevant power relations (Bernstein, 2000). The main concepts of framework theory are adopted in this study to investigate how knowledge is transmitted to the student (acquirer) through the implementation of FA in Omani Biology curriculum. The concept of FA, including peer and self-assessment, can be independent of direct teacher direction (Black and Wiliam, 1998). Bernstein (2000; 2003a) uses the term ‘frame’ to refer to the rules that organise the transmission of knowledge in the classroom or in the pedagogical relationship between the teacher and the students or students and students. For example, in the case of peer assessment, the power relationships between students in group work are quite equal. In fact, Bernstein studies how school knowledge is transmitted and illustrates how teachers and students construct school knowledge and practice through social interaction (Bernstein, 1996).

Bernstein’s theory provides an opportunity to explore the concepts of classification and framing theoretically and link them to empirical research (Cookson and Bernstein, 1997). His work connects power and control, modes of pedagogic transmission and consciousness and provides insight into the relations between social structure and pedagogic knowledge (Cooper, 1998). Within this study, the concept of classification aids understanding of the relationships between policy makers, teachers and students, and the power relations that produce and reproduce symbolic boundaries (gap or space) between them that create legitimate relations of social order (Singh, 1997). The concept of framing is applied to the pedagogical relationship between the teacher and the students (Bernstein, 2000) and the forms of pedagogic communication that influence teacher-student relations in specific classes such as Biology and Chemistry (Singh, 1997). At the level of the subject, it entails differences in recognition and realisation rules and presupposes a hierarchy in forms of communication and power relationships (Bernstein, 1981). Thus, classification and framing can be used to understand social interactions in the classroom, and to achieve a better balance of power and control that can give students a sense of

social context in which they learn and share ideas. This can give them confidence in themselves and their learning potential.

Bernstein's concepts in connection with classroom context and curriculum delivery are relevant to this study for a number of reasons. Firstly, developing appropriate strategies for pedagogical change requires understanding of these power structures and their effect on the learning environment. In terms of policy making, Bernstein's theory provides a means to understand the change process when a new developmental system is introduced, and what is needed in order for it to be successful. Secondly, his theory can inform teacher professional development and awareness of the curriculum, pedagogy and pedagogic communication necessary for effective assessment in the Biology classroom and to understand the 'recognition rules' and 'realisation rules' of that social environment, (Bernstein, 1981, 2000). In my study, recognition rules are the process by which the specificity of the context is acknowledged by the assessment stakeholders including assessment policy makers in the MoE, Biology teachers and students. This process helps them to perceive the demands of the assessment context, for example if students do not recognise these rules, they will not be able to read the context and may remain silent or ask inappropriate questions (Bernstein, 2000). Realisation rules refer to the ability of stakeholders (policy makers, teachers and students) to communicate with each other about and develop meaningful understandings and behaviours within the classroom culture (Bernstein, 2000). Individual differences between students with respect to understandings of the pedagogic discourse and their ability to recognise and realise rules can strongly influence their performance. Thus, recognition and realisation concepts are helpful in understanding the dynamics of assessment in the Biology classroom in Oman. When a student learns appropriate rules for the culture in the classroom, this enables effective orientation and interactional practices within that culture (Bernstein, 2000).

Effective pedagogic communication is key to ensure that assessment mechanisms are understood and accepted by others within the classroom. This study investigates PBE teachers' understandings of interactional practices and rules and their perceptions of what is going on within the classroom. Where classification is strong, there are obvious boundaries between policy makers, teachers and students. When classification is weak, the boundaries between different categories are blurred (Bernstein, 2000; Bernstein,

2003a). On the other hand, where framing is strong, the transmitter (teacher) has explicit control over the selection of pedagogical activities in the classroom. Where framing is weak, control in the learning process lies with the acquirer or recipient (student) (Bernstein, 2000). Strong framing reduces the student's power over what, when and how he/she receives knowledge and increases the power of the teacher in the pedagogical relationship (Bernstein, 2003a).

Understanding of the Biology assessment process can be aided by an analysis of the specific pedagogic discourses that regulate Biologic knowledge and how this is transmitted and assessed through specific codes that integrate knowledge contents and classroom contexts relevant to this knowledge (Morais, 2002). Studying pedagogic discourse in the classroom can provide a wider perspective on the classroom culture and Biology curriculum practices in Oman. Bernstein's work explains how knowledge is produced and reproduced, connecting pedagogical practices with related power issues. The basic concepts of 'classification' and 'framing' (Bernstein, 2000) help to explore how knowledge is constructed and transmitted to the student through the implementation of FA in classrooms (Bernstein, 1996). The concepts of classification and framing can deepen our understanding of the power structures that play an important role in the assessment environment and help to inform recommendations for strategies for change and improvement in Biology assessment practices in the Omani classroom.

2.5 Levels of assessment within policy and practice

This study is constructed to investigate the Biology assessment system from three aspects: the intended (written) assessment at policy makers' level, the implemented (enacted) assessment at teachers' level (see for example Krolak-Schwerdt, Cate and Hörstermann, 2018) and the assessment experienced at students' level. These aspects shed light on what students are expected to learn as defined in assessment policies; the power relations by which policy decisions create the focus for assessment and how these decisions are translated and implemented in practice by teachers and experienced by students (Foucault, 1979) (see Figure 2.3).

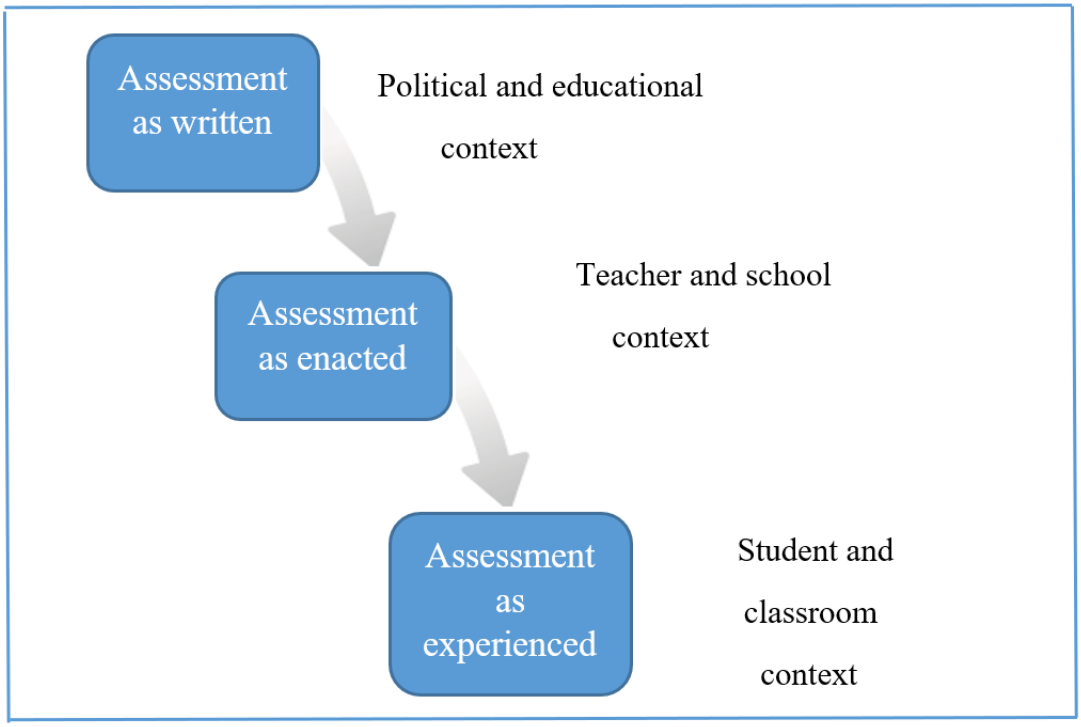


Figure 2.3 Assessment levels

Because of the importance of contextual conditions in case studies for the explanation of the phenomenon (Wynn and Williams, 2012; Bassey, 1999), this research gathered information on the following range of contexts for assessing Biology (IEA, 2013) (see Figure 2.3):

- National, social and educational contexts;
- School contexts; and
- Classroom contexts.

2.5.1 Assessment as written by policy makers

Assessments are a necessary component of any successful policy for educational improvement. However, they might fail without the appropriate technical and institutional considerations (Schwartzman, 2013). Awareness of the variety of philosophical viewpoints is required before suggesting policy recommendations to legislators and local schools (Lumpe, 1999; Corrigan et al., 2013). Political pressures have had the effect of supporting the dominance of assessment, recognising that decisions about what is to be assessed, by whom, for what purpose and by what method, reflect relativities of time and place, for example differences in national contexts (Klassen, 2006; DeLuca and Bellara, 2013; James; 2011), and between developing and developed countries (Broadfoot and

Black, 2004). Assessment as written may involve a standard model designed to illustrate national assessment arrangements (Broadfoot and Black, 2004). National assessment policies are used as a lever for improving education (Harlen and James, 1997, Koh, 2011; Chen, Klenowski and Kettle, 2014). For example, in the USA in order to ensure that prescribed policies are followed, the states continue to promulgate standards, tests and funding policies (Lumpe, 1999; Turgut, Guliz, 2013). As governments have progressively come to realise the powerful potential of assessment as a mechanism of state control, its importance as a policy tool has increased enormously in recent years (Lingard, 2010). The political reasons for the creation of assessment systems in education, especially examinations, are that they facilitate access based on merit to certain forms of employment, higher studies that provide entry to professions, higher lifetime earnings and higher social status (Mills, 1983; Imlig and Ender, 2018; Turgut, 2013; Elwood, 2013). Assessment policy is used as the driving force and rationale for the current educational assessment reforms.

The practice of assessment does not exist in isolation from the context of education (Imlig and Ender, 2018). Assessment policy decisions are interpreted in the day-to-day classroom assessment practices of teachers and in the interactions between teachers and students. Assessment policies and practices are essential structuring characteristics of classrooms, schools and education systems (Lingard, Mills and Hayes, 2006).

2.5.2 Assessment policy in Oman

The previous paragraphs critique some of the general issues related to the successful implementation of assessment policies in different education systems or practices. Previous research into assessment policy in Oman linked to these issues is limited. Little is known about the views of policy makers or the impact on assessment practices as enacted by teachers and experienced by students. This research attempts to address this gap, investigating Biology assessment policy at the level of the MoE and assessment practices and experiences at two local schools in Oman.

The Omani philosophy of education as the fundamental basis for societal progress is supported by national educational policy objectives and principles that proceed from the Basic Statute of State (The Education Council, 2017; UNESCO, 2010). The philosophy of education represents a principal reference for educational planning and policy-making in Oman. It covers aspects of the comprehensive development of the student; aims to support ideas such as Omani identity and citizenship; and seeks to provide a high-quality

education system relevant to the attainment of sustainable development and the future requirements of society from which the targeted objectives of the education system are extracted (Ministry of Education, 2006; The Education Council, 2017). In order to achieve these objectives, a shift in assessment approaches has been promoted since the Basic Education programme was introduced in Oman in 1998 (The World Bank, 2012, MoE, 2006). This shift reflected widespread international moves towards more student centred pedagogical and assessment approaches (Al-Mahrooqi and Denman, 2018) in which students are supported to develop conceptual understanding and critical thinking skills.

In Oman, studies carried out before the new Basic Education (BE) system was fully introduced in 1998 indicated that students' performance in science and mathematics was below the expectations of the Ministry of Education (The World Bank, 2012; IEA, 2013). The MoE therefore changed its assessment policy to focus on SA and increasing the grades and marks. This put pressure on teachers to teach for the test. In the basic (1998) and post-basic education (2007) phases, MoE policy has more recently focused on a new assessment policy placing greater emphasis on both formative and summative purposes by introducing the concept of CA (The MoE, 2006; MoE, 2015). Improving the quality of student learning requires thorough CA and FA and the provision of realistic feedback to both students and teachers (The World Bank, 2012; MoE, 2015). To implement the CA system, Biology teachers are expected to use a variety of assessment instruments such as quizzes, projects, practical tests, short written tests and semester tests (MoE, 2018; Alkaharusi et al., 2012; Alkharusi et al., 2014b). The combination of CA results and end-of-semester examinations provide an overall judgement of the quality of student learning (MoE, 2015).

The assessment reforms reflect the new philosophy of education in Oman. The Philosophy of Education document provides a solid foundation for the attainment of a high-quality education that encourages the development of appropriate knowledge, skills and competencies to deal with present developments and challenges (MoE, 2004; General Secretariat of the Education Council, 2017). The MoE vision is to develop teaching and learning processes to educate the next generation for effective and continuous learning and coexistence with others on the basis of commitment and responsibility (MoE, 2016c; Issan and Gomaa, 2010). The strategic plans of the Ministry help administrators and school principals to frame their intentions in mission statements that reflect school

philosophy (MoE, 2016c; Al-Ani and Ismail, 2015). Figure 2.4 presents a conceptual model of a school mission policy within Oman's philosophy of education adapted from Al-Ani and Ismail (2015). The mission is framed around themes, such as academic achievement, learning outcomes excellence and professional development that reflect the philosophy of the Basic Education (BE) system in Oman and align with national educational goals, the school performance evaluation system and sociocultural values. The mission of all BE Schools is to increase student achievement and it is used as a criterion for evaluation of school performance.

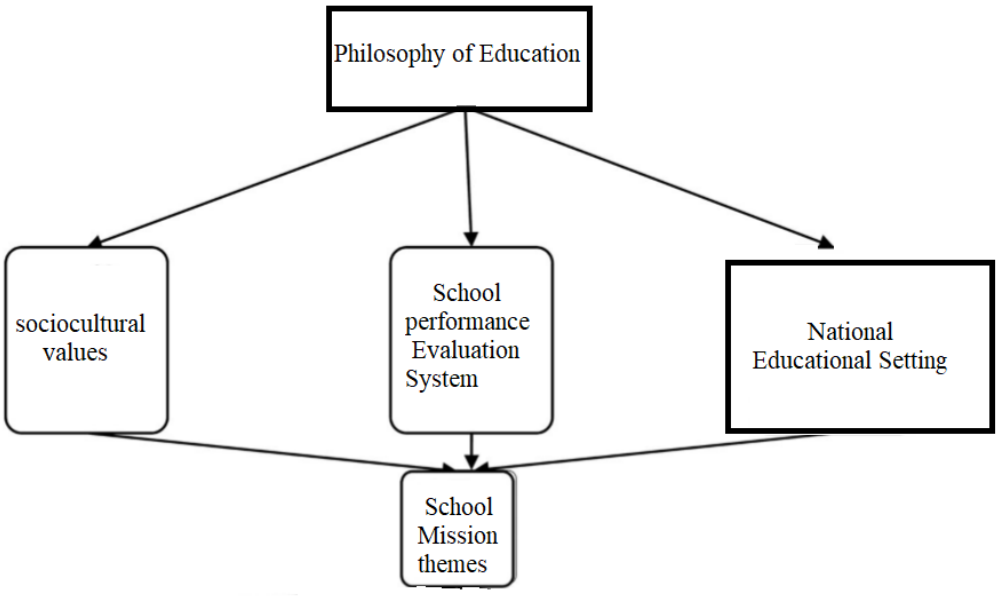


Figure 2.4 Philosophy-mission framework. Adapted from Al-Ani and Ismail (2015, p. 463).

To enhance student achievement the Student Assessment Handbook for Science Grades 11 and 12 provides guidance on a wealth of techniques for CA and FA in PBE (The New Zealand Consortium, 2017; MoE, 2015). This represents a major shift in how education in the classroom occurs in Oman (MoE, 2006; University of Cambridge, 2013). However, such shifts are gradual and need careful nurturing and time to take root and have a positive impact on both engagement and increasing learning outcomes. The MoE is deeply concerned that CA may be used by teachers in the same way as SA (MoE, 2015).

The policy makers emphasise formative focus of CA to improve learning. However, teachers were not provided with more guidance to understand the required practice of

assessment and how this practice will contribute to the goals of improving the quality of education (Nasser and Romanowski, 2011; The New Zealand Consortium, 2017; MoE, 2004a). Most of the existing pedagogy in Omani PBE can be classified as teacher-centred, didactic forms of teaching (the New Zealand Consortium, 2017). Although student-centred learning approaches (that encourage students to have a role in planning, conducting and assessing their learning (Jacobs and Renandya, 2019; Emenyeonu, 2012)) have been promoted as a national policy priority since the introduction of basic and post-basic education programmes, practical enactment of this initiative in the PBE Biology classroom is still very limited (Cambridge, 2013; MoE, 2006; Heim et al., 2015).

2.5.3 Assessment as enacted by Biology teachers:

Assessment as enacted concerns the practices of assessment in schools and other learning environments, in other words assessment at the classroom level. Classroom assessment is regarded as one of the main responsibilities of teachers. Teachers' practices of classroom assessment are influenced by assessment policies and the recommendations of policy makers. However, teacher's knowledge and perceptions of assessment principles impact on the quality of classroom assessment and influence their assessment practices (Corrigan et al., 2013; Randel and Clark, 2013). There is a growing body of evidence that teachers' beliefs are an influencing factor in the implementation and uptake of assessment reform initiatives (Dixon, Hawe and Parr, 2011). The beliefs/ practice nexus cannot be ignored since teacher beliefs and perceptions play a powerful role in the enactment of specific practices (Dixon, Hawe and Parr, 2011; Black and Wiliam, 2003; Alkharusi, 2010). The sustained support of particular assessment strategies by policy makers or assessment experts can have little effect on teachers' practice if these are at odds with their personal beliefs (Dixon, Hawe and Parr, 2011). Teachers must perceive the positive aspects of assessment in order to use it effectively as part of the teaching and learning process (Green, 1992; Lyon, 2011; Ogan-Bekiroglu, 2009).

Despite expectations and the direction of governmental policy on teaching, it has been found that in practice many teachers put more effort into reflecting on the curriculum and pedagogy, but relatively less effort into thinking about assessment (Mok and On Lee, 2017; Van den Bergh et al., 2013; Hellrung and Hartig, 2013). Educational reforms involve change, and change-induced stress experienced by teachers could lead to resistance to change. Teachers' anxiety towards new technology, unfamiliarity with the

skills associated with assessment reform and their perception of risk may be important barriers to the process of implementation (Mok and On Lee, 2017; Westberry et al., 2015; Martin-Gamez, Prieto-Ruz and Jimenez-Lopez, 2016). Cooperation between policy makers and teachers could support implementation because teachers will generally be more cooperative if their views and concerns are taken seriously (Könings, Brand-Gruwel and van Merriënboer, 2007; Robinson, 2017; Kumar and Scuderi, 2000).

Teachers make informal assessments in their classrooms many times each lesson (Alkharusi et al., 2014c). The commonly used methods of classroom assessment are questioning in normal classroom interactions, and 'marking' of written activities or homework (Randel and Clark, 2013; James, 2017). Teachers may shift their practice to include a much greater integration of teaching methods and assessment when they link informal classroom assessments to learning progression, and interpret and take instructional action on the basis of what students know and do (Pappageorge, 2013; Furtak, Morrison and Kroog, 2014). Science teachers must be given "the time, support, and assessment tools to create instructional environments where their students have adequate opportunities to learn what is now expected of them" (Pellegrino, 2013, p.323).

Teachers are the key to the success of any assessment initiative yet their role in enacting assessment innovation has often been underplayed (Dixon, Hawe and Parr, 2011; Black and Wiliam, 2003). A three-year study undertaken in Queensland Australia, 1998-2000, investigating the classroom assessment practice of approximately 250 teachers suggested that teacher practices are the most important school factors in student learning outcomes (Lingard, Mills, Hayes, 2006). Indeed, teachers' assessment pedagogies mediate the achievement of valued performances in the classroom (Lingard, Mills, Hayes, 2006; Hayes et al., 2006). Since teachers may spend one-third of their professional time on assessment-related activities, assessment literacy is vital to effective assessment (Stiggins, 2004).

Assessment literacy can be supported by targeting productive initial teacher training and ongoing professional development opportunities emphasising FA (Stiggins, 2004; Randel et al., 2016; Bell et al., 2008) to improve teachers' assessment skills (Creemers, Kyriakides and Antoniou, 2013). To understand what shapes teachers' perceptions of assessment and how, time should also be spent during professional development programmes to raise teachers' awareness of their beliefs and how they affect their practice (Dixon, Hawe and Parr, 2011). Professional development opportunities modelled

on FA approaches could help to provide teachers with the skills and confidence to use FA approaches in their classrooms (Stewart, and Houchens, 2014).

Waiting for clarity and training

In major assessment reforms, there are inevitably gaps between design and implementation issues (Lam 2003; Fok, 2016). The emotions associated with a sense of ambiguity about how to enact the assessment policy effectively, such as anxiety and a feeling of worry and stress were difficult to become free of and this showed itself in a lack of confidence. Melville and Hardy (2018) foreground how trust is an essential ingredient for teacher learning as policy enactment. In this way, their work suggests that professional learning contexts need to be 'trust-rich' if they are to serve as a vehicle for meaningful policy enactment. Between the old situation and the new one, there is a phase where teachers and students feel uncertain and unsure of quite what they are doing with the new methodology. The teachers did not understand the intended meaning or purpose of assessment reform. The spirit of the new assessment system was still not fully understood. The teachers were waiting for support in this liminal phase to accept fully and enact the new assessment system. A liminal space is one in which someone is being transformed, acquires a new knowledge, and acquires a new skill and identity (Mayer and Land, 2005; Piro ans O'Callaghan, 2019; van Gennep, 1960). The teachers were in a space of anxiety and concern until they received the correct instruction or training.

Thus, teachers' professional development (TPD) should be taken into account when introducing new policy into the educational system. However, policy which is not aware of the basic conditions under which teachers are optimally motivated to pay attention to the change and implement it will fail to effect change in teaching and learning, and in the end result in wasted resources and stakeholder frustration and resentment (Hallinger, Heck and Murphy, 2014; Bachman, and Damböck, 2018). However, like all policies, improvements can be made, and, with some important changes, it may still be possible to get teachers headed in the right direction (Ford, 2018).

2.5.4 Assessment as experienced (students' perceptions of assessment):

Students are important stakeholders in the assessment process (Parke and Lane, 2007). Their views of education are framed by assessment and the assumptions they make about assessment on the basis of what they have experienced (Leeuwenkamp et al., 2018). In school contexts, earlier studies have suggested a connection between students'

construction and experience of reality, perceptions of assessment and their learning and studying processes (Al Kharusi et al. 2014c; Struyven, Dochy and Janssens, 2005). When exploring the implementation of a new assessment system, it is important to consider students' views about how they are assessed, the importance and fairness of assessment tasks, the relationship between assessment tasks and classroom learning activities and their relatedness to real-life situations (Dorman and Knightley, 2006; Zapata, 2016). Dorman, Fisher and Waldrip (2006) link students' perceptions of assessment and the learning environment with their attitude to science and academic efficacy in Australian secondary schools. Their results suggest that student perceptions of assessment and the classroom environment were significant positive predictors of academic efficacy and attitudes to science. Students' perceptions of the quality of assessment are important as they play a considerable role in determining their attitude to science (Dorman, Fisher and Waldrip, 2006), their effort in learning (Kaur, Noman and Awang-Hashim, 2018) and how they use assessment information to guide their learning (Leeuwenkamp et al., 2018).

Previous research on students' perceptions of assessment has focused on one or two particular factors such as students' perceptions of self-assessment (Orsmond, Merry and Reiling, 1997; Wong; 2017; Gashi-Shatri and Zabeli, 2018), students' perceptions of peer and self-assessment (Hanrahan and Isaacs, 2001; Abdou, 2017; Lee-Fong, 2015) and students' perceptions of continuous and final assessment (Kniveton, 1996; Naomi, 2015). Part of this thesis focuses on students' perceptions of assessment practices in post-basic Biology assessment. Exploring students' perceptions of assessment practices can pave the way for getting students more meaningfully involved in assessment processes, which can in turn improve assessment practices (Alquraan 2014).

Listening to student's opinions and involving them in the implementation and design of assessment is important since they are key stakeholders in education and the key targets of assessment policy changes (Cavanagh et al., 2005). Student opinions can be a powerful tool for school improvement (DeFUR and Korinek, 2010; Voight, 2015). Indeed, the design of learning experiences to facilitate the development of specific thinking qualities (McLean, 2018) as students learn to express their opinion and respect the opinions of others. Engaging students in critical thinking may assist students in becoming more democratic (Cooper, 2016; Michael, 2012). Student opinion also serves to improve our understanding of the ongoing relationship between the student and teacher as co-constructors of knowledge and practice within the classroom (Kau et al., 2013).

Furthermore, the Convention on the Rights of the Child (CRC), which was adopted by the United Nation Law in 1989 (Whitehead, 2009) and ratified by all UN member states except the USA (Shuman, 2017) committed governments to do everything in their power to promote and protect children's rights and ensure that their voices are heard. The CRC recognised the right of the child to education and to learn and 'discipline in schools must respect children's dignity and their rights" (UNICEF, 1989, article 28). Oman government ratified the CRC in 1996 (Oman Human Rights Commission, 2016). Thus, a commitment was made to respect children's rights.

2.6 The contribution of this study and the research gap:

Much of the earlier research on educational assessment in Oman focusing on teachers' practices and students' perceptions of assessment and the assessment environment, has adopted a quantitative approach (see Al Kharusi, 2007; Alkharusi, Kazem and Al-Musawai, 2011; Alsarimi, 2000; Alkharusi et al., 2012; Alkharusi et al., 2014a; Alkharusi et al., 2014c). There has been no previous research on the phenomenon of assessment (as a case study) in the context of the Biology classroom that specifically includes perspectives from policy makers. This study has implications for the quality of education because it explores the top-down approach in the assessment reforms in Oman from policy makers to teachers and students.

Following the review of the literature regarding assessment phenomena in general and the Omani case in particular, a gap in previous research has been indicated, that relates to:

1- The limitation of previous studies on the role of policy makers in writing the policy of Biology assessment in the Omani context.
2- Shortcomings in the link between the Biology assessment reforms as written, enacted by Biology teachers and perceived by students.

2.7 Conceptual framework

The literature review has led to the development of a conceptual framework for this study which will be progressively refined during the research process (Davison, 2011). It reflects broad themes and key concepts identified in previous work that are relevant to the study and map relationships between them (Rocco and Plakhotnik, 2009; Marshal and Rossman, 2016). This can help the researcher to see where refinements are needed, or

where overlaps or contradictions exist (Creswell, 2003). The main concepts identified in this literature review to provide the theoretical and structural basis for this study are summarised in Figure 2.5 and Figure 2.6, which offer a visual representation of the study's conceptual framework.

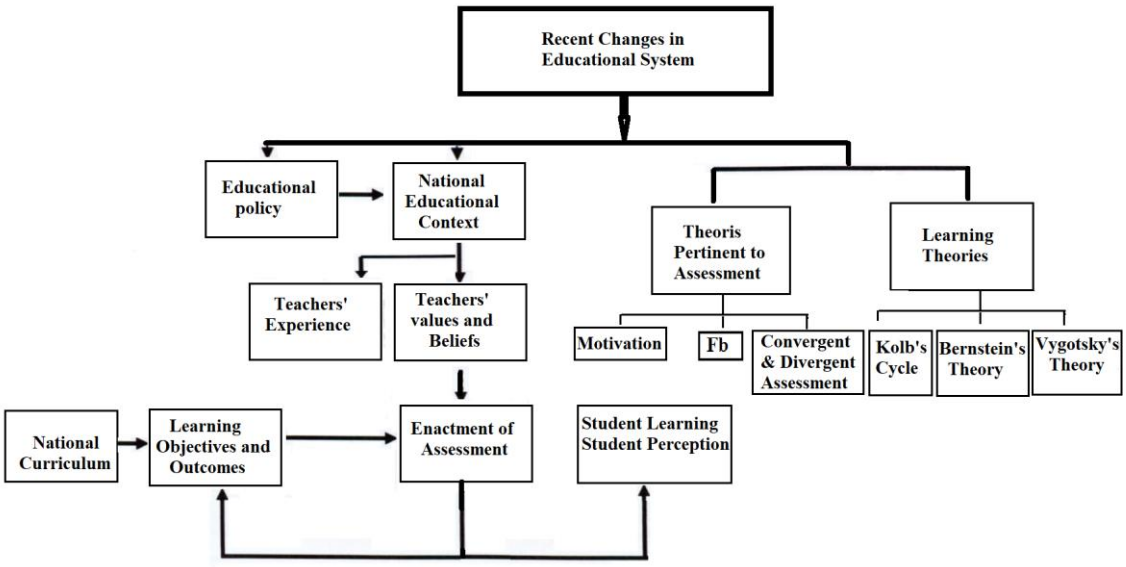


Figure 2.5 The Conceptual Framework of the Study.

(PBE= Post-basic education; Fb= feedback)

Having identified the nature of the investigation, Figure 2.5 and Figure 2.6 present the reader with the study's conceptual framework. This framework has evolved through the process of considering the research questions that form the basis of the study and through reviewing the literature that is pertinent to the study. Figure 2.5 shows that recent changes in the educational system in Oman form the formal context of pedagogy, curriculum and policy that interact with assessment. Contextual information is included in the framework to illustrate the circumstances in which the assessment reform took place. Recent changes in the educational system including the national curriculum have served to endorse this framework with a focus on learning objectives and outcomes. The review of the literature suggests that the national curriculum has adopted a top down approach to the teaching of Biology. In Oman this process includes the imperative to complete a content intensive and tightly prescribed curriculum (see for example, Nasser and Romanowski, 2011; The New Zealand Consortium, 2017; MoE, 2004a). This top-down reform process affects the enactment of assessment (Chuen Huang and Shih, 2011; Craddock et al., 2013). Furthermore, some recent educational assessment literature advocates the inclusion of the

top down approach to teaching, and the impact this has on specification of attainment and adoption of particular assessment practices (see, e.g. Bernstein, 1996, 2000; Melville and Hardy, 2018; Imlig and Ender, 2018; DeLuca and Bellara, 2013). Utilising this framework, I used learning theories and theories pertinent to assessment in my analysis of the reforms.

In addition, teachers' experience and beliefs are associated closely with the enactment of assessment. The assessment literature suggests that experienced teachers connect FA strategies with feedback in order to impact upon students' learning and perception (see for example, Sadler, 1989). Furthermore, teachers' experiences, values and beliefs serve to shape how they interpret and implement educational reforms and these have a direct relationship with their teaching practices. They also give us "insight into the factors that motivate their actions in educational reform" (Datnow and Hubbard, 2016, p. 18). Teachers come to an educational setting with a set of pre-existing beliefs about the value of FA (Coburn and Turner 2011; Farley-Ripple and Buttram 2015). Teachers' understanding of reform is specifically tied to the ways in which they see the world and how they decide the actions they take (Jimerson, 2014). Teachers' assumptions and beliefs influence how they perceive assessment reform and how they enact assessment. Thus, the review of the literature has provided the theoretical basis for this study.

Figure 2.6 below illustrates a second conceptual framework that emerged during the review of the literature related to educational assessment and its interaction with learning processes and learning outcomes. Explaining the figure from left to right, assessment policy is inextricably linked to curriculum policy, and the teaching and learning process. Assessment policy, together with curriculum policy, helps to determine what is important to teach and learn, how this is interpreted by schools and teachers, and the pedagogical and learning outcomes that result from the teaching and learning process.

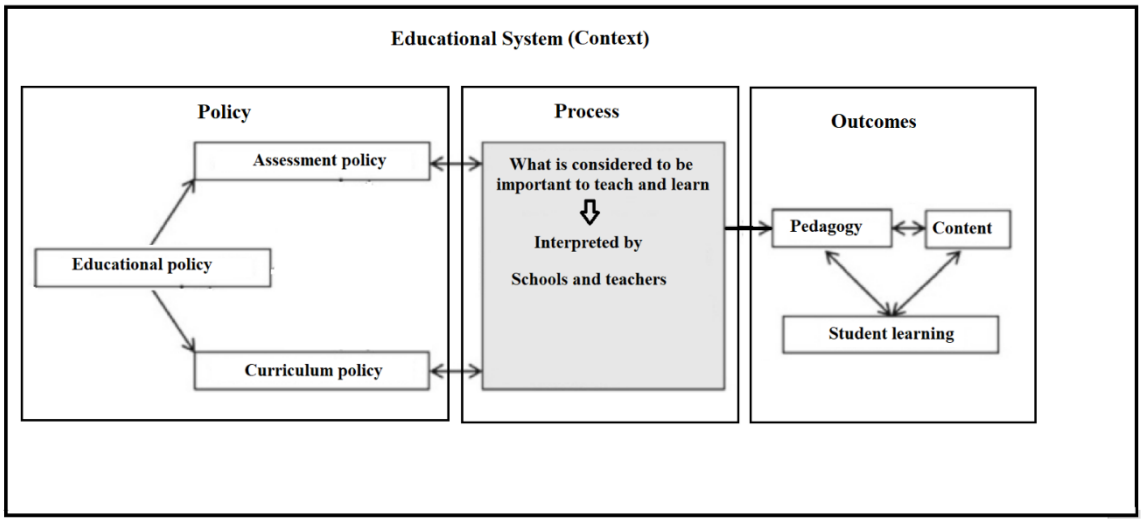


Figure 2.6 Interaction between assessment, pedagogy, curriculum and policy (Adapted from Corrigan et al., 2013, p.3).

Figure 2.6 illustrates the reciprocal relationship between elements of policy and process. Educational policy includes guidelines for both assessment and curriculum, determining what is considered to be important to teach and learn in a top-down process. The policy as written influences teachers' pedagogical decisions and the implementation of curriculum in the classroom. Teachers' responses to assessment policy and enactment of assessment in the Biology curriculum are substantially influenced by their understanding of the policy and aims of curriculum and their beliefs about the nature and purpose of assessment, (the grey box). Hence teachers' perceptions of the assessment policies and the values that determine how they interpret and embed them within their practice are a central concern of this study. The student learning outcomes referred to in the Figure relate to the skills, knowledge and attitudes of students following educational interventions (e. g. Pholboon et al., 2015; Hagger and Chatzisarantis, 2016). Pedagogy and curriculum content mediate students' learning achievements (see for example, Lingard, Mills, Hayes, 2006; Hayes et al., 2006).

2.8 Conclusion

A critical review of relevant assessment literature helped me to identify a gap in previous studies and to design this study. The review indicated that educational assessment has a critical role to play in raising educational standards and enhancing the learning experience. The importance of FA in assessment research creates a convincing argument

for assessment for learning (Sadler, 2010; Black and Wiliam,1998; Torrance; Pryor,998). Section 2.3 connected educational assessment with learning theories, for example theories on motivation, Kolb's (2015) learning cycle and Bernstein's (2000) classification and framing theory to provide a theoretical framework for the analysis of data and discussion of findings, so that the research is sensitive to its context. Previous research on Biology assessment policy in Oman from the point of view of policy-makers and considering its impact on practice is limited. This study focuses on how assessment as written (assessment policy) is enacted by teachers and perceived by students.

In addition, the study explores the necessary conditions for effective assessment and feedback strategies in post-basic Biology. Learning is a central part of education and the ability to evaluate and enhance students' learning is key to effective assessment practice. Teaching and learning processes are complex and require deep and critical reflection on practice as a central feature of effective learning (Corley and Eades, 2004) for teachers and students (Kolb, 1984, 2015; Dewey, 1933). More generally, critically reflective and reflexive learning are regarded as vital to lifelong, or life wide learning.

Chapter 3. Methodology

3.1 Introduction

This research examined Biology assessment policy and practice in PBE in Oman. Chapter Two reviewed the relevant literature to highlight the main arguments regarding educational assessment and identify the gaps in previous studies. This chapter provides a rationale for the methodology adopted in this study, and describes the research approach that was adopted i.e. the case study approach. It highlights the design of the study, the research gap it attempts to address, the methods used to conduct the research. It also discusses the reliability and validity of the data collection methods, explores ethical considerations and the limitations of the study.

3.2 The rationale for the research focus

The phenomena of assessment processes in the context of the Omani PBE system forms the key focus of this research. The literature review suggested that there had been little research on the phenomenon of Biology assessment in the Omani context at different levels, with respect to the role of policy makers (policy formation), teachers (classroom practice) and students (lived experiences and perceptions of those who are assessed). There has also been a paucity of empirical research about the impact of assessment practices on students' perceptions of classroom assessment (Harlen and Crick, 2003; Al Kharusi, 2007).

Social and educational research should be persuasive, purposive and positional (Clough and Nutbrown, 2007). A thorough search of books, articles and on the Web suggested that the phenomenon of the new Biology assessment programme in PBE in Oman had barely been researched as I embarked on this study. This research therefore set out to bridge this gap by enhancing understanding of the interrelationship between the intention of the assessment policy, what teachers do in enacting it and how students experience it. It is hoped that this study enriches the existing literature by addressing various aspects of the assessment phenomenon in the Omani educational context, throwing some new light on how the concept is perceived in Oman.

Much of the research associated with assessment issues in Oman has neglected to investigate the impact of the top-down approach on assessment. In my professional role, as a Biology supervisor, I noted that many Biology teachers in Nizwa did not appear to be

evaluating either the homework or the laboratory tools according to the guidance provided in the Student Assessment Handbook. There appeared to be a gap between the assessment document's instructions and the teachers' assessment practices. These factors motivated my interest in researching the issue of assessment processes in the Omani educational context.

This study adopted an exploratory case study design to obtain insights into assessment in the Omani post-basic Biology context. This phenomenon is investigated by considering the following questions:

Main question:

How is the 2015/ 2016 written Biology assessment policy in PBE in Oman enacted by Biology teachers and perceived by students?

Sub-questions:

1.1 How do teachers in Nizwa schools in Oman enact and perceive assessment?

1.2 How do students in Nizwa schools in Oman perceive assessment?

The research questions were designed to draw on the voices of key stakeholders including policy makers and the writer of the assessment document, Biology teachers involved in the study and their students. Investigating both teachers' and students' perceptions and experiences as users of assessment policy and guidelines addresses a gap in understandings of the reality of Biology assessment in Omani public schools. The study attempted to reveal the differences (if any) between the intentions of the assessment policy and the enactment of it. In order to illuminate the phenomenon, the exploratory case study approach was designed to gather data from various key stakeholders: policy makers, Biology teachers and students (Tittle, 1994).

3.2.1 An exploration of the phenomena of assessment as written, assessment as practiced and assessment as experienced.

To address the research questions, an exploratory case study approach was designed and data collected from people in different positions: policy makers (including assessment policy writers), Biology teachers (as doers or agents for assessment practices in the classroom) and students (as people who experience the process of assessment). This interest is motivated by the debate concerning the effectiveness of the assessment process

in education which involves a communication system between students and their teachers (Dhindsa, Omar and Waldrip, 2007; Torrance and Pryor, 1998). The study explores the phenomena of assessment as written, assessment as practiced and assessment as experienced. The fundamental aim of this study is about exploration as opposed to testing a theory (Yin, 2014). Through theory-testing research, one can make generalisations. Generalisations, in case studies, are 'fuzzy' and carry an element of uncertainty (Bassey, 1999). (please see section 3.5.1).

Based on my reading of the literature and previous professional experience, I expect that there will be a gap between the intention of the assessment policy, teachers' practices as they enact the policy, and students' experience of assessment. This assumption led to the approach taken to investigate factors that influence the implementation of the assessment policy (taking account of the views of policy makers), and how it is perceived and enacted by key stakeholders (the participating teachers and students).

3.3 Philosophical underpinnings and research design

The case study is one of several ways of conducting social science research (Bryman, 2012). How researchers explore the nature of a social phenomenon is determined by their assumptions about it (Burrell and Morgan, 2016). There are two philosophical underpinnings of social research: ontology and epistemology (Bryman, 2012). The former deals with the nature of the social world that may confront us, and the latter relates to how knowledge is generated about the reality of the phenomenon as we perceive it (Anderson and Arsenault, 1998). The methods that are adopted within any study depend on the stance taken by the researcher. Considering the particular objectives of this research, the study used an exploratory case study design (section 3.4).

The ontological standpoint of this study is constructivism because the meanings of the social phenomena are constructed in the day-to-day interactions with and between the participants or stakeholders (Burton and Bartlett, 2009; Cerbone, 2006) and these meanings are frequently changing (Bryman, 2012; Burton and Bartlett, 2009). Holding this position, my view of social phenomena is not external facts, i.e. beyond my reach or influence. It is actually socially constructed through social interaction within the educational environment. As research in education, this research is more subjective rather than objective, investigating the direct experiences of different participants in the

educational assessment system and attempting to shed light on the subjective meaning of educational activities (Burton and Bartlett, 2009).

The epistemological position is interpretivism, which involves looking for explanations within participants' consciousness and understanding of the world (Burrell and Morgan, 2016). These interpretations are subsequently explained by the researcher in the light of literature and theories related to the discipline (Bryman, 2012). This interpretive explanation promotes understanding by placing what requires explanation within a specific social context that have a meaning system (Neuman, 2014; Robson, 2002). In other words, human feelings, thoughts and behaviour are, to some extent, determined by their context. This highlights the importance of studying the way people operate in their context since their behaviour, feelings and thinking can only be understood by getting to know their world and what they are trying to do in it (Gillham, 2000). This approach is widely used in qualitative research (Neuman, 2014) and suitable for the study of people's perceptions on their social world because it focuses on their subjective and personal experiences. These ontological and epistemological perspectives have an influence on the development of the methodological approach adopted and thus justify the use of the case study design, which helps to dig deep into the participants' understandings and interpretations of the phenomenon of Biology assessment.

In this research, Omani educational assessment is a real social activity. However, different participants may have different perceptions towards this phenomenon. Hence, exploring participants' experiences and perceptions of assessment helps to understand how they construct this activity (assessment).

3.4 The Case Study

This section discusses the concept of case study and justification for conducting case study research. The case study design studies phenomena in real contexts and defines the boundaries of the research context (Cohen, Manion and Morrison, 2011). In order to define a case study, the concept of the case should first be understood. The 'case' could be defined as a phenomenon embedded in its context which cannot be examined outside of its real world (Yin, 2014; Miles and Huberman, 1994; Gillham, 2000, Ragin, 1992; Kwak, 2016). The case (unit of analysis) could be a student or a teacher or a classroom of students or a school or an innovative programme. "The case is a specific, a complex, functioning thing" (Stake, 1995, p. 2). Hence, a case study is a design which investigates

single or multiple examples or cases to seek different kinds of evidence which exist in the case setting (Flyvbjerg, 2006; Gillham, 2000; Stake, 1995; Yin, 2014). The researchers in case study research enter the scene with an interest in learning how people (actors) and programmes function in their ordinary milieus (Stake, 1995). The strength of the case study method is its ability to investigate, in-depth, a "case" within its "real-life" context (Yin, 2006).

In my study, educational assessment is regarded as a social activity created by the interactions of individuals and the design of the study was intended to illustrate the varying perceptions that those individuals may have towards this issue. The case study design adopted here to explore this phenomenon enables me to get under the skin of events regarding educational assessment as a phenomenon that is socially constructed (Leat, 2015) by social agents– the policy makers, teachers and student participants (Coe, 2013; Khandan, Fadaei and Vasfi, 2015). To build an in-depth interpretation of its complexities, particularly the relationship between assessment policy and both teachers' enactment and students' perceptions of it, two post-basic schools were chosen to represent the case in the Omani context, where a new PBE system had been introduced in 2007/ 2008.

The case study design was chosen because it recognises the importance of contexts and allows the flexibility which is needed for the dynamic processes involved (Bell, 1999; Yin, 2009). Furthermore, the case study design was appropriate as the researcher has 'little control over events' (Hitchcock and Hughes, 1995, p. 322). During the data collection, I accessed some Biology lessons that were expected to involve classroom assessment, to observe the assessment process in practice. With the permission of the teachers, students and their parents, teachers and students participated in my research. As case studies are arguably prone to problems of researcher design, observer bias and subjectivity, I employed a number of data collection methods including a questionnaire, semi-structured interviews, focus groups and documentary analysis. This facilitated the opportunity to build the study.

3.5 Data collection

The data collection occurred during the academic year 2016/ 2017 in two Nizwa schools in the Interior Governorate in Oman. The data collection instruments were applied to address the different research questions focusing on assessment in its context and

exploring how the new assessment policy had been enacted and perceived. In this study, data was collected in natural settings, such as observing teachers and students during teaching and learning activities; observing how Biology teachers enacted the assessment system in the classroom (Shavelson and Towne, 2002; Yin, 2006; Yin, 2018); looking at student work, CA tools and results.

3.5.1 The units of analysis

This research adopts an exploratory case study design involving multiple units of analysis (Yin 2014). The unit of analysis (the case) or bounded system (Bassey, 1999) could be an individual person (such as a student or a teacher), a classroom, a whole school, programme or specific event (Yin, 2014, 2018; Cohen, Manion and Morrison, 2011). The overall case under investigation is Biology assessment practices in the post-basic public education context of Oman. Within the case are smaller embedded units of analysis including policy makers (the Assistant Director General for Evaluating Achievement and the writer of the Biology assessment policy document), Biology teachers and students in PBE. Table 3.1 below shows the different units of analysis used in the study and the concepts and themes being investigated.

Object of interest (units of analysis)		Methods of data collection	Themes investigated
Policy makers level • Assistant Director General for Evaluating Attainment Achievement • The writer of the Biology assessment document ↓ influence		*Documentation *Semi-structured interviews	*How assessment policy is written. *How the implementation process is secured. *Perceptions of the assessment idea. *Initiatives that operate in the Omani educational assessment system *The challenges for effective implementation of assessment
School level	Teachers level • Male Biology teachers • Female Biology teachers	*Semi-structured interviews *Non-participant classroom observations	*How they implement assessment in the classroom * Perceptions of the assessment concept

Object of interest (units of analysis)		Methods of data collection	Themes investigated
	↓ influence		
	Students level • Male students • Female students	*Questionnaire *Focus group interview	Perceptions of the Biology assessment idea and practices

Table 3.1 Units of analysis

Out of nine post-basic schools in Nizwa city (five female schools and four male schools), the study focuses on just two of them: one boys' school and one girls' school. These schools were selected because they were both from the same geographical location (Nizwa) and the family background of the students in both schools was fairly similar. In addition, the schools were known to the researcher who had visited them in a professional capacity as a Biology supervisor. This meant that access to the schools was straightforward due to the established professional role of the researcher within these schools. The rationale for this was to seek to understand the impact of the introduction of the new assessment system on teachers' approaches to assessment practices and students' perceptions of the assessment system.

This study adopted a qualitative dominant mixed methods approach (see Torrance, 2012a). The research instruments complemented each other when used together (Klingner and Boardman, 2011; Feuer, Towne and Shavelson, 2002; Kelle and Buchholtz, 2015). Regarding the quantitative part of this research, a questionnaire provided preliminary quantitative data about students' perceptions of Biology assessment. It investigated the similarities or differences between the thinking of the male and female students, and therefore informed the approach to the qualitative studies within the boys' and girls' schools. Moreover, this instrument provided general data about students' perceptions of assessment that helped in forming the interview's questions. The qualitative component was the main data collection approach (Bryman, 2016). The study involved three smaller embedded units of analysis (stakeholders) (Table 3.1). They were assessment policy makers, Biology teachers and students. The table presents the approach taken in my study.

It is worth mentioning that in this sense, the case study does not include a representative sample (Cohen, Manion and Morrison, 2011) and the goal is to expand theories (analytic generalisations) and not to extrapolate probabilities (statistical generalisations) (Yin,

2014, 2018). My units of analysis were not "sampling units" as they were too small in number to represent the larger population (all post-basic schools) (Yin, 2014). The objective, here, was to capture the conditions and circumstances of an everyday situation, to yield insights into how the assessment system in Oman as written, was enacted and perceived. It sought to provide insights into the relationship between assessment policy, Biology teachers and students.

3.6 Methods and procedures (instrumentation)

Clearly some methods will be better than others to address certain types of research questions (Feuer, Towne and Shavelson, 2002). The choice of methods for this study was clearly linked to the research questions being studied and the problem under investigation and its milieu (Flyvbjerg, 2006; Hayes et al., 2006). The study collected data from the following sources: a preliminary questionnaire to students; semi-structured interviews with policy makers and teachers; focus group interviews with students; classroom observation and documentary analysis. The questionnaire was used to inform the interviews with policy makers, teachers and students. Triangulation was achieved through the use of different sources of information in order to form themes or categories in the case study (Creswell, 2003; Leat, 2014; Yin, 2014).

3.6.1 Piloting

Both the English and the Arabic versions of the questionnaire were sent to an academic lecturer in one Omani college, who is an expert in educational assessment and in both English and Arabic languages. The statements in some items of the questionnaire were changed accordingly. Then the Arabic version was sent to three Biology teachers who were asked to check the concepts and terms of the questionnaire according to the vocabulary and terms used in their schools. They gave some feedback that prompted the researcher to change some terms and vocabulary (See appendix S). For the questionnaire, a pilot study was conducted before the actual study was organised to see whether or not the students understood the items and if they had any queries about the questions. Six male students and six female students participated in the pilot study by answering the questionnaire (Ref. field notes). This group size was considered optimal to save effort and time for the investigator (Yin, 2014; Hertzog, 2008; Beebe, 2007). Prior to data collection, a pilot teacher interview was conducted with one of Biology teachers as an initial run-through of the procedures to be used in an investigation (McLeod, 2007;

Turner, 2005; Beebe, 2007). The interview was recorded. The researcher listened to the interview later in order to check whether anything was missed in the interview. One student also participated in a pilot interview. She was my niece, who was in Grade 12.

3.6.2 Questionnaire

In this research, students' perceptions of assessment were assessed with a 30-item questionnaire. The questionnaire was designed to collect preliminary information on the students' perceptions of Biology assessment which informed the development of a protocol for student focus groups. It provided useful data to demonstrate the similarities and differences between the thinking of the male and female students, and prior to the further data collection in the boys' and girls' schools. Ezzy (2002) suggests that preliminary data analysis during data collection results in both sharpening the focus of the research and guiding the data collection process by the emerging interpretations of participants.

This instrument (the questionnaire) was constructed by Cavanagh et al. (2005). The questionnaire employs a four-point Likert response format for each item (Strongly Agree, Agree, Disagree and Strongly Disagree). The researcher administered the questionnaire himself. When filling in the questionnaires, some students asked questions to clarify that they understood the questions responses. They read the questions carefully and then ticked the responses according to what they perceived was relevant. Table 3.2 describes the student sample which consisted of 44 grade 11 and 52 grade 12 students.

Gender	Sample Size		
	Grade 11	Grade 12	Total
Male	21 out of 55	23 out of 43	44 out of 98
Female	23 out of 74	29 out of 68	52 out of 142
Total	44 out of 129	52 out of 111	96 out of 240

Table 3.2. Description of student sample answering the questionnaire

3.6.3 Semi-structured Interview

Qualitative interviews are a useful method of data-gathering in qualitative-dominant research. The interview as a directed conversation or face-to-face contact calls for a reflexive approach in which diverse viewpoints can be considered (Burton and Bartlett, 2009; Alvesson, 2011; Charmaz, 2006). The semi-structured interviews conducted during

this study explored in more depth some of the significant issues that were found in the questionnaire responses. This research utilised interviews as the main data collection tool. Interviews could be used when in-depth and detailed responses were required and the number of respondents was limited.

Although assent had been granted for the interviewees to participate, the participants were informed about the purpose and procedure of the interview and they were informed that they knew they had a choice to participate or not, that they knew they could withdraw if they so choose. The Student Assessment Handbook was used as a written stimulus to overcome some barriers to productive interviewing and to encourage participants to talk about their ideas (Barton, 2015). This was intended to reduce the power imbalance between respondents and interviewer, and enhance the ability of participants to develop their ideas and responses. The success of these techniques "is inseparable from other characteristics of good interviews, such as researchers' rapport with participants and their ability to encourage conversation" (Barton, 2015, p.199).

Part of the interview was conducted in the education directorate in the Interior Governorate. This directorate is my workplace, which rendered me an insider researcher conducting research in my own work environment. This helped in building a good rapport and trust in the interviews and facilitated conducting of the interviews. Access to the participants was relatively straightforward and saved considerable time. However, Burgess et al (2006) state that being an insider researcher carries a risk of bias towards participants and might compromise the validity of the collected data. In addition, there might be a danger of respondents saying what they thought the researcher would want to hear. In order to overcome this issue, the Students Assessment Handbook and the interview protocol (Appendices U and V) were used as guides to the interview.

A total of six semi-structured interviews were conducted. These were undertaken at the Directorate-General of Educational Evaluation and the Directorate-General of Education in the Interior Governorate. It was difficult to conduct focus groups here because it was difficult to bring together the different MoE personnel. Moreover, the number of interview participants was limited, i.e. one policy maker (There were three members of the group of directors who run the Directorate General of Educational Evaluation. Two of them declined to be interviewed), one Biology assessment writer (AW) and four Biology teachers. The teachers were chosen from two post-basic schools (see section 3.5.2),

together with students from their classes, to participate in this study. The teachers were chosen because the teachers were keen to be involved in the study and were cooperative with the researcher. In addition, the participant teachers were known to the researcher who had visited them in a professional capacity as a Biology supervisor. I had built professional relationships with the participant teachers prior to the study.

In order to build trust between the researcher and the participants (see Wellington, 2015), on first meeting a policy maker, AW and teachers regarding the study, I explained the purpose of the study and outlined my interest in developing an understanding of the assessment system in Oman through gaining insights into their practice. The participants know me as a Biology supervisor and previous Biology teacher, so I felt that my position was clear. Although building trust was fundamental in the study, it was required to maintain critical and professional distance. Therefore, I kept a research diary (Hammersley and Atkinson, 2007) and I discussed issues of objectivity within the study with my supervisors.

The number of participants in case study research is not determined by complex statistical formulae, but by the whole of the research agenda and satisfaction with the understanding of the multi-faceted phenomenon studied (Rubin and Rubin, 2012; Neuman, 2014). Thus, the sample for my research adhered to a non-probability approach (or purposive sampling approach) in which specific groups of participants are targeted despite the fact that they may not necessarily be representative of the population. This is because the main aim of the study is not to generalise findings but rather to provide an in-depth exploration of the assessment system phenomenon in the Omani context.

The purposive design in this exploratory case study seeks participants who meet certain criteria (Ezzy, 2002) and act as key informants who are knowledgeable about the topic being explored and represent a range of perspectives to give the study depth and balance. To meet these criteria, the research participants included people who had expertise of educational assessment and involved different levels of stakeholders to explore their perceptions of the assessment system. In my study, the semi-structured interview participants were drawn from different educational level, either those involved in decision making concerning assessment reform or Biology teachers who enact this reform. Similarly, the focus group sampling followed a purposive sampling approach in which Biology students were selected from the same schools as their teachers were.

The semi-structured interviews were conducted in Arabic. All the interviews were tape-recorded (with the consent of the interviewees) and transcribed for analysis to generate chains of evidence. During the data analysis stage, the data was managed in both Arabic and English. However, parts of the transcripts in Arabic were literally translated to English when used as quotations or to supplement input from other participants.

It is good practice after an interview to take the report back to the interviewees so that they can agree that they are correct records and that they are willing for their report to be used in the research (Bassey, 1999). Therefore, after conducting the interviews, the transcripts were given to the teachers so that they could agree that these were accurate records of the interviews. Similarly, the transcripts of the focus groups were given to the groups of students so that they could endorse that these were a true statement of the discussion that had occurred.

3.6.4 Focus Groups

Focus groups or group interviews involve a small group of people discussing a specific set of issues or topics supplied by a researcher (Morgan, 1997; Arthur et al., 2012). They can reveal how perceptions and attitudes are formed by individuals within a group situation where different and similar views are exchanged through conversation (Holbrook and Jackson, 1996). The key feature of focus groups is that they are interactive, both the group opinion and the individual opinion are important. Reasons to select focus groups over interview include the desire for multiple perceptions of classroom assessment in an interactive discussion and the practical dimension as focus groups are a speedier way of conducting interviews than interviewing many individuals (Arthur et al., 2012; Cohen, Manion and Morrison, 2011).

The focus groups participants were selected from two post-basic schools (one male and one female) in Nizwa. The participating students were selected by their Biology teachers according to their academic levels in Biology: excellent students, average students and weak students. The focus group method was used to explore students' experiences, attitudes, feelings and perceptions about Biology assessment (Appendix W).

Focus Group Name	Academic/ ability level			Total No. in group
	Strong Students	Average Students	Weak Students	
Students (11M)	4	4	4	12
Students (11F)	4	4	4	12
Students (12M)	4	4	4	12
Students (12F)	4	4	4	12

Table 3.3 Focus Group Participants

(11M= Grade 11 male, 11F= Grade 11 female, 12 M= Grade 12 male and 12 F= Grade 12 female).

Four focus groups were conducted, each group consisted of 12 students from different ability levels (see Table 3.3). The time was chosen so that students did not miss lessons which were important to them and so they would feel comfortable. The focus groups were held in the laboratory or in the learning resources room. The focus groups lasted one lesson (about 40 minutes). The researcher himself was the moderator or facilitator of the focus groups. These focus groups highlighted some of the major assessment-related practices in the Omani education system. The rich exchanges of talk uncovered the students' real encounters with assessment practices as well as presenting a variety of experiences and concepts concerning the topic, such as personal opinions on how assessment was implemented in the Omani context.

3.6.5 Non-participant observations

Observation offers a researcher the opportunity to collect live data from naturally occurring social circumstances (Cohen, Manion and Morrison, 2011), and therefore observation has the potential to yield authentic data. The main aim of using this method was to gain an understanding of the practice of the Biology teachers regarding both SA and FA in their natural settings, and how students responded to it.

In this research, as the observer I was already known to the teachers. This might mean that teachers were either more at ease because they were used to my presence in their classrooms or their behaviour had been influenced by what they thought I would expect to see or hear. The semi-structured observation was chosen because this approach is typically open, but can focus on issues to observe in order to gain rich relevant data (Cohen, Manion and Morrison, 2011).

During the data collection phase, six classroom observations were conducted for each school, that is, three observations for each teacher in order to avoid different untypical lessons. Observations of classroom assessment at work are extremely useful aids for understanding the actual uses of assessment and any problems being encountered (Yin, 2014). Observations of the assessment process were useful following teachers' in-depth interviews. The research technique involved interviewing teachers before conducting the classroom observation in order to observe the differences between their views and practices, then they were interviewed again to discuss any apparent differences between words and deeds (Charmaz, 2006). During the visit to each school, classes in Biology were observed for about 40 minutes each. Three classroom observations per teacher were scheduled over a two-month period to observe how classroom assessment was conducted in Biology lessons (Mok, 2011). To enable an effective data analysis, all the observed lessons were audio- and/ or video-taped (after getting written consent of the parents, teachers and students) (see Appendices E, F and G).

Time was spent with the teachers before the observation in order to build trust and understanding. During the lessons, I sat taking notes of what was said and done and the lesson was recorded on a digital recorder. The focus of the observation was on how the teacher carried out both formative and summative assessment and how they gave feedback on the students' work. With regard to students, the observation noted how often the students asked their teachers for clarification on topics in the lesson and how often they assessed themselves and their peers.

3.6.6 Documentary analysis

Documents are extant texts. The researcher does not affect or alter their construction. They are treated as data to address research questions (Charmaz, 2006; Oczkowski et al., 2018). The justification for using such documentary analysis was that it provides the researcher with a rich vein of analytical topics and a valuable source of data. Analysing the assessment document promotes the critical analysis of its content and the evidence it provides.

In this research, the Student Assessment Handbook for Science (grades 11 and 12) (MoE, 2015) was used as a source of data alongside interviewing its authors (one policy maker and one AW). In Omani schools, each teacher has a copy of the assessment document (the Student Assessment Handbook for Science). There was no other assessment

document that was produced by the school leaders. Each subject in the school had its own assessment policy document (the Student Assessment Handbook). The head of the subject (senior teacher) was responsible to ensure that all his teachers had this policy document. The Biology teachers referred to the Student Assessment Handbook when they wrote their lesson plans so that they assessed the performance of their students in accordance with criteria specified in the handbook (Ministry of Education, 2008a).

3.7 Triangulation of multiple sources of evidence

In triangulating methods, sufficient data are collected from different sources for researchers to be able to analyse significant features of the case completely and to interpret what is explored for discussion (Bassey, 1999). Using multiple sources of evidence and triangulation of data strengthened the case study evaluation (Yin, 2013). The findings were triangulated through cross-checking the interpretations of the facts with key informants (Vellema et al., 2013) to develop converging lines of enquiry (Yin, 2014). In this case study, the triangulation of the data was achieved through the gathering of multiple perspectives on the assessment process: questionnaires, interviews, observations and document analysis. These different sources of evidence were analysed to present a logical case study of assessment practices in Omani post-basic schools (Yin, 2014).

3.8 The process of data analysis

In case study research, the process of analysis is one of the most difficult aspects of the study due to the large amounts of qualitative data (Yin, 2014; Wellington, 2015). Therefore, the starting point of the process of analysis was a careful reading of the data in order to become familiar with it and identify broad trends or themes (Neuman, 2014). Compared to the vast volume and variety of qualitative data, quantitative data is precise, and standardized.

The quantitative data was analysed by using descriptive statistics in IBM SPSS Statistics as this study sought theoretical generalisations rather than the statistical generalisation of findings. In addition, the purposive sample did not permit analytical statistics and statistical generalisation of results. The dependent variable was students' perceptions of the classroom assessment tasks in terms of congruence with planned learning, authenticity, pupil consultation, transparency and diversity. Whereas, there were two independent variables: the gender and the class grade. All variables, except for gender

and class grade, which were nominal scale variables (1= male and 2= female; 1= grade 11 and 2 grade 12), were ordinal scale variables (using Likert Scale). The analysis and findings of the quantitative data were used as a preliminary phase to inform the analysis of the qualitative data. The questionnaire was designed to collect preliminary information on the students' perceptions of Biology assessment which informed the development of a protocol for student focus groups. It provided useful data to demonstrate the similarities and differences between the thinking of the male and female students, and prior to the further data collection in the boys' and girls' schools.

The qualitative method of thematic analysis was employed. This approach allows the emergence and exploration of new themes. The thematic analysis was supported with quotations from respondents' data. Word for word accounts of the audio interview were initially transcribed in Arabic and then translated into English using both the 'Oxford Dictionary of Education' (Wallace, 2015) and my experience with English language and educational terms. Moreover, computer technology, 'Oxford Advanced Student's Dictionary' with iWriter technique (2010) and 'Cambridge Advanced Student's Dictionary' With CD-ROM (2013) were found useful in translating from Arabic. Both transcriptions were read and analysed for initial open codes. Once the initial codes were defined, all codes and patterns that dealt with a wider theme were grouped together for axial coding. At this stage, both the observational notes and document analysis were used to help triangulate participants' responses as well as to identify emerging patterns and themes (see for example, Lawson and Alameda-Lawson, 2012).

The data were organised manually into categories based on emerging themes. Despite its suggested benefits in qualitative data analysis, computer-assisted data analysis (CAQDAS) was not practical for this study because the use of two languages (Arabic and English) in gathering and handling the data made it difficult to employ computerised software. NVivo (version 10) does not support Arabic language. Such programme is generally suitable for content analysis including offering word counts and does not serve thematic analysis, which requires in-depth consideration of meaning (Seale, 2013). The themes were manually analysed. Each theme included the respondents' input concerning the concept and highlighted the participants' thoughts and relevant documents. This coding took the form of a table.

My identity as a researcher could shift and develop during this study and these changes influenced the ways in which data was collected and interpreted. In addition, the analysis of data might be affected by the researcher's personal feelings (Jackson, 2003) and his/ her assumptions and backgrounds (Pang, 2018; Jackson, 2003). Therefore, the research needs to be reflective so that the researcher can uncover his/her deep-seated thinking, views, and conduct. The use of different instruments of data collection helped to probe the reality and avoid the researcher's bias.

3.9 Ethical considerations

The ethics of research are critically important for work intending to contribute something to society. I followed the ethical guidelines for educational research (BERA, 2011) throughout this research. The guidelines emphasise the need for voluntary informed consent and the right of each participant to withdraw. On the issue of privacy, according to the BERA (2011) guidelines, participants' data must be treated confidentially and anonymously. 'Educational researchers must take into account the effects of the research on participants; they have a responsibility to participants to act in such a way as to preserve their dignity as human beings' (Cohen, Manion and Morrison, 2011, p. 112). Hence, researchers must balance their demands for the pursuit of truth and their subjects' values and rights potentially threatened by the study.

As a researcher, I may have more power than the participants, be this by age, knowledge or role. I determined the timing, the agenda and duration of the interviews, focus groups and classroom observations, for example collecting what counted as useful data. This was particularly the situation when researching with students, as they were more vulnerable than adults.

In this research, a number of precautions were taken to avoid any ethical problems. First of all, full ethical approval was obtained from the University. Then, in order to gain informed consent, permission from the Ministry of Education in Oman was requested to collect data from 11^{th} and 12^{th} grades students and their Biology teachers in the selected schools (See Appendix D). The written consent of the teachers, students and their parents or carers were obtained (See Appendices E, F and G). The participants were informed that they were not obliged to participate in the study and their responses would remain confidential and anonymous (Alkharusi et al., 2012; Yin, 2014). Participants were able to withdraw at any time.

In order to build trust on first meeting with the headteachers and teachers, the purpose of the study was explained. The position of the researcher was also clarified, in that, although the researcher was a Biology supervisor he was not critic and all information provided would be completely anonymised and would be used for the purposes of the study only and would not be shared with any other body in the government or out of the government. The headteachers and teachers knew about the purpose of the data collection as they were informed previously by the local authority that permission for the study had been given (See Appendix D). Moreover, the policy makers and the writers of the assessment document were informed by the Ministry of Education. During the data collection, the researcher sought to strengthen the bond between himself and the research participants by respecting them "as fellow human beings who are entitled to dignity and privacy" (Bassey, 1999, p. 74).

3.10 Criteria for quality in case study

The concept of trustworthiness in naturalistic research (including case study) was established as an alternative to the conventional paradigm: internal validity, external validity, reliability and objectivity (Lincoln and Guba, 1985, 1986; Guba, 1981). Trustworthiness can be regarded as one of four criteria (with credibility, confirmability and data dependability) that are used to judge the quality of case study design (U.S. General Accounting Office, 1990; Yin, 2014). It can be applied to illuminating respect for the truth in case study research (Bassey, 1999; Lisa, 2007). Yin (2014) has identified the four design tests in almost the same way as that of the conventional style: construct validity (confirmability), internal validity (credibility), external validity (transferability), and reliability (dependability).

Adopting the notion of trustworthiness, I used the terms used by Yin (2014) rather than the conventional terms in this section, e.g. to establish confirmability (content validity), the instrument (the questionnaire) was given to three experts in the field of educational assessment from Sultan Qaboos University and Nizwa Collage of Applied Sciences. This 'panel of experts' (Muijs, 2010) were asked to check the accuracy of the translation and judge the clarity of the language of the content and appropriateness of items for the aim of the instrument. Their feedback was taken into account and some items were changed accordingly. Moreover, the items in the questionnaire were checked by three Biology

teachers who gave feedback on the extent to which these questions would get replies that have meaning.

To establish confirmability in qualitative methods, full explanations of how data would be gathered were given (Burton and Bartlett, 2009). A pilot study was conducted because what the respondents think about the instrument would affect how they respond to the items (Muijs, 2010, p.58; Yin, 2014). A pilot study was carried out for the questionnaire, teacher's interview and student's interview. The instrument was then changed to reflect comments from the participants. In addition, internal validity/ credibility, which is concerned with the relationships between cause and effect, was identified to avoid the threat of spurious effects (Yin, 2014).

Although the validity of the research was taken into account, in case study research the concept of external validity/ transferability, which is concerned with the extent to which the results can be generalised to other contexts, is problematic (Bassey, 1999). Discussion of the targeted phenomenon should provide enough information to enable the reader to evaluate transferability. Transferability refers to the extent to which findings are consistent in similar contexts, so that the findings can help the reader to decide whether the intervention could be applied to their work with similar cases (Lee, Mishna and Brennenstuhl, 2010). In this research, the participants were not randomly selected from a population. That limited the transferability of the case study. However, the research design, the contexts of the case study, the procedures for data collection and analysis were described in detail. This information can help other researchers to decide the extent to which the methods and findings from this research can be applied to other situations.

Credibility refers to the validity within a study and is parallel to the conventional concept of internal validity (Riege, 2003). Research credibility can be defined as "the ability of a research process to generate findings that elicit belief and trust" (O'Leary, 2007, p. 228). Multiple sources of data were sought to increase the credibility of this case study (Lee, Mishna and Brennenstuhl, 2010; Wagar, 2014; Riege, 2003). Regarding confirmability, the data was interpreted and the outcomes were rooted in the contexts of the phenomenon (Omani educational assessment settings).

Dependability (reliability) is concerned with consistency in measurement (Gronlund, 2006; Anderson and Arsenault, 1998; Burton and Bartlett, 2009), minimising errors and biases in a study (Yin, 2014), or whether a study is repeatable (Bryman, 2016). As

mentioned previously, this study adapted a questionnaire from Cavanagh et al. (2005). The instrument was reviewed and trialled with a sample of 658 science students in 11 English secondary schools (Dormana and Knightley, 2006). The scaling was found to have internal consistency reliability (Cronbach coefficient α) ranged from 0.63 to 0.85. and reliability was scored between .60 and .75 which is regarded acceptable and good (Bryman, 2012).

In order to improve the dependability of the qualitative instruments, the procedures followed in this case study were documented, so other investigators were able to repeat the methods. While the qualitative data of this research adhered to these criteria, one factor could mean that some aspects would be different when the research was replicated by another researcher: the interpretation of the results may vary due to the position of the researcher. I reached this study through my experience and the data collection processes on the assessment system in Oman. I interpreted the data in the light of my beliefs, so that my interpretations might be different to those of other researchers trying to use the same methods and following similar instructions. However, to overcome this weakness or intrinsic bias, I used a triangulation procedure (Yin, 2014), searching for convergence among multiple sources of data to form themes in the study. In addition, this study aimed to generate some understanding of the Biology assessment at PBE level and of the thoughts and perceptions of participants regarding this system. Participants' attempts to understanding the world is both a cognitive and emotional process and therefore their views may vary since "participants' thinking is part of the reality" (Soros, 2013, p310).

3.11 Limitations of this study

Like many other studies, this research also has some limitations concern the scope of application and some methodological aspects. The scope of the investigation is limited to a single case due to access constraints. The investigation was devoted to Biology assessment implementation in two public schools in the Interior Governorate, with different stakeholders. Therefore, it is possible that different findings might have been generated by variation in case study sample. This study covers only educational assessment at the PBE level. Other levels of education (e.g. the basic education) could be covered in further research. In addition, a limited number of stakeholders were involved: Biology teachers, students and educational assessment decision-makers (policy makers and an assessment documentary writer) in Oman. Parents and supervisors were not

included because they were not considered direct stakeholders in the study. However, their participation could have informed the educational and social aspects of the proposed assessment framework, an aim which future research can address. The concept of context is also a limitation of the study, which is influenced by several factors such as subject, grade levels and time. When applying findings from this study to other contexts, careful consideration should be given to relevant contextual differences. The case study might not reveal all aspects of assessment in Oman, i.e. the perceptions of the participants of this study may differ from those of other stakeholders. Thus, further aspects could be researched, such as the exam-driven context of Omani educational culture.

The methodological limitations arose from the non-probability sampling. Purposive sampling impedes the generalisability of the research findings. Furthermore, subjectivity and the insider's perspectives of both the researcher and participants might impinge on the findings. Although triangulation was used to attempt to overcome this issue, it is acknowledged that subjectivity and bias can be inherent in conducting interviews and focus groups and in the analysis of the data from interviews and focus groups (Harry, 1996). 'Every result in a qualitative design is one that is an interpretation, subjective; it is influenced by the lens [a priori values] through which the researcher has interpreted the data' (Haven and Van Grootel, 2019).

3.12 Summary

In this chapter, the design of the case study has been described and the rationale for this research design was provided. This chapter also discusses the philosophical underpinnings, which determined the methodology and design. It then described and justified the data collection methods used, the sampling techniques and the analytical procedures adopted and how trustworthiness of the research was approached. In addition, the ethical considerations and the research limitations were discussed. The next chapter presents the findings.

Chapter 4. Data Analysis

4.1 Introduction

This thesis investigates a PBE context in Oman, where a new system of assessment had been introduced. Previous research suggests that top-down reform processes determined by policy makers affect the processes and practices of assessment and accountability to achieve at higher levels (Chuen Huang and Shih, 2011; Craddock et al., 2013). For example, in Oman these processes include the imperative to complete a content intensive and tightly prescribed curriculum and the accountability arising from examination pressures, both affect active learning methods (Leu and Price-rom, 2006).

The preceding chapter discussed the research methodology. In order to explore the case of PBE Biology assessment practice in Oman the research draws on empirical data collected over semester two 2017 from smaller, embedded units of analysis i.e. an assessment policy maker, an AW, Biology teachers and their students in two post-basic schools in the Interior Governorate. Apart from this, the researcher's own personal and professional reflections are included as a source of data. The raw data was analysed in order to answer the research questions. In this process, the data was divided into various integral features and reduced to an interpretable and clear form. Hence, the issues under investigation can be analysed, and conclusions can be drawn. To remind the reader of the research questions, they are written here again:

Main question:

How is the 2015/ 2016 written Biology assessment policy in PBE in Oman enacted by Biology teachers and perceived by students?

Sub-questions:

1.1 How do teachers in Nizwa schools in Oman enact and perceive assessment?

1.2 How do students in Nizwa schools in Oman perceive assessment?

The research questions that formed the basis of the study developed gradually from engagement with a broad range of literature and personal experiences. They are used as a rationale for guiding the analysis and interpretation of the findings. Therefore, it is essential to highlight the relationship between the data analysis and the questions that form the basis of the study (see Figure 4.1).

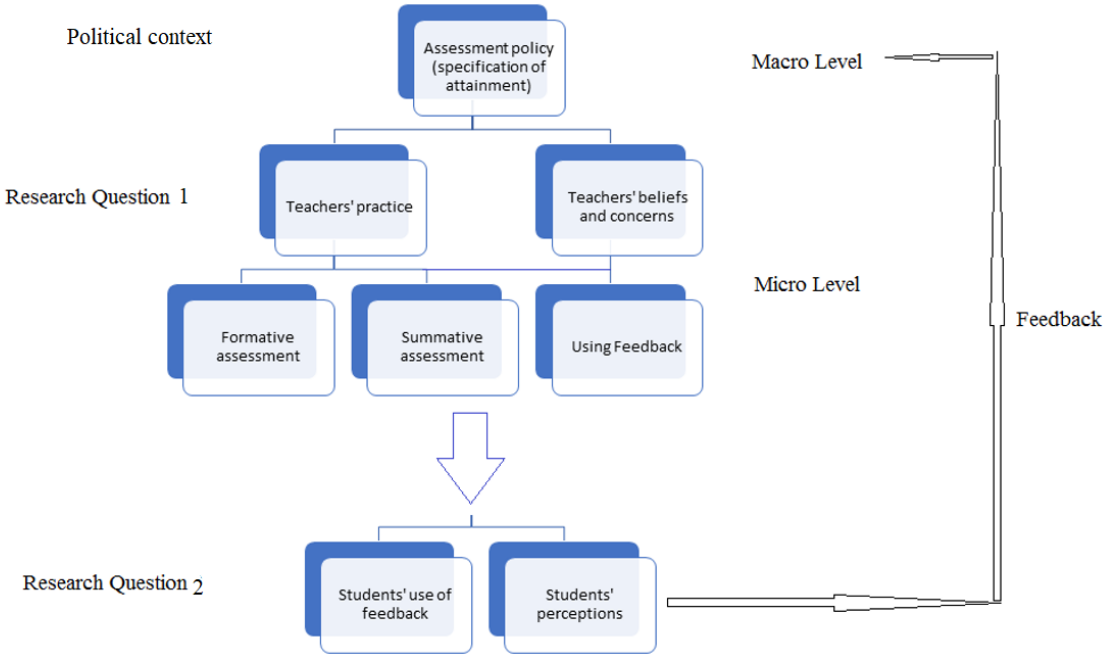


Figure 4.1 The relationship between findings and the Research Questions

In the case of the Omani assessment system, it was found that there was a top-down approach. Teachers' practices of assessment were affected by the decisions made by high officials. Since inevitably students were affected by changes to the assessment processes, their voice was well worth considering.

In order to analyse the main data, the inter-relatedness of different levels of assessment has been presented. The first part presents the use of feedback by students, their perceptions of assessment and the emerging themes relevant to students' perceptions of assessment. The second part (level) shapes the assessment policy context. The political influence of assessment is the driver of teachers' practices, which affect teachers' approaches to formative and summative assessment. The third part focuses on Biology teachers practices of assessment. Given that, there is a direct link between the intentions of assessment policy makers and teachers' practices of Biology assessment in their classrooms.

4.2 Students' perceptions of classroom assessment (preliminary questionnaire)

In this section students' perceptions of assessment are analysed and interpreted quantitatively drawing on the Students' Perceptions of Assessment Questionnaire prepared by Cavanagh et al. (2005) (See Appendix B). Opening the results chapter with the findings from the preliminary questionnaire can then be justified in analysing data in later sections. The

findings from the preliminary questionnaire introduce the perspectives of boys and girls before embarking upon gathering and analysing major data. The questionnaire items probe students' perceptions regarding classroom assessment in Biology. On the scale of 1-4 (Strongly Disagree to Strongly Agree), one option had to be selected by the students. The analysis illustrates that most students' perceptions of assessment were positive. See the following examples.

Regarding the topic 'Congruence with planned learning', in response to the statement concerning how assessment in Biology tests the knowledge acquired by students, there was a high percentage of agreement among students that assessment in Biology tests their knowledge: 59.4 % and 25.0 % agreed and strongly agreed respectively that assessment examines what they know (Table 4.1). Whereas 15.6% (4+ 11/ 96) disagreed. Table 4.1 indicates that both females and males agreed that Biology assessment tests their knowledge.

		Strongly Disagree		Disagree		Agree		Strongly Agree		Total	
		N	%	N	%	N	%	N	%	N	%
Gender	Male	4	9	8	18	28	64	4	9	44	100
	Female	0	0	3	6	29	56	20	38	52	100
Total		4	4.2	11	11.4	57	59.4	24	25.0	96	100

Table 4.1 Assessment in Biology tests what I know

With regard to the second question of the topic, assessment is congruent with planned learning: *Assessment examines what students do in class*, Table (4.2) below shows that most of the students, males and females (75%) reacted positively to this question (35 Agree + 37 Strongly Agree/ 96). The other 25% did not react positively to it.

		Strongly Disagree		Disagree		Agree		Strongly Agree		Total	
		N	%	N	%	N	%	N	%	N	%
Gender	Male	2	4.5	13	29.5	13	29.5	16	36.4	44	100
	Female	2	3.8	7	13.5	22	42.3	21	40.4	52	100
Total		4	4.2	20	20.8	35	36.5	37	38.5	96	100

Table 4.2 Assessment examines what students do in class

Regarding authenticity, students responded positively to the statement '*I find Biology assessment tasks relevant to what I do outside of school'* (Table 4.3).

		Strongly Disagree		Disagree		Agree		Strongly Agree		Total	
		N	%	N	%	N	%	N	%	N	%
Gender	Male	5	11.4	14	31.8	9	20.4	16	36.4	44	100
	Female	3	5.9	9	17.6	23	45.1	16	31.4	51	100
Total		8	8.4	23	24.2	32	33.7	32	33.7	95	100

Table 4.3 Assessment tasks are relevant to what I do outside of school

According to Table 4.3, both boys and girls agree that assessment tasks are relevant to what they do outside of school as approximately 66.6% of them agreed that assessment is relevant to what they do outside of school.

With respect to student consultation, the analysis of statement 3.6 *(I can have a say in how I will be assessed in Biology)* is used as an example. Figure 4.2 below shows that most students responded negatively towards the idea that they can have a say in how they will be assessed in Biology. (See Table 4.4).

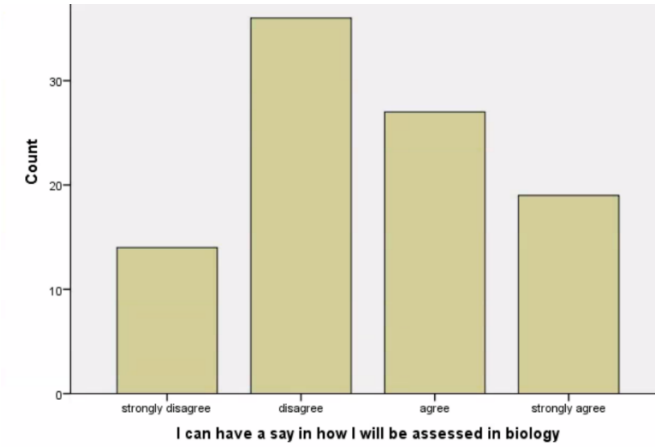


Figure 4.2 students' opinions regarding assessment

		Strongly Disagree		Disagree		Agree		Strongly Agree		Total	
		N	%	N	%	N	%	N	%	N	%
Gender	Male	6	13.6	22	50.0	10	22.7	6	13.6	44	100
	Female	8	15.4	14	26.9	17	32.7	13	25.0	52	100
	Total	14	14.6	36	37.5	27	28.1	19	19.8	96	100

Table 4.4 I can have a say in how I will be assessed in Biology

Concerning transparency '*I know what is needed to successfully accomplish a Biology assessment task*, Figure 4.3 shows that students supported this statement.

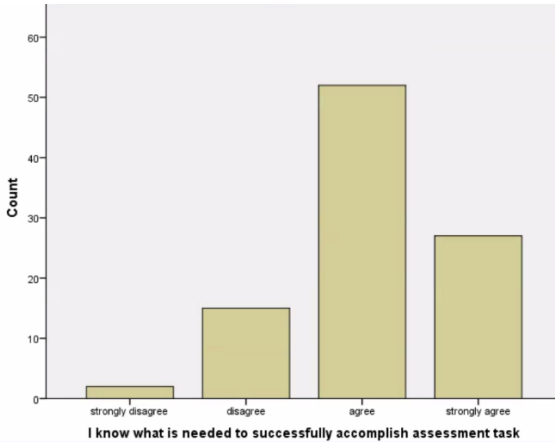


Figure 4.3 Assessment transparency

		Strongly Disagree		Disagree		Agree		Strongly Agree		Total	
		N	%	N	%	N	%	N	%	N	%
Gender	Male	2	4.5	10	22.7	24	54.6	8	18.2	44	100
	Female	0	0.0	5	9.6	28	53.9	19	36.5	52	100
	Total	2	2.1	15	15.6	52	54.2	27	28.1	96	100

Table 4.5 I know what is needed to successfully accomplish a Biology assessment task

Table 4.5 shows that both females and males agreed with respect to this variable. Regarding students' chances of completing assessment tasks, it can be inferred that the

majority of students 36.4% and 45.8% agreed and strongly agreed on the given statement respectively. (Table 4.6).

		Strongly Disagree		Disagree		Agree		Strongly Agree		Total	
		N	%	N	%	N	%	N	%	N	%
Gender	Male	0	0	6	13.6	18	40.9	20	45.5	44	100
	Female	4	7.7	7	13.5	17	32.7	24	46.1	52	100
Total		4	4.2	13	13.5	35	36.5	44	45.8	96	100

Table 4.6 I have as much chance as any other student at completing assessment tasks

All in all, the analysis illustrates that there were apparent similarities between the thinking of the male and female students. Both boys and girls positively responded to the perception questionnaire items, and therefore, validating my approach to combining the studies of the boys and girls schools.

4.3 Biology assessment in PBE (document analysis)

Assessment document analysis was used to establish the context in which assessment of students' achievement was conducted in Oman. It presented the official perspective and decision-making process. In this research the Student Assessment Handbook for Science grades 11 and 12 (MoE, 2015) was used for the analysis (hereafter referred to as Assessment Handbook).

This handbook was written by a team of science assessment members and based on the official guidelines for assessment issued by the Directorate General of Educational Evaluation of the Ministry of Education" (MoE, 2015, p.5). The use of multiple assessment tools to gather information about students' achievement levels in Biology, such as exams, short tests, oral work, homework, and practical performance, requires a variety of assessment positions to allow for an objective decision about their achievement. These tools share the final grade expressed in the level of student achievement in science (Total score 100) distributed in grades (11-12) as follows:

Grade	Continuous Assessment	Final Test
11	40	60
12	30	70

Table 4.7 Relative weight of assessment tools

Source: Student Assessment Handbook, 2015

Table 4.7 illustrates that for Grade 11, 40 per cent of course scores are allocated to CA (continuous assessment or ongoing assessment) and 60 per cent to the final test. Whereas, for Grade 12, 30 percent of course scores are allocated to CA and 70% to the final test. The document was centrally issued by the Directorate General of Assessment. The following table illustrates the weight of the various assessment tools used to assess students' performance in Biology in grades 11and 12 during the semester in question:

Tools / Grades	Continuous Assessment				Final Exam	Total
	Homework	Practical Performance		Quizzes		
		Practical Activities	Practical test			
11	5	5	10	20	60	100
12	5	5	10	10	70	100

Table 4.8 Weights of assessment tools

Source: Student Assessment Handbook, 2015

Table 4.8 shows that CA comprises homework, practical performance and quizzes. In both grades 11 and 12, the highest scores are given to practical tests (10 percent) and quizzes (20 percent and 10 percent respectively).

4.3.1 Themes in the Assessment Handbook

In analysing the Assessment Handbook, the focus was on thematic analysis, the context in which the documents were produced and the generation of common themes to compare and contrast the results from different data sources (Rasmussen, Muir-Cochrane and

Henderson, 2012).The following common themes emerged from the Assessment Handbook:

1. Criterion-referenced assessment, in other words, assessment is based on criteria or objectives.
2. Assessment practices are congruent with the teaching process.

4.3.1.1 Criterion-referenced assessment:

The assessment policy in Oman emphasised criterion-referenced assessment (sometimes called 'objectives-based' tests) which aim to classify students according to their ability to reach the level of a task or set of tasks satisfactorily. The test scores are interpreted and reported with reference to a specific content domain or level of performance against instructional objectives. The policy document stated that assessment methods should have the traits of a criterion-referenced assessment:

> "This document was considered to include the objectives of the subject, which should be the starting point for the assessment planning process and the selection of appropriate tools." (Assessment Handbook, p.4).

This quotation shows that assessment policy emphasises the importance of measuring students' mastery of the subject objectives. This topic is stressed in more than one place in the handbook such as: "Refer to the learning outcomes/ objectives of your subject, and choose, to achieve them, the appropriate assessment tools." (Assessment Handbook, 2015, p.5) and "In the course of their ongoing assessment, all teachers should consider linking assessment processes to the learning outcomes or objectives of each teaching subject." (Assessment Handbook, 2015, p.6). Thus, all assessment should be based on achievement of learning objectives in schools.

In this instance, for practical performance, students are assessed by observing and following them up on their activities by focusing on a range of abilities according to the criteria specified to assess these activities (Assessment Handbook, 2015, p. 33, 37). Furthermore, there is a final exam specification which illustrates the content of the textbook, learning level and relative weighting for each chapter (Assessment Handbook, 2015, p.52). (see Appendixes O and P). In this respect the writer of the student handbook (AW) points out the topic of criteria in the assessment (please note that the interviews were conducted in Arabic and then translated into English):

AW: The issue of the criterion was also included in the evaluation of each tool. Then, this topic was introduced to the moderation committee. However, there are questions that measure the output exactly. I set these questions here in advance. These questions will be asked on time, when exactly.

Mohammed: Why are these questions asked?

AW: In order to make sure the outcome is achieved.

Mohammed: What about final exams?

AW: Even the final test. The criteria or learning outputs are specified and determined in advance.

This exemplifies some of the ways in which document writers realise the importance of criterion-referenced assessment in the process of educational evaluation. For the policy makers what constitutes academic success is to meet the specific learning objective of the subject.

Although the 'Student Assessment Handbook for Science' clarifies the criteria for assessing students' performance (See Appendix Q), teachers see that assessing students in practical activities (their performance in laboratory) is not accurate as the students depend on each other in solving the problems. One of the teachers said "They [students] copy the solutions from each other" (Nasir). However, some of them work things out through collaboration and discussion (Ref. Lab. Work Observation of Suleiman). Generally, in this tool (practical activity), there was quite a big gap between how the assessment policy is written and how the teachers enact it. Similarly, the teachers and their students complain that the homework tool is inaccurate because of the possibility of cheating. "Students copy the answers from each other and add a few of their own refinements" (interview with Aida). This may be due to the fact that the Assessment Handbook failed to explain how this instrument should be assessed. It stated that homework is:

> "assignments related to the course, which the teacher instructs the student to perform in his/her free time at home or school and in order to achieve this, the teacher should consider the following:
>
> 1- Informing students about the proposed timeline for submitting this tool
> 2- Assessing a group of students each time" (Assessment Handbook, 2015, p. 29).

The second item above is not clear, and each teacher interprets it according to their own views and therefore, there is a gap in the Assessment Handbook. In this respect, the document writer (AW) shows that:

> "I see that homework should be regarded as a part of FA. That is, among the daily practices in the classroom. As an author of the assessment document, my goal should be to raise the level of the students and to establish their real learning, not to measure surface learning. However, homework is regarded as a part of SA tools because of the insistence of many teachers that homework should be regarded as a part of SA. That is, to give the student a mark on the homework question" (AW).

This quotation illustrates that there is a gap between the intentions of the document writer (AW) and the practices of teachers regarding the homework tool and the writer is aware of this issue. It can be inferred that there is a lack of criteria in assessing this tool. On the other hand, the document writer blamed teachers for misunderstanding their intentions (AW and his colleagues):

> "The problem of assessing homework is that the teacher does not plan it in advance. Here, it is necessary to read the Student Assessment Handbook well, because it explains and clarifies what teachers should do for classroom assessment practices. The problem is also that the goal of both teachers and students is focused on how to gain marks rather than acquisition of learning" (AW).

This potentially indicates an issue of lack of proof of developmental opportunities to implement the policy. This might present a challenge as these data suggest that the teachers have been used to more directives and less professional approaches to assessment implementation. With the provision of the Student Assessment Handbook, the AW expected that teachers would have better opportunities to manage the new changes effectively. However, such a view misinterpreted the situation because he seems to have overlooked the present situation of teachers' professional development.

4.3.1.2 Congruence between assessment practices and teaching process:

This section interprets how the Biology assessment specifications correspond to the learning outcomes. It is linked to the previous section and is complementary to it. It can be noticed that the Assessment Handbook emphasises that Biology assessment tasks focus on covering most of the learning outcomes and therefore, fulfil the requirement of content validity:

> "All teachers should, during their ongoing assessment, consider linking evaluation processes to the learning outcomes or objectives of each instructional subject" (Assessment Handbook, 2015, p. 6).

This citation suggests that assessment should be a part of learning instruction or pedagogy. Clearly, assessment should aim to provide useful information about students' intended learning. Thus, it focuses on the learning outcomes expected of students. Learning outcomes are closely related to assessment as they focus on what the students actually learn and the influence that teaching processes have on their achievement.

> "Assessment of the learning outcomes is based on gathering information, which can be used for both summative and formative purposes" (Ref. Assessment Handbook, 2015, p. 6).

In this excerpt, assessment plays two roles. First, it is used to diagnose learning problems and solve them in order to improve learning. Second, to measure and judge students learning.

> "The assessment process is essentially a translation of the specific objectives/ outputs identified to teach each part of the science course in each class, which in turn translates the general objectives of teaching science in general during the learning stages." (Ref. Assessment Handbook, 2015, p.8).

This quotation illustrates the relationship between assessment and instruction objectives and how the assessment is affected by both general and specific objectives of each subject. The above quotation indicates that the assessment process was connected to learning. There was a demand from assessment policy for students to achieve the required Biological skills and knowledge involved in the curriculum.

Moreover, the assessment handbook emphasises that assessment should be made in a timely manner during the educational learning process and a key part of natural practices during the implementation of day-to-day activities:

> "Remember that when you use the assessment tools during the day-to-day teaching process, you are practicing a continuous FA. This ... means the continuation of assessment and training ... Therefore, assessment and teaching are complementary processes." (Assessment Handbook, 2015, p.14).

This recommendation also applies to quizzes:

> "Quizzes should be administrated as part of normal classes teaching in order to encourage students to continuity of learning." (Assessment Handbook, 2015, p.20).

These ideas are confirmed by the document writer when he says:

> "It is supposed that assessment tools should be integrated into everyday teaching. It is a mistake to isolate the assessment tools from the daily teaching process. Unfortunately, many teachers separate the assessment process from the day-to-day teaching process. For example, when I visited classrooms, I noticed that the assessment was not done in a formal way and was, mainly, disorderly. Public schools lack teachers, who practice the assessment correctly. The teacher lacks professional work" (AW).

In addition, the handbook writer suggested that it is important to link between the assessment tool and the learning objective:

> "It is necessary to reconcile the tools of the assessment with the educational outcome. However, most teachers teach the textbook content. I mean, they don't focus on the teaching outputs. In addition, it is necessary to review the levels of learning and identify outputs when building curricula… The teachers are interested in finishing the content of the textbooks at the expense of giving their students sufficient assessment practice and other teaching work. Therefore, coordination and cooperation between evaluation department and the curriculum department is essential" (AW).

Similarly, the assessment policy maker noted:

> "FA tools, in particular, are not just tools to assess what a student has learned. But, are for learning itself. When the goal is the learning process. You measure and process. You measure and evolve. I mean, a process in which there is no separation between teaching and learning on the one hand. And between the evaluation process on the other hand. This is what I seek." (PM).

It can be inferred from these excerpts (the interviews quotes and quotes from the assessment handbook) that the assessment policy in Oman stresses the importance of regarding assessment as an integral part of the instruction process. The assessment policy reflected good practice. The Student Assessment Handbook for Science (2015) was coupled to a deep understanding of the assessment principles and gave good guidance on techniques for CA that encourage FA. However, in practice it was found that CA was used as a SA, for example when questioned do you assess your students for awarding marks or for learning, Suleiman said:

> "We usually use assessment [short test] to award marks. There are only minor exceptions. In a number of instances, some students are unable to achieve the grades required for success. Here, we use very simple alternatives. For example, you repeat a specific test for him or you may change the same test for the student to improve himself" (Interview with Suleiman).

In addition, I noticed that "the students had a lot of written work in their exercise books but they were not given feedback! The teachers did not see them and give written feedback" (Ref. Classroom Observations).

This issue could be due to the incorrect implementation of the Student Assessment Handbook or confusion in terminology and practice making it hard for teachers to understand what was required of them. Hence, there was a need to ensure that Biology teachers use the outcomes of student assessments that occur throughout the school year

(CA) to ensure they know the specific strengths and areas of weakness of all their students. The feedback should be used to adapt the teaching to meet the needs (Black and Wiliam, 1998).

4.4 Analysis of interviews data obtained from an assessment policy maker (PM) and Assessment Handbook writer (AW)

This section discusses the qualitative results obtained through the interviews with the Assistant Director General for Evaluating Attainment Achievement (PM) and one of the writers of the assessment document (AW). It gives a context or background of the enactment and perception of assessment. The following themes emerged from this section:

1- Development in basic and post-basic education was accompanied by a change in the assessment process.
2- The new system of assessment creates a kind of tension between the assessment officers and the teachers.
3- The students' portfolio is an essential part of assessing students' development and learning.
4- Introduction of the ideas of continuous assessment (CA), self-assessment and peer assessment is new in the Omani assessment system.
5- Students are at the centre of the learning and teaching processes (student-centred approaches).

The Director General for Evaluating and the Assistant Director General for Evaluating Attainment Achievement (PM) as well as the writers of the assessment document (AW) have a great responsibility to make sure that the assessment process is implemented effectively in Omani schools. Therefore, an interview protocol constituting different semi-structured questions was created to analyse the assessment policy in Oman (See Appendix U). Table 4.9 below contains direct (translated from Arabic to English) quotes from PM and AW.

Interviewees → / Themes ↓	PM	AW
Why and how assessment change introduced	- … education in general and evaluation in particular must always be developed. - … as a result of the recommendations of international conferences held at the local level attended by experts from several countries. In addition, the recommendations of the Council of Ministers and the recommendations of the labour market…	The world is constantly changing. We must keep pace with evolution.
The rationale behind the development of assessment policy	- ...the recommendations of the Council of Ministers - "…we are living now in the age of technology, and the age of openness. … Life has changed, the labour market has changed. It doesn't need a person who just owns the information. It needs someone with 21st century skills"	- The science assessment document was prepared centrally at the Ministry level. -The science assessment document emerged from the general document which is the general framework for the philosophy of assessment in the Sultanate.
Teacher Training	- We are confident that teachers must be trained to prepare test questions.	- At first, we intensified the training process: training of supervisors, training members of the curriculum, training of teachers, intensifying our training in the field of assessment tools. How to apply assessment tools inside a classroom. - Before 2010 there was an intensification of training.
Difficulties and challenges	- … teachers complained that the new assessment system was very time consuming and put extra pressure on them. In addition, the assessment practices in Omani	- In 2011, teachers demanded that changes in assessment patterns should occur.

Interviewees → / Themes ↓	PM	AW
	schools are inadequate for the tasks they have to perform, for example many schools have not yet implemented self-assessment and peer assessment". - We retreated in 2011 … the conditions that led to a retreat from some of the things that we were unconvinced of.	- …we still need quality and stronger controls in our assessment practices.… many practices in assessment have no technical accuracy. - …most teachers teach content not learning outcomes. Most teachers are busy finishing the content of the textbook at the expense of doing enough assessment. - The problem is that attention is given to grades not to students' deep learning.
Benefits	- The new assessment has a wide diversity of assessment tools and dos not rely on only one assessment tool [tests]. It also introduced the idea of a student portfolio as well as the introduction of the concepts of FA, CA, self-assessment and peer assessment.	- The new assessment system contains a diversification of assessment tools rather than relying on one assessment tool [tests]. Moreover, it introduces practices of portfolio, self-assessment and peer assessment.

Table 4.9 PM and AW response matrix

Key: PM- Policy Maker (Assistant Director General for Evaluating Attainment Achievement)

AW- Assessment Document Writer.

Regarding why and how assessment changes were introduced, PM responded as follows:

> "Education in general and evaluation in particular must always be developed. The change in the learning process is a required dynamic process, I mean, that there is a need to match what actually exists … life has already changed, the labour market has changed. Also, as a result of the recommendations of international conferences held at the local level attended by experts from several countries. In addition, the recommendations of the Council of Ministers, and the recommendations of the labour market that graduates of public education should meet the requirements of higher education and the requirements of the labour market" (PM).

Similarly, AW attributed the need for changes to the fact that the world is constantly changing and the assessment system must be aligned with modern day needs.

It is clear that the officers (PM and AW) intend that, as the world is developing and changing steadily, the education system and assessment system must support students to cope with this issue. The PM pointed out that the nature of current life is different from the past and consequently, the education system has changed:

> "The former education system focused on giving students information about what was going on in science. So, the assessment system was appropriate for the nature of that period. But we are living now in the age of technology, and the age of openness. Students now can't be left, as we were, sitting still while their teacher stands in front of the blackboard teaching them a lesson and there would be a written test at the end. Life has changed, the labour market has changed. It doesn't need a person who just owns the information. It needs someone with 21st century skills" (PM).

The above statement indicates that students need skills for the changing world in which they live. She called these competencies "21st-Century Skills". In this manner, Metz (2011) ; Trilling and Fadel (2009); Larson and Miller (2011) list the competences required at this level, such as an understanding of the nature of science; the ability to cope with technologies and job conditions; developing and using critical thinking in creative ways; developing the ability to work in teams; and being able to work autonomously. According to the PM, the assessment system helps to develop these skills or competencies. She stated:

> "Assessment, now, evaluates skills, evaluates specific learning outcomes…, [which might be] knowledge, skills or sentiments. So, you can't rely on just a single assessment instrument such as tests, for example, and say: This is the only assessment tool used by the teacher. The other assessment tools are also a very rich source of information. …The assessment system is developing according to changing attitude towards education. In the end, the tools of FA, in particular, are not just tools to assess what the student has learned. But they are also, assessment for learning itself. … there is no separation between the learning processes and the assessment process." (PM).

This above excerpt demonstrates how the new assessment mechanism has been introduced to manage the change in the curriculum. The PM stated that the new assessment system has attempted to keep a balance between what students should know, understand and be able to do in order to achieve the learning outcomes. She acknowledged the need for 21st century skills within the context of science assessment.

For the policy behind the change of assessment, PM stated that:

PM: One of the reasons for this change was the recommendations from the Council of Ministers…

PM: Of course, the objectives of the Ministry must be renewed within a national strategy

Mohammed: What determines national strategy?

PM: The Council of Education, representatives of the Ministry of Education, representatives of the Ministry of Higher Education and representatives of the labour market.

Whereas, AW said:

AW: The science assessment document was prepared centrally at the Ministry level.

Mohammed: Could you explain that?

AW: The science assessment document, from the first to twelfth grades, emerged from the general document which is the general framework for the philosophy of assessment in the Sultanate.

Mohammed: What is the source of this philosophy?

AW: First of all, the general document comes from the high policies of the Educational Policy Committee. This committee activates everything.

These excerpts illustrate that the Biology assessment system in Oman has developed from the general policy of the state and under its supervision and the assessment policy makers have the power to be influential in formulating the government policy on assessment. As evidenced by this conversation, a lot of assessment innovation and trialling originated from the central Ministry. The general policy of the state was mainly concerned with the assessment underpinning the philosophy and objectives of education in Oman and establishing standards of good learning against which assessment can be made to measure improvements.

Although teacher training is considered as an essential instrument for bringing positive change in education, PM did not bring the issue of training into sharp focus. She only stressed the importance of training in formulating questions. She pointed out that: "We are confident that the teacher must be trained to prepare test questions" (PM). However, AW was more concerned with teachers' training in the new assessment than PM. He explained:

> "At first, we intensified the training process: training of supervisors, training of members of the curriculum, training of teachers, intensifying our training in the field of assessment tools. How to apply assessment tools inside a classroom… Before 2010 there was an intensification of training" (Interview with AW).

This implies that most of the training was conducted before 2010. There has been no training in Biology assessment for new teachers since 2010. This insufficient and sporadic training explains why misunderstandings about some aspects of assessment occur, such as how homework should be assessed. Ongoing in-service training is required.

With respect to the difficulties and challenges encountered during the implementation of the new assessment system, PM showed that:

> "In 2011, teachers complained that the new assessment system was very time consuming and put extra pressure on them. In addition, the assessment practices in Omani schools are inadequate for the tasks they have to perform, for example many schools have not yet implemented self-assessment and peer assessment" (PM).

This quotation indicates that teachers used CA as SA, so because of the incorrect implementation of the CA system teachers complained that the new assessment system increased the burden on them without producing commensurate benefits.

PM explained how challenging it was for the Ministry to waive some of its decisions:

> "We retreated in 2011 as a result of, everyone knows, the conditions that led to a retreat from some of the things that we were unconvinced of. But, for the public good, you want the stability of education, you want to appease teachers" (PM).

This statement implies that teachers were not satisfied of the need for the new assessment system as they struggled to implement both the PBE curriculum and the new assessment requirements. The assessment system was too demanding in terms of skill and teachers' time and was perceived to be over-prescriptive.

In almost the same way, AW states that:

> "In 2011, teachers demanded that changes in the assessment pattern should occur… However, we still need quality and stronger controls in our assessment practices because many practices in assessment have no technical accuracy… and most teachers teach content not learning outcomes. Most teachers are busy finishing the content of the textbook at the expense of doing enough assessment… The problem is that attention is given to grades not to students' deep learning" (AW).

This excerpt suggests that the AW was aware of the challenges the assessment system faces in trying to ensure that assessment practices align with the skills and knowledge specifications for students set out in the curriculum. However, he mentioned that the Ministry responded to the teachers demands:

> "The Ministry responded to the demands of teachers… by forming work teams to discuss those demands… After that, a comprehensive meeting was organised, including members of assessment, educational supervision, curriculum authority, private schools, special education, and senior teachers... Of course, the changes in assessment, since 2011 and so far, have been a response to the demands of the educational field. The assessment tools, which caused turbulence in the educational field, were reduced" (AW).

As noted in these excerpts (from interviews with both PM and AW), assessment in Omani schooling between 2007 and 2011 had been surrounded by dispute and controversy. In

2011, teachers staged a protest against the proposed changes in assessment, placing strong pressure on policy makers. Assessment officers (PM and AW) were not satisfied by the level of teachers' performance in the heavily contested assessment, placing strong pressure on teachers. The PM, AW and teachers expressed concerns about various components of the Oman assessment system between 2007 and 2011. The key challenge was how to evaluate, monitor and maintain the curriculum to meet teachers' requirements and national benchmarks. The above excerpts suggest that unlike the AW, the PM was not completely aware of the challenges and issues the assessment system had faced (in trying to achieve its desired shifts in assessment methods) until the teachers demonstrated this. The implementation of the assessment system in the classroom raised issues. The new assessment system would seem to have increased burden on teachers.

However, at a policy level, the interviews with both the PM and AW suggested that the assessment system was good and fit for purpose. They implied that it has a rich diversity of assessment tools and introduced the idea of a student portfolio. PM stated:

> "The new assessment has a wide diversity of assessment tools and dos not rely on only one assessment tool [tests]. It also has introduced the idea of a student portfolio as well as the introduction of the concepts of FA, continuous assessment, self-assessment and peer assessment" (PM).

> "If you follow up the new assessment policy document, you will find that the portfolio is used as an assessment instrument. … The portfolio itself has a specific mark ... like a project, and a quiz" (PM).

The above statement corresponds with the assessment policy document, which defines a student portfolio as:

> "An ongoing collection of work done by the student. It provides concrete evidence of the student's learning, and of the type and level of work that he/she has done" (Student Assessment Handbook, 2015, p.3).

Similarly, AW said:

> "The new assessment system contains a diversification of assessment tools rather than relying on one assessment tool [tests]. Moreover, it introduces practices of portfolio, self-assessment and peer assessment" (AW).

These comments indicated that the new assessment system has motivated both students and teachers to adopt modern techniques of assessment, such as using portfolio, peer assessment and self-assessment. The PM, AW and the Student Assessment Handbook reported that the new system evoked students' enthusiasm, so it is reasonable to assume that it was in the implementation of the intended assessment in the classroom that the

variation in practice and effectiveness introduced barriers to improvements in learning, i.e. The PM and AW's perceptions challenge that of the teachers.

4.5 Analysis of Biology teachers' implementation of assessment (How do Biology teachers in Nizwa schools in Oman perceive and enact Biology assessments?)

The purpose is to demonstrate the relationship between the national assessment contexts, and both teachers' experiences and assessment practices. The rationale for presenting such evidence lies in the fact that for teachers the surroundings of national assessment policy and their beliefs affect their assessment practice. The demographic information of teacher participants is illustrated in Table 4.10.

Gender		Age category	Years of experience	Qualification	Average size of the class
Male	Nasir	31- 35	9	Bachelor in Science Education	20
	Suleiman	31-35	9	Bachelor in Science Education	
Female	Aida	31- 35	9	1- Bachelor in Science (Biology) 2- Diploma in Education	30
	Amina	25- 30	6	Bachelor in Science Education	

Table 4.10 Demographic data of the teachers

Table 4.10 shows two male teachers and two female teachers participated in the study. Three teachers (1 female and 2 male) had 9 years of teaching experience and were all in the 31- 35 age bracket. One female teacher (Amina) had 6 years of teaching experience and was in the 25- 30 age bracket. Three have the same academic qualification. One female teacher (Aida) has both a Bachelor in Science (Biology) and a Diploma in Education. The average size of the male classrooms was 20, whereas, the average size of the female classrooms was 30. Thus, the female classes were larger than the male classrooms because female students tend to specialise in Biology more than male students, who prefer engineering as Nasir said:

> The Higher Education Admission Centre [which Coordinates with Higher Education Institutions]. I mean, the student says: “I want to study engineering”. Most male students direct their attention to engineering, so students don’t choose biology. Why? They say: “In fact, my teacher! we are required to get higher marks in Mathematics, Physics, Chemistry and English”, so if these students get a low percentage in Biology, they don't care much. …. He doesn’t have a strong interest in Biology like his interest in physics and chemistry. .... This is a problem.

This section analyses the qualitative findings in terms of the themes emerging from the analysis of the interviews and the classroom observation data of the participating Biology teachers in two schools in the Interior Governorate. The following themes emerged from both the interviews and the classroom observations:

1. There is a gap between what is written and what is enacted and a tension, created by the assessment system, between teachers and the assessment policy makers.
2. Challenges have been met with regard to teachers training in the new assessment practices.
3. Homework and practical performance tools should be specified clearly in order to avoid misunderstandings about enacting them by teachers and to prevent students’ cheating.
4. There is a pressure on teachers to focus on surface learning at the expense of deep learning in dealing with assessment.

These general themes entail several sub-themes and give rich information.

To gain a deeper interpretation of the phenomenon under enquiry, a semi-structured interview protocol about teachers’ practices to implement changes in assessment was designed. (See Interview protocol, Appendix V). Table 4.11 shows the response matrix containing replies from the participating teachers.

Interviewee Themes	Nasir	Suleiman	Aida	Amina
Homework assessment	Most students do not do the homework alone, but rather transfer it from one another.	I feel that the students in the group, to which I have distributed the homework, have the same answer, so I don’t consider homework a	Homework is not a valid measure of student performance because, in the end, the lazy student copies the answers from a distinction student	Students communicate answers directly through social media.

Interviewee Themes	Nasir	Suleiman	Aida	Amina
		correct method of assessment or an appropriate assessment tool.	and gets the full grade.	
Practical activity	I assess the student during the experiment: I ask him: What did you notice? What did you conclude? What are the procedures of the experiment? Then, I give the student written questions on his experiment. Then, he will answer them and submit it to me. (Not in accordance with the document's instructions). The problem here is that students copy the solution from one another. We do not take advantage of the attached card [checklist] to evaluate the student, because the supervisors do not want that.	You find that in the groupwork, a certain student works and knows everything but evaluation is an assessment of all students. In this lesson, we can't make every student work alone because microscopes are limited. - We evaluate the students as follows: The student conducts the experiment and I ask him questions related to the experiment and he writes down some observations and conclusions.	Each time we evaluate a group of students. Often, in practical performance, we give students an activity and they solve it. There is no real practical performance.	We observe students, working in groups. We also ask them questions related to the same topic. I leave the students working collaboratively in the group. But every student is assessed on her own.
Practical test	In Biology, the experiments are mostly theoretical, theoretical enquiries: we bring the tools of experiments and put them in front of students. Depending on the tools you have, answer the questions about this experiment: What is the name of this	The practical test is semi-theoretical: the experiment is in front of him, and it has been prepared previously.	There is no real practical performance. The experiments are mostly theoretical. Laboratory materials and tools are not sufficient for group work in the laboratory In the practical test, I give them the experiment and questions about it. Firstly, because of the	Most Biology experiments are theoretical. There is a severe shortage of microscopes, materials and other laboratory tools. Therefore, the students do not acquire skills in adjusting the microscope.

Interviewee Themes	Nasir	Suleiman	Aida	Amina
	experiment? What is its purpose? Most Biology experiments need a long time, such as experiments about the phases of mitosis in the onion cell and experiments related to respiration. Or very simple, such as foetal development experiments: the student is given pictures and asked to measure the growth rate of the foetus every month. Sometimes, the necessary materials are not available in the laboratory, such as: microscopic slices to examine the ovaries, and examination of sperm cells.		lack of time, secondly, the lack of laboratory materials and tools.	
Short test/ quiz	The short test is good.	The 11th Grade students came from Cycle Two phase schools where the classroom is as dense as 45 students and were not trained in the skills to solve questions that require interpretation, comparisons and reading figures and drawings	This shows some kind of true level of the student.	In short tests, individual differences are already evident ... there is an excellent, weak and average student.
Feedback	After the student submits the test, I correct it and then	If students are weak, for example in the short test, I	If the students know that a test doesn't affect	After correcting the short test or any other test, we

Interviewee Themes	Nasir	Suleiman	Aida	Amina
	hand it over to the student to review his answers. If he has any queries about a particular question, I am ready to discuss it and clarify it. If many students do not know the answer to a particular question, I explain it to them.	will give them another test, or I may change the same test in order to improve their grades.	their final grades, they underestimate it ... They don't participate in any activity without marks. So, they don't care about their notebooks because they don't gain marks from them.	hand it over to the students and explain a typical answer. In addition, we discuss the possible answers. Reviewing the test after corrections is a key point.
Peer assessment	Working in pairs. Each student corrects a peer's answers and discusses the solution with him: How did you answer this way?	I get the students to do the exercise as pair work. Every student solves the problem with his peer. I don't put more than two students in a group because it is chaotic and they rely on the active one and the rest transfer solutions from him. They do not work.	Applying cooperative learning in groups. Each student gets help from one another.	____
Self-assessment	As for self-assessment, I didn't find it valid, even though the supervisor encouraged me to do so. He says: Let the students solve problems themselves. But if I don't explain the answer to the student, he doesn't understand it.	We don't apply it.	We don't conduct it.	I don't try it.

Table 4.11 Biology teachers' response matrix

Talking about homework in the new assessment system, all the participant teachers pointed out that most students copy the answers from excellent students and get the full mark:

> Most students do not do the homework alone, but rather transfer it from one another (Nasir).
>
> I feel that the students in the group to which I have distributed the homework have the same answer, so I don't consider homework a correct method of assessment or an appropriate assessment tool (Suleiman).
>
> Homework is not a valid measure of student performance because, in the end, the lazy student copies the answers from a distinct student and gets the full grade (Aida).
>
> Students communicate answers directly through social media (Amina).

By analysing the Biology Assessment Handbook, evidence shows that what is required by the Biology assessment policy is different from what is understood and enacted by both the male and female Biology teachers regarding the homework tools, as illustrated below. It is clear in the document that:

> "Homework is a task related to the course, determined by the teacher and the student is required to do it at home or at school. The teacher must correct it accurately, and inform each student of his or her mistakes instantly" (The Student Assessment Handbook, p. 29).

To enact this tool correctly, teachers should follow the following instructions:

> "[Teachers should] provide students with a proposed timeline for their evaluation, target a group of students to evaluate at one time, and the teacher should provide the students with a series of assignments (FA) prior to applying this tool to score grades (SA)." (The Student Assessment Handbook, p. 29).

The Student Assessment Handbook suggests that homework should be given individually or target a group of students to evaluate at one time and each student should answer his/her own homework independently. The Assessment Reform Group (assessment PMs and Aws) has produced guides on this. However, there was some misunderstanding in enacting this instrument by teachers and consequently, the risk of students' copying each other's work increased. It can be inferred from this comparison that the Assessment Handbook maybe open to interpretation by teachers and lack clear instructions that explain what exactly is required in order to assess students in using this instrument or it could be that teachers lack time and skills (training) to address this issue. This is supported by the teachers' statements, for example Nasir said: "I haven't received any training course in assessment". Regarding the time, Suleiman stated: "The Biology

curriculum is over-loaded. We don't have time for reviewing and training in assessment". This issue created a tension between what was intended by the assessment policy and what was enacted by the teachers regarding homework.

To integrate the interviews with classroom observations and students' portfolios, it was noticed that the teachers focus on giving marks on students' homework rather than feedback on their students' work:

> "For both genders, teachers do not give a lot of written feedback and do not write much on the work. Moreover, they do not give general feedback (comments) except marks on homework or some classwork." (Ref., fieldnotes).

This note shows that teachers focus on surface learning (to give a mark or grade) at the expense of probing students' actual learning.

Table 4.12 below summarises and relates the teachers' responses in Table 4.11 back to the policy makers' response in Table 4.9.

The intended policy is carried out	The intended policy is to some extent but not completely carried out.	The intended policy is not carried out.
- Conducting continuous assessment. - Diversity in assessment instruments. - Carrying out quizzes.	- Implementing self-assessment and peer assessment. - Conducting FA. - Student's portfolio contains examples of their work. - Doing laboratory experiments. - How feedback was used.	- Teacher training. - Attention is given to grades rather than learning. - Carrying out homework.

Table 4.12 Relating the teachers' responses to the policy makers' responses

4.5.1 Analysis of classroom observations

Key ideas from the policy document on assessment and Policy Makers (what should happen)	Observation (what does happen)			
	Nasir	Suleiman	Aida	Amina
Introduction	Gave activities related to the previous lesson and began his lessons giving a	Asked questions about what was studied previously linking them to	The teacher gave students a written activity to link the last lesson with the	At the beginning of the lesson, the teacher distributed activity papers to

Key ideas from the policy document on assessment and Policy Makers (what should happen)	Observation (what does happen)			
	Nasir	Suleiman	Aida	Amina
	brief general background about it.	the new lesson.	current lesson.	the students.
FA practices: activities and discussions.	- He didn't train his students to answer questions correctly. - Doesn't know the differences between summative and formative assessment	- He trained his students. - The teacher was using FA	- She used FA in the lessons	- She used FA in the lessons
Teachers should encourage the process of self-assessment	Unfamiliar with it, because he does not practice it regularly.	The teacher does not practice it regularly.	Not available	No evidence
Teachers should encourage the process of peer assessment	Unfamiliar with it	X	Not available	✓ Students work cooperatively in groups.
Teachers can gather useful information by looking closely at students' homework. (Observation)	Students copy answers from each other.	Not available	The teacher gave feedback on the previous homework	Not available
Teachers should provide instant (ongoing/ integrated) and very delayed feedback on student work.	Oral instant feedback during class questioning	- Oral instant feedback - Through activities	Yes, during the lesson discussion	- At the end of each activity. - during questioning.
Teachers should pay attention to the application of both formative and	More concentration on SA.	✓	More concentration on FA.	✓

Key ideas from the policy document on assessment and Policy Makers (what should happen)	Observation (what does happen)			
	Nasir	Suleiman	Aida	Amina
summative evaluation in a balanced manner.				
Practical performance measures students' activity in the laboratory.	Not available	✓ . However, he didn't mark	Not available	✓conducting experiment

Table 4.13 Classroom Observations matrix

Table 4.13 illustrates the teachers and students' behaviour in the classroom during the delivery of the lessons. Regarding Nasir, in the introduction, he did not introduce the lesson topic. Lessons should be integrated into their existing knowledge structure. One method of integration is using an advance organiser (Mohammadia, Moenikiab and Zahed-Babelanc, 2010), which suggests that a student brings with him to a learning situation a vast reservoir of information and concepts. Nearly any new knowledge is related in some way to what has been learned in the past (Mohammadia, Moenikiab and Zahed-Babelanc, ibid). An advance organiser is a cognitive strategy proposed by Ausubel (1960) in his Learning Theory, which shows the relationship between the information the students have already learned and what they are about to learn. In this research situation, the teacher just gave brief information about the lesson. (see Appendix X1):

> Nasir: Yesterday, we almost finished learning the second chapter: "Fertilization and the development of the foetus". We learned many things: how the foetus is formed in the womb of its mother, how twins are formed, fertilization and pregnancy, technologies and how to help couples who complain of infertility, things you know in general. …
>
> … Close your books. Today we will start 'Genetics'. A quick introduction ok? We'll be studying this unit until almost 20th May. The genetics unit is fun and interesting, you'll get to know many things. Regardless of the logic of grades, you're going to recognise many things. Before we proceed to study genetics, take 8 minutes to answer these questions in pairs. Please write your names. Don't open your textbook or any notes.
>
> (The teacher distributed the activity papers to the students). Students worked in pairs.

After the time finished, the teacher told the students to submit their answer papers.

It was observed that the teacher collected the papers and did not discuss the answers with his students. He collected the exercise papers to mark them, with no formative feedback

on their work. He did similar things in lessons two and three, for example in the second lesson (see Appendix X2), he introduced his lesson (Testcrosses) by saying:

> Nasir: "We will study testcrosses today and then we try to solve a genetic problem. The problem which was written on the whiteboard is related to today's lesson"

Similarly, for the third lesson, the teacher asked some oral questions about the previous lesson. Then he embarked upon the new lesson.

Referring to lesson one:

> Nasir: First of all, What's genetics?

Then, students began to give answers to the question in a way similar to a brainstorming session. After that, the teacher summed up students' answers and gave the best definition of the term genetics. He used discussion and historical approaches as a way of teaching topics in lesson one. However, in lessons two and three students were given a chance to solve the problems on the whiteboard. During the discussion, he gave students feedback on their answers. At the end of the lesson, the teacher asked questions related to the whole lesson as a final assessment to make a judgement about the quality of the students' learning of the topic. For lesson two, the teacher asked the students (See Appendix X2):

> "… as a result of solving this problem, can anyone tell me what's meant by the term testcrosses?"

The teacher taught his students to arrive at the solution or answer by a simple process of deduction. He asked them to define the concept of testcrosses after giving them an example of the term. The annotated sketch below (Figure 4.4) shows some indication of the time in the lesson:

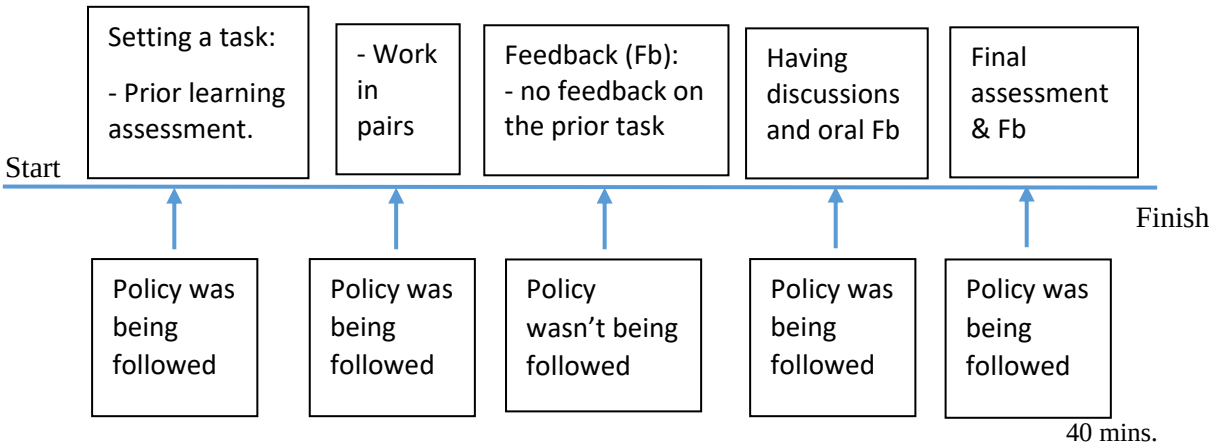


Figure (4.4) Annotated sketch showing some indication of the time in a lesson.

Regarding Suleiman (See Appendix X3), he illustrated an advance organiser to introduce the lesson topic and show the relationship between the information the students were about to learn and what they had already learned. See this excerpt, for example:

> Suleiman: Which organisms do photosynthesis?
>
> Omar: Plants
>
> Suleiman: What does the plant contain for photosynthesis?
>
> Salim: Chlorophyll.
>
> Suleiman: What are the organelles that are found in plants and not found in animals and fungi?
>
> Zaker: Chloroplasts
>
> Suleiman: Well done
>
> Suleiman: Now we will ask a very important question. In order for the plant to do photosynthesis, it needs things including the sun. What is the importance of the sun?
>
> Sayd: Making food
>
> Isa: It provides the plant with light
>
> Qasim: The sun gives the plant carbon dioxide
>
> Suleiman: Does anyone have another answer?
>
> Khalifa: The sun is the source of energy
>
> Suleiman: The sun is the main source of plant energy by which the plant can perform photosynthesis and make food for itself and for living things.

The teacher linked this lesson to the previous one in order to let his students know how the two lessons connected.

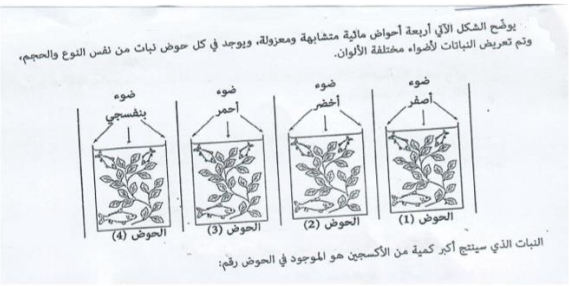
During the lesson, there was evidence of formative feedback on students' answers to the teachers' convergent questions. Moreover, the teacher made comments on the subject of discussion, for instance he gave more information about the photosynthesis equation which some students had written on the whiteboard:

$$6CO_2 + 6\ H_2O \xrightarrow[\text{Chlorophyl}]{\text{Light}} C_6H_{12}O_6 + 6O_2$$

The teacher clarified the equation written by a student and added: 'chlorophyll' under the arrow. Then, he asked them to define the term 'photosynthesis' using the equation as a summary of that topic. In a similar way, he moved on to the next item 'types of autotrophs'.

Then he embarked upon the new lesson in a similar style to his colleague (Nasir); posing questions and receiving answers. He used discussion as a way of teaching topics in lesson One. He moved from one topic into another smoothly, for example after completing the topic 'autotroph', he moved on to the next topic 'photosynthesis pigments'.

As a final assessment, the teacher gave the students two activities (exercises) as shown below:



The Figure illustrates four identical and separated water bowls. Each bowl contains an identical plant exposed to lights of different colours: (1) yellow; (2) green; (3) red; (4) purple. The plant which produces more oxygen is found in bowl number: ……?

The Table illustrates the amount of oxygen gas emitted by a plant during the photosynthesis process measured over three days, 18 hours a day.

1- When was photosynthesis highest on average?

2- Which day was cloudy? Why?

Figure 4.5 Classroom assessment activities

After the students had finished answering them, he discussed the answers with them using the technique of FA as required by the policy document:

> "FA should accompany daily teaching and aims to provide both teachers and students with performance results consistently". (Assessment document, p.2).

However, the scope of FA was very limited since teaching was geared to the mastery of a body of knowledge. The greater the scope for interpretation and creative/ critical thinking the greater the scope for FA.

Lesson two was a practical performance in the laboratory. Each student has his laboratory workbook. They opened them and followed the experiment instructions, which were about 'Factors affecting the rate of the transpiration process'. They worked in groups. They got the experiment installed (see Figure 4.6):

- This was an experiment, which was probably one of the better places where FA was being practiced.
- More open discussion.

Demonstrating formative peer assessment.

Figure 4.6 Laboratory work

Then, they investigated the effect of these factors on the rate of transpiration: air current, humidity, rise in temperature and the number of leaves. After that, students answered the questions in the analysis section. Finally, the teacher discussed students' work and gave them feedback on it.

This practical activity corresponded exactly to the requirements of the Student Assessment Handbook:

> "In a practical activity, the work should be done in groups…. the teacher should use a brain storming style in the implementation of the practical activities, to train his students on how to deal with practical equipment" (Student Assessment Handbook, p. 31).

However, the teacher did not mark the students' work. He gave formative feedback instead. Therefore, no one was assessed summatively on their practical performance although the policy document suggests that teachers should give marks in practical activities:

> "This instrument should be assessed twice throughout a semester" (the Student Assessment Handbook, p. 32).

When the teacher was asked about this issue, he replied that his purpose in this lesson was to teach and give feedback. The assessment would be in a separate paper prepared for marking purposes. It seems that the teacher was making a good judgement.

Regarding Aida, at the beginning of lesson one (See Appendix X4) and lesson two, the teacher reviewed and discussed previous homework. She gave feedback and made helpful comments. In lesson one, she gave a written activity to link the last lesson with the current one:

> Aida: Write numbers and types of potential genotypes for the following gamete: AAbb.

After the students had answered the question, the teacher made comments on their work and asked two students to solve the problem on the whiteboard one after the other.

Then, she embarked on the lessons using dialogue and discussion. The questions were convergent which typically have one correct answer (see Section 2.2.3). The techniques applied for asking questions were similar to that of Nasir and Suleiman. After teaching a topic, she summarised it by giving a statement of the main ideas. The students were active throughout the lesson. At the end of the lesson, the teacher used FA to check students' learning and provide ongoing feedback. This approach is consistent with the intentions of the policy maker and the Student Assessment Handbook:

> '…Typically done through adaptation of teaching, giving feedback' (PM).
>
> '… you … need to evaluate the actual impact of what you have done, and then make further decisions as part of an ongoing process, (Student Assessment Handbook, p. 7).

However, the teacher did not encourage her students to self-assess or peer-assess. Teachers did not appear to distinguish between FA and CA, which is used during the school year to award marks. The most effective FA takes place when ideas or thoughts are being developed. When she was asked about that she replied that "she did not receive any training in these techniques". It appears that she lacked the skills and capacities to carry through with FA. Effective assessment requires awareness of the effects of this type of assessment on the learning process.

With regard to Amina, she began her lesson by conducting FA connecting what has been learned with what will be learned. She gave the students five minutes to answer the questions. Then, she gave oral feedback to the whole class. This behaviour fitted the policy document:

> "Feedback (is) comments … about the quality of students' work with the aim of improving it" (Student Assessment Handbook, p. 2).

During the laboratory activities, students were divided into four groups. Each one was given a name, for example Station 1 examined the adaptation of desert plants to drought;

Station 2 examined a sample of algae (grown in water) under a microscope; Station 3 looked at and studied a cross section of a plant stem under a microscope; and Station 4 studied fertile soil. The students were engaged in their activities, observing the samples and recording the results. During the experiments, the teacher observed the students' work and made helpful comments. In addition, she used a checklist to assess one of the groups summatively.

Here, the teacher balanced formative and summative assessment, which responded to the suggestion in the assessment document that:

> "Teachers should pay attention to the application of both formative and summative assessment in a balanced manner" (Student Assessment Handbook, p.5).

Moreover, she used the checklist suggested by the policy makers. Finally, the groups presented their work to each other. Hence, there was interaction between the members of the groups, for example, some students asked questions and their peers in other groups answered them and vice versa. The teacher gave her students opportunities to give feedback to each other. This process can produce interesting communicative classroom interaction. Therefore, the teacher followed the instruction of the policy document faithfully:

> "The teacher is not the only person in the classroom who can give feedback. Students should be given opportunities to give feedback to each other." (Student Assessment Handbook, p.3).

Although Amina was the least experienced teacher (6 years), she appears to understand how to enact the assessment policy guidance. Post observation interview suggests that she learned these techniques at the university. She said:

> "We have learned at the university that group work is an effective method to develop critical-thinking and communication skills, especially communication between groups in the classroom… It needs careful planning" (Interview with Amina).

To conclude, classroom observations show that questions the teachers asked students were typically about the application of concepts that were connected with abstract ideas such as adaptation, heredity and environment. However, most questions asked by the teachers were convergent, which involved students' memory in recall questions. In addition, they were used to guide students through the experimental procedures posed in the practical activities. On the other hand, there was no sign that the teachers were using

divergent questions or open-ended questions, which encourage students' creativity or critical thinking such as analysing data and making inferences:

> "In nearly all lessons observed the teacher talked from the front of the classroom, asked 'closed' questions to students. Rarely was any attempt made to determine whether other students agreed with answers. There was very little attempt to draw from students their understanding or probing into reasons or explanations for the answers that students gave. It was rare that the teachers had designed imaginative information for students" (Ref. classroom observations).

Regarding feedback, it was observed that all teachers focused on oral feedback and neglected written feedback. There was a much higher priority given to marking than feedback. The teachers underestimated the value of written feedback to improve learning and teaching. Interviews with the teachers suggests this was partly due to the pressure on them to grade their students. When questioned "do you give homework for the students", Amina said "yes, we give two separate homework, so the students don't care about the exercise books because there isn't any mark specified for it". The teachers believe that giving formative feedback on exercise books was not a core part of their responsibility. This practice does not align completely with the assessment policy that "You [the teacher] should provide students with a series of homework and comment and give feedback on any aspect of it. In other words, carry out formative assessment before conducting SA" (Student assessment Handbook, p, 29).

For homework and practical activity, there was a gap between what is written and what is enacted, for example the Biology Assessment Handbook describes clearly how teachers should assess their students in this instrument:

> "In the practical activities, the teacher should assess his student by observing him during the performance of the activity using the performance card or a checklist." (Student assessment Handbook, p. 31).

However, the teachers did not enact this tool accurately and there was a gap between what is written and what is practiced except for Amina, who implemented this instrument properly. Hence, as they concentrate purely on the requirements of SA, teachers focus on surface learning not on deep learning (Smith and Colby, 2007). Obviously, the Student Assessment Handbook encourages teachers to give their students the opportunity to become deep learners. This common practice was clearly illustrated by Nasir:

> "We have two ways (to assess this tool): either I will discuss the experiment with every two or three students: What did you gain from this experiment? What did you conclude? What did you observe? What are the procedures? Then, the student will answer orally, then I give him the marks. Or, the method we have adopted since the first semester, we give the student theoretical questions about the experiment he performed in the laboratory, and then he comes to the school the next day having answered them, perhaps as homework, students copy the answers from each other. They copy each other's work. We assess students this way to show the moderation committee that we have assessed this tool" (Interview with Nasir).

This conversation indicates that the teachers were pressed to show the moderation committee that they have assessed their students and awarded them marks at the expense of real learning or deep learning. However, the assessment policy expects teachers to do FA:

> "Because, in the end, the CA tools are not only assessment of learning but also assessment for learning." (PM).

This analysis shows that there is a gap between how the assessment policy is written and what the teachers do in enacting it. The dominance of high-stakes assessment underpins a performance orientation, which may cause difficulties in encouraging students to adopt positive dispositions to learning.

The following sections give examples of how the Biology teachers implement the new assessment policies.

4.5.2 Teacher cameos

This section analyses the information acquired through two participant teachers. The primary evidence used to form the cameos originated from assessment policy, interviews and classroom observations. Two Biology teachers from two post-basic education schools (one male teacher and one female teacher) were selected to identify the practice of assessment in a real situation. The teachers were chosen based on the following criteria:

* educational qualification (all have Bachelor's degree in Biology education)

* work experience (all have the same work experience; 9 years)

* the same geographical location (urban)

* different gender (one male teacher and one female teacher).

During the study efforts were made to investigate teachers' interpretation of their classroom assessment practices and to identify the gaps between assessment policy and teachers' practices of assessment. In addition, an attempt was made to explore the nature of the difficulties encountered by post-basic Biology teachers in the implementation of their classroom assessment.

4.5.2.1 Cameo of Nasir (a pseudonym)

Biology Teachers' Context

The male post-basic school (School A) is based in the Interior Governorate, located in the north of Oman about 160 km from the capital city; Muscat, in an urban area on the outskirts of Nizwa city. It is a small sized post-basic school with "322 students in 2016/ 2017 academic year" (interview with the head teacher). The school building has one floor only. There were only Grade 11 and Grade 12 in the school. At the time of commencing the study, the school was equipped with a computer laboratory (with 35 computers), a learning resource centre (10 computers and learning resources including books, magazines and CDs) and two scientific laboratories (one for Biology and Chemistry and the other for Physics). The school was staffed by a head teacher, deputy head teacher, full time teachers for each subject and a range of support staff, including a laboratory technician, a computer specialist and a learning centre specialist (See Table 4.14).

School	Area	Gender	Grades	Sts. No.	Ht.	DHt.	Lab. Tech.	CS.	LRC.
A	Urban	Male	11- 12	322	1	1	1	1	1
B	Urban	Female	5- 12	943	1	1	2	1	2

Table 4.14 School demographics.

Keys: School classes (Grades), Students' number (Sts. No.), Headteacher (Ht.), Deputy Headteacher (DHt.), Laboratory Technician (Lab. Tech.), Computer Specialist (CS.), Learning Resources Specialist (LRC.)

Regarding the school building, the head teacher said: "The school is old, built in 1978, and next year we will move to another building". Regarding the classroom in which the teacher was visited:

> "The classroom was a caravan. However, it was well furnished, well lit, well ventilated, and air conditioned due to the high temperature in the summer months as high as 45 degrees Celsius". (Field notes).

During the winter months, the temperature is moderate. I visited the school during March and April when the temperature was as high as 30^0 C.

"The students were sitting in rows." (see Figure 4.7).

Figure 4.7 A classroom environment

Nasir has a Bachelor's Degree in Biology education from Sur College of Education. He had nine years of experience at the end of the academic year 2016/ 2017. He has been based in the same school for virtually all of his teaching career. He was visited three times in a Grade 12 Biology classroom. The first lesson was 'An introduction to genetics. The second lesson was 'Testcrosses' and the third one was 'Mendelian traits'.

Nasir talked about assessment practices in his class:

> "For CA, it is excellent, because it makes the student interested in the teacher, and the lesson" (Nasir).

However, he was not satisfied with the way the students deal with homework and practical activities. He noted that the students copied from each other and therefore, a theme of tension between his students and himself has emerged:

> "I know that some students cheat on homework and I seem to be powerless to prevent this issue." (Nasir).

This quotation suggests that students have become more 'performance-oriented' at the expense of 'learning-oriented'. This issue could influence what is learned, when, in what way and for what purpose (Broadfoot and Pollard, 2000). The emphasis on high-stakes

assessment underpinning performance orientation may cause difficulties in encouraging many students to adopt positive dispositions to learning.

The teacher commented on the assessment context and how this influences his beliefs and values:

> "CA scores make students pay attention to the teacher, do homework, and be interested in the lesson. However, assessment instruments need to be modified to ensure that the students are awarded the right marks." (Nasir).

It seems that the teacher confused FA with CA, which takes place throughout the semester. CA could be either formative or summative assessment:

> "CA is assessment that is conducted — in schools, by teachers — throughout the school year, rather than just at the end. Provides a fairer, more balanced picture of students' attainment. Also allows the inclusion of skills… which are difficult (practically) to assess by means of formal testing. Can be used for both Formative and Summative purposes" (Student Assessment Handbook, p. 2).

Different outcomes are assessed in different ways: some using only CA; some using only End-of-Semester Tests and others using both methods.

Since the academic year 2005/ 2006 the teachers of Grade 12 have undergone a moderation inspection, which is "a range of formal procedures designed to ensure that marks awarded to students are consistent and fair in all schools throughout the country." (Student Assessment Handbook, 2015, p. 3). This formal procedure applies only in Grade 12 for the CA marks awarded by teachers because it is the year in which the General Education Diploma (the national school-leaving certificate) is awarded. This moderation procedure is based on a supervisory visit to the school before the marks are finalized and submitted. During this visit, each Grade 12 teacher is required to present evidence of students' work from the students' portfolio. In this situation, the reliability of CA marks has a higher priority than usual (MoE, 2015).

Nasir explained how difficult it was during the moderation inspections. He described how he was sometimes demoralized by the suggestions because they focused on the concrete evidence for awarding marks to the students. This impacted upon his practice and Nasir explained how challenging it was to remain positive during the moderation:

" When the moderation committee visits the school, the supervisors tell us that they want to assess the practical activity by giving the student questions entitled "practical activity". Questions on the experiment that they conducted, and letting them take the questions home, and come in the next day having solved them. When we told them that this is like homework, vulnerable to cheating, they replied that they wanted it this way, so there is concrete evidence of using the tool." (Nasir).

Nasir explained that this had impacted on his practice which may contradict his beliefs and produce a tension between his supervisor and himself:

"They said: Well, what is the evidence? Then he got into an argument with the teacher. I said: Well, don't you trust the teacher? You know the style of the teacher!" (Nasir).

For the practical assessment in Grade 12, Nasir complained that the biological experiments were mostly theoretical. There was not a lot of practical work:

"Most of the experiments are theoretical enquiries, there is no practical work, I mean, I'm talking about Grade 12, we bring the tools of the experiment, we put them on the laboratory table, in front of the students, and according to the existing tools, the student answers the questions related to the experiment. … the student doesn't do practical work because there isn't real practical work in the curriculum itself." (Nasir).

According to this excerpt, the teacher was unable to test his students as required by the Student Assessment Handbook. He tests his students theoretically. He explained:

There is no experiment, and if you find an experiment, sometimes, you need two lessons [90 minutes] to finish it. How does the student perform it? We only have a quarter of an hour for practical testing or 20 minutes. It's a problem!" (Nasir).

This quotation indicates the shortage of time available to conduct a laboratory experiment. This could impact upon Nasir's practice and perceptions of assessment with consequences for the practice of both formative and summative assessment.

Having focused on the summative aspects of CA, I now discuss the formative potential of CA. Regarding peer assessment, it was noticed that in group work students discussed each other's performance and ideas. In the interview when I asked him about that he said:

"Sometimes I ask my students to work in pairs and correct their friend's answers and discuss their work" (Interview with Nasir).

Here the teacher showed that students were given a chance to give and receive feedback, learn from each other and do peer assessment. However, the teacher was not observed conducting self-assessment and when he was asked why he did not do this type of

assessment he replied that he did not receive any training course in the new strategies of assessment:

> "We did not take courses or training in the new educational assessment techniques, only, we rely on supervisors' guidance when they visit the school." (Nasir).

The teacher's reflections on enacting assessment provide insights into the effect of the educational setting on his practices and perceptions. The cameo of Nasir illustrates how the context surrounding a teacher can influence the manner in which he/ she delivers lessons. The political and teaching contexts, and teachers' beliefs and efficacy shape teachers' practices of assessment, positively or negatively.

4.5.2.2 Cameo of Aida (a pseudonym)

The factors that influence Aida's practices and beliefs about assessment are presented in the following section. This follows the same format used for the cameo of Nasir in order to facilitate comparison of the two cameos.

4.5.2.2.1 Aida's teaching context

The female post-basic school (School B) based in the city, is located in an urban area built in 1994. It is a relatively large secondary school situated about two km to the west south of School A. Students attending the school come from the same social backgrounds as School A. Unlike School A which includes only 11th and twelfth grades, School B had approximately 943 female students on roll when the study commenced with classes from grade five to grade 12. The two classes studied are situated on the first floor.

The school was staffed by a head teacher, deputy head teacher, full time teachers for each subject and a range of support staff including two laboratory technicians, one computer specialist and two LRC specialists. Grade 12 teachers undergo the moderation inspection at the end of each semester.

Aida has a Bachelor's Degree in biological technology from Sultan Qaboos University and a Diploma in Education from the same university. She had nine years of experience in three secondary schools, before moving to School B in 2013. Aida's teaching has

focused on teaching Biology in Grade 12. She works alongside two other Biology teachers and they work cooperatively in a team:

> "If we teach the same level of the grade, we cooperate with each other, and we write tests cooperating together." (Aida).

This facilitates communication and builds good relationships with her colleagues. During the school visits, it was noticed that:

> "The Grade 12 classrooms were on the first floor, well furnished, well lit, well ventilated, and air conditioned…" (Field note).

When the study was conducted during March and April, temperatures hovered around 30° C. The students were sitting in rows. Each of them has her own desk. This facilitated classroom management but hindered group work. It was not easy for groups to form and for all students to be able to hear one another clearly.

Regarding formative feedback, it was noticed that the teacher, at the beginning of her lesson, discussed and gave feedback on previous homework. Then, she gave her students an activity on a piece of paper related to the last lesson as an advanced organiser. After completing the tasks, she discussed the solution with the students. However, she asked the students to answer the questions individually. Thus, the students did not discuss the answer with each other, which can be helpful in facilitating formative feedback.

Concerning the types of questions which were used most often by the teacher, during the lesson, the teacher was asking short verbal and convergent questions (See Appendix X4), for example:

"What is the factor that determines sex in human beings?" (Classroom observation).

However, she sometimes built on students' ideas:

> "So, as your peer said, male has two different types of sexual chromosomes X and Y while female has only one type of sexual chromosomes, X, so, male is the determinant of sex in humans" (Classroom observation).

At the end of the lesson, Aida formatively assessed what was learned in the lesson:

> What are the factors that decide the sex of these organisms?
> Chicken; turtle; bees; grasshoppers; butterflies? (classroom observation).

Although there was a focus on FA during the lesson, there was no evidence of collaborative group working, peer assessment or self-assessment. Most of her questions were direct convergent and there were no divergent questions which need higher thinking. Pryor and Crossouard (2010) show that divergent assessment appears to fit with the

criticality dominant context. However, convergent assessment focuses on the successful completion of tasks (see section 2.2.3). In this lesson, Aida determined what constitutes a correct answer and whether the students understand knowledge through asking closed questions, then giving oral feedback on what the students say, so she was concerned to transmit knowledge to students.

When talking about assessment instruments, Aida pointed out that awarding marks is an effective means for increasing students' interest in the subject. Generally, she was positive about assessing students by more than one instrument:

> "Assessment instruments enhance marks' credibility because they help to meet the individual differences between students. On one hand, grades will be distributed among different tools and on the other hand, this will demonstrate the abilities of students in the assessment." (Aida).

However, she appeared dissatisfied with the way students dealt with homework:

> " I wish that homework could be cancelled and replaced by short questions, so the girls would take more care." (Aida).

> "Homework is not an accurate measure of performance, because, in the end, a careless student copies from an excellent one and gets the final grade." (Aida).

These extracts suggest that students were 'performance-oriented' at the expense of 'learning oriented'. They focus on marks rather than learning, with potentially profound implications for deep learning (Broadfoot and Pollard, 2000). For instance, the teacher stated:

> "… if students know that there is no mark for the task, they ignore it and do not work hard preparing for it because the teacher will not award a mark" (Aida).

This suggests that students use feedback summatively concentrating on grade rather than comments. The following statement suggests that student behaviour is influenced by parental pressure on their students to get higher grades:

> "Parents do not encourage FA or any activities that aren't used in awarding marks and grades. Any assessment that doesn't award marks is considered a burden on their daughters. They do not want to increase the burden on their children, especially, Grade 12 students," (Aida).

With regard to laboratory experiments, Aida complained that the Grade 12, biological experiments are lengthy to complete within lesson time:

> "the problem is that most of laboratory experiments are time consuming. I mean, one lesson is not enough to complete it" (Aida).

Furthermore, she noted the scarcity of experimental equipment needed for laboratory lessons:

> "For laboratory instruments, the school haven't been provided with laboratory materials for several years. Only one working microscope." (Aida).

This situation impacts upon Aida's practice and perceptions of assessment with some consequences for both formative and summative laboratory activities.

Aida felt that she had not been well prepared and trained to implement the new strategies of assessment:

> "We took an educational assessment course during university only. But we haven't received any training in the current assessment" (Aida).

This illustrates why Aida's implementation of a range of assessment strategies in her daily teaching may be limited.

Both participants illustrate challenges they face in implementing the new assessment. These include the lack of availability of professional training, the difficulty of completing the lengthy Grade 12 laboratory experiments within lesson time and the scarcity of laboratory equipment.

4.6 Biology assessment as perceived by students (Qualitative approach)

This section focuses particularly on the importance of the student voice. It specifically, focuses on students' perceptions of post-basic schools' assessment. As students are exposed daily to a variety of assessment tasks, they develop beliefs about the utility and importance of the tasks. In this context, students' perspectives can provide useful and challenging messages about what makes assessment relevant and effective (Michael and Fredrickson, 2013; Herz and Haertel, 2016; Hopfenbeck, 2013).

4.6.1 The context and demographics of students who participated in the study

The factors that influence students' perceptions and experiences of assessment are presented in this section. School A receives boy students from cycle two schools (aged 16-18) (see Figure 1.2 Section 1.2.2) and School B receives girl students from cycle one schools (aged 10-11). The family, social, cultural and class background of male and female students was generally similar. The two schools were housed in two separate

buildings because of the culture in which women are segregated from men. In both schools, the Arabic was the language of instruction. Unlike the male school, School B reported that "students' absence, bullying and lack of punctuality were regarded as a problem, which could affect the positive atmosphere of the school" (Deputy Headteacher).

Table 4.15 below shows the demographic data of the students who participated in the study, which aids in understanding the perceptions of both female and male student participants.

Grade (school class)	Gender			Age		Average classroom size
		n	%		%	
11	Male	20	21	16- 17	21	18.3 students
	Female	23	24	16- 17	24	24.7 students
12	Male	24	25	17- 18	25	21.5 students
	Female	29	30	17- 18	30	32 students
Total		96	100		100	

Table 4.15 The demographics of students participated in the study

Among 96 students, 21% (20 students) were male in the 11th grade, 25% (24 students) were in the twelfth grade, 24% (23 students) were female in the 11th grade and 30% (29 students) were female in the twelfth grade. The age range varied from 16- 17 years for Grade 11 and from 17- 18 years for Grade 12 for both sexes. The average size of classes varies from 18.3 to 32 students. It is clear that the size of female classes was larger than the size of male classes.

4.6.2 Focus groups data analysis

This section relates to the qualitative analysis and common themes emerging from the focus groups of post-basic students. When talking to students, it appeared that the intentions of policy makers were not recognised because the students behave and do what they are asked, which depends on what their teachers state.

The following main subjects (themes) emerged from the discussions:

1. Homework has not been done as the government's policy on assessment intended.
2. The practical activities (laboratory work) encourage FA as students have had opportunities to talk to each other while conducting experiments in cooperative groups.

3. Quizzes and final exams encourage students to work separately on individual tasks, which are related to SA.
4. Most students received feedback from their Biology teachers.
5. The students were not encouraged in self-assessment and reflection.

A focus group protocol comprising semi-structured questions was prepared to probe students' ideas of the current assessment (See focus group protocol, Appendix W). Table 4-16 below shows the students' responses to different questions posed by the researcher.

Focus Group Themes	Group 1 Grade 12 Boys	Group 2 Grade 11 Boys	Group 3 Grade 12 Girls	Group4 Grade 11 Girls
How are you trained to answer exam questions?	Before a real exam, our teacher gives us questions for practice and gives us formative feedback and sometimes he gives us mocks.	In every lesson, the teacher gives us activities for practice. But he didn't give us mocks due to time shortages and the intensity of the curriculum contents	After every lesson, the teacher gives us activities relevant to it. Gives us models of previous exams. She usually doesn't give us mock exams	The teacher trained us in solving questions from previous final tests, and from other sources. But she didn't give us mock exams.
What type of feedback used?	After marking exam papers, the teacher gives us marks in it. But, does not give us the answer sheets to know our mistakes.	After doing the test, the teacher gives feedback on it. the students are told about their answers. We learn from our mistakes.	The teacher focuses on questions that we didn't answer and tries to suggest the idea or clarify the question in another way.	After correcting the exam papers, the teacher gives them to us to know our marks. The teacher explains the correct solution to the whole class. If a student makes a mistake, she will know where her fault is.
How do teachers encourage self-assessment?	The teacher did not give us an opportunity for self-assessment.	The teacher didn't use self-assessment due to lack of time.	We train to solve previous final exam questions. Then, we make sure that the answer is correct by looking at the answers.	We do self-assessment at home when we train to answer previous exam questions. After that, we check our answers to make sure that they are true.
How the teachers	Sometimes if I don't know an	During group discussion or	I feel that I learn from my	We don't assess each other.

Focus Group Themes	Group 1 Grade 12 Boys	Group 2 Grade 11 Boys	Group 3 Grade 12 Girls	Group4 Grade 11 Girls
encourage peer assessment?	answer to a question, I'll ask my peer. I mean, he is more useful than the teacher because he is closer to me than the teacher.	work each member feeds back his ideas to the group.	classmates better, because I am not embarrassed to ask her about anything.	
How are the assessment instruments carried out?	Most students copy homework from each other.	The student doesn't solve the assignment himself. He copies the answer from one of his peers or one of the outstanding students instead.	-Students can copy from one another. - If I don't know the answer, I ask my friend to explain it to me. But she doesn't solve it for me.	We discuss the ideas about the answer and copy it or try to recognise the idea and solve the problem ourselves.

Table 4.16 Students response matrix

When asked, 'how you have been trained in answering the questions posed by assessment tasks?' or 'how often were you given mock exams before the real one?', all the members of group one agreed that before a real exam, their teacher gave them practice questions and gave formative feedback. Sometimes they were given mock exams.

Group two and group four had the same opinion as group one that their teachers have given them activities for practice. However, they were not given mock exams because of a shortage of time. One of group two said:

> "In every lesson, the teacher gives us activities for practice. But he didn't give us mocks due to time shortages and the intensity of the curriculum contents" (grp. 2).

One of group four responded that:

> "The teacher trained us in solving questions in previous final tests, and from other sources. But she didn't give us mock exams" (grp. 4).

Therefore, it seems that both the male and female students in Grade 11 have not had mocks. Whereas, students in Grade 12 have this opportunity because they took a high-stakes test, where the scores are used to determine advancement or graduation for students.

With regard to feedback, all students agreed that they received formative feedback on their work or about their progress except group one (Grade 12 boys) who had only been given marks or summative feedback. One of them said:

> "After marking exam papers, the teacher gives us marks. But, does not give us the answer sheets to realise our mistakes" (grp. 1).

This excerpt suggests that the teacher only marked examinations and did not provide students with any direct feedback on their work apart from an overall grade. When questioned, their teacher could not distinguish between formative and SA. He said:

> "Believe me, I haven't heard about this definition (FA)" (Nasir).

This issue arose, because the teacher had not been well prepared and trained to implement the new strategies of assessment:

> Mohammed: Have you ever taken courses in assessment either from the Directorate General of Education in the province or from the Ministry?
>
> Nasir: No. I've never taken courses like that. But when the Biology supervisors visit the school, they tell us about how to assess students' performance.

Concerning the implementation of self-assessment, all four groups pointed out that they were not encouraged to assess themselves and engage with their learning, for example a student from group one stated:

> "The teacher didn't give us an opportunity for self-assessment" (Focus grp. 1).

Regarding peer assessment, the students had been given opportunities to discuss each other's work during cooperative tasks in which the students work together in small groups on organised activities especially in laboratory work and groupwork. A member of group two commented:

> "During group discussion or work each member feeds back his ideas to the group" (Focus grp 2).

That suggests a more sophisticated insight into feedback.

On the question relating to the way in which the assessment instruments in Biology were conducted, all students perceived that there was a lack of organisation in applying homework because of mistakes that the teachers had made in implementing it:

> "Most students copy homework from each other" (Focus grp. 1).
>
> "Students can copy from one another" (Focus grp. 3).

Most students at both schools admitted to copying answers from their excellent peers:

> "Most students cheat homework by copying from each other." (Ahmed).

Another student was critical of this practice:

> "But the students don't solve homework by themselves. This [behaviour] makes them lazy, dependent on their peers" (Rashid).

Some female students also commented on the issue of copying. Whereas the first student accepted this practice, others were more critical:

> "From my point of view, this (homework) is beautiful, because, really, we're awarded 30 marks for CA and we don't want to lose them." (Zeinab).
>
> "There are instances of cheating in homework. Students cheat... copy from each other" (Huda).
>
> "…Thus, the student did not benefit from homework. It was like another copy and the student got a good grade without effort." (Mona).

These excerpts suggest that students equate copying with getting higher marks. The SA practice led students to focus on how to pass and get a higher grade at the expense of deep learning. In order to increase students' motivation, opportunities for challenging learning, and a focus on assessment for learning should be in place. The data suggests that students' extrinsic motivation may be enhanced by concentrating on SA, although teachers are asked to develop their students' intrinsic motivation by giving them formative feedback, which can help them to discover and gain skills or understanding.

With regard to laboratory experiments, female students were positive towards them:

> "For practical activities, we do the same thing. So, we carry out the experiment and discuss its result. We like to come to some conclusions from our discussion." (Hoor).

This quotation shows that the students do laboratory experiments in groups. They have been given opportunities to talk to each other and assess each other's work, which lies at the heart of FA (field note) (see Figure 4.8 below):

Figure 4.8 group work in the laboratory is an opportunity to enhance peer assessment.

Concerning the impact of classroom assessment on learning, the majority of students interviewed were in favour of classroom assessment (See the following statements):

> "Assessment tasks are useful for monitoring progress and knowing the points that haven't been studied." (Adil).
>
> "Assessment is good. It helps me to recognise what I've learned" (Raya).
>
> "Assessment's helpful in measuring the success of my learning at a particular stage. … I sometimes learn from the test because if my answer is wrong, I'll learn from my mistakes and remember the correct answer. So, I can spot the weakness and strength in my learning." (Aziza).

The above excerpts indicate that both male and female students agreed that FA gives them a great chance of success as the discovery of mistakes helps them to see where they went wrong. However, most students (boys and girls) were concerned about the marks they received because this was seen as an indication of how well they were doing and whether they were likely to get a good exam result at this stage. This was a limited view of assessment and feedback because assessment does not just focus on awarding marks but also on learning.

4.7 Thematic analysis from teacher and student data

Data based on teachers' practices of assessment and perceptions were reflected in the students' understandings of classroom assessment. The data were arranged into clusters of similarities and differences between participants to provide a composite picture of how assessment was practiced and viewed.

participants	School			Gender	Grade/ school class	Age	Qualification	Experiences
	Name	Location	Age					
Teacher 1 'Nasir'	School A	Urban	39 years	Male	12	31	Bachelor in Biology education	9 years
Teacher 2 'Aida'	School B	Urban	23 years	Female	12	34	Bachelor in Biology and Diploma in Education	9 years
Students group 1	School A	Urban		Male	12	17- 18		
Students group 2	School B	Urban		Female	12	17- 18		

Table 4.17 participant demographics

Table 4.17 illustrates the data relating to the quantity and characteristics of people who participated in the research. It shows that their schools were located in urban areas. However, School A (built in 1978) was older than School B (built in 1994). With regard to the teachers, both Nasir and Aida had nine years' teaching experience. However, the male teacher held a bachelor's degree in Biology education and the female teacher had bachelor in Biology and a Diploma in Education. Student group 1 and student group 2 were in the twelfth Grade aged between 17 and 18. Table 4.18 below shows the similarities and differences between the participants.

Themes	Teacher 1 'Nasir'	Teacher 2 'Aida'	Student group 1	Student group 2
1. Assessment information is used summatively	Formal CA by awarding marks and grades and reporting them to parents and Ministry.	Used to award marks and report on standards of learning. Also involves reporting to the Ministry and to parents.	SA and FA complement each other. -This measures what you have learned. -Students were under pressure from SA.	I learn from my mistakes.
2. Assessment information is used formatively	Using classroom questioning and written activities to make sure that the students understand the lesson.	- Classroom questioning. - Activities after lessons can improve students' knowledge.	- This trains you. - Marks are indications of how well they are doing.	-It's neglected by students. - Students ignore any suggestions from teachers. -Most of students were concerned about the mark they get.
3. Giving feedback on students' work	- Giving classroom activities then correcting them. In the next class, we'll discuss the answers (written feedback) - Dialogic feedback during lessons. - receive direct feedback from students on our marking.	-Face-to-face feedback during lessons. - After returning the assessment papers to the students, we'll give feedback and comments. - No written feedback on students' exercise books or note books.	-	-We have easy access to the teacher. She's easy to talk to.
4. How students use feedback			-Assessment is useful to know your own weaknesses - Go to the teacher to review (talk about) the	-We prefer that the teacher clarifies the question and the way of solving it in order to be able to answer a

Themes	Teacher 1 'Nasir'	Teacher 2 'Aida'	Student group 1	Student group 2
			corrections he had made to his work.	similar question in the final exam. - Students focused on mark rather than comments - After receiving their marks, some students didn't like discussing the answers.
5. Encouraging self-assessment	- Sometimes he gave students questions and their answer keys and told them to correct their own answers.	No evidence.	-Didn't know what it meant. -No, we have never done self-assessment.	-Do it by ourselves. - By checking our answers by looking at the answer sheet.
6. Encouraging peer assessment	Conduct activities that make students discuss the answer with their peers in a group and participate in doing activities.	Group work opens up discussion.	-Group work especially during lab experiments. - Learn better from each other than from our teacher.	- In group work, I feel I can ask questions and help them out. - Learn better from each other than from our teacher. Depends on the students - The teacher gave us a question paper. Every student answered them. then, exchanged papers and corrected each other's paper.
7. Teachers' training	No	No		
8. Challenges and difficulties.	- Lak of training - Lab. experiments were lengthy but time was limited - Scarcity of lab. equipment.	- Lack of training - Many parents objected to the way we assess their students. - Scarcity of experimental tools. - Not enough time to do some experiments.	-Lab. Experiments take time to finish.	-

Table 4.18 Cross-Participant analysis matrix

Table 4.18 shows a cross-participant analysis of how two Biology teachers enacted current assessment and how their students perceive it in two Omani schools. The analysis drew heavily on Biology teachers' and students' interviews and classroom observations.

For SA (the awarding of marks), both Nasir and Suleiman conducted formal CA through the semester for the purpose of awarding marks and reporting to the parents and the Ministry. On the other hand, Focus group 1 perceived SA as complementary to FA. Student 1 from the group said: "summative and FA complement each other. They together form a useful combination of skills". Student 2 stated: "SA measures what you've learned through FA". However, they found it anxiety provoking as student 3 said: "Marks and results really stressed me out". While Focus group 2 reacted positively to SA as they had learned from their mistakes. One of them stated: "I learn from my mistakes".

With regard to FA, Nasir used classroom questioning and written activities as a means of making sure that the students understand the lesson. Similarly, Aida conducted FA through classroom questioning and training to improve her students' knowledge. However, the views of students in group 1 was that FA trains them, although most of them were concerned about the mark they get. One of the students said: "we need marks and FA helps us to acquire good marks because this is an indication of how we're doing". While, most of girls neglected FA and ignored written comments on their works rather than marks as one of them said: "Most of students were concerned about the mark they get" (Huda).

Regarding feedback, Nasir said:

> "I give the whole class written exercises related to the lesson. Then, I correct them. In the next lesson, I discuss the answers with the students…. I also receive direct feedback from the students on my marking" (Nasir).

This statement indicates that feedback also depends on how students react and get involved in the feedback interaction. In this situation, feedback included interaction between the teacher and his students.

According to the classroom observations, it was noticed that the teacher conducted classroom questioning using the following order:

> "First, he asked the whole class a question, usually a convergent question with only one correct answer. Second, he selected one student to respond to the question. Then the teacher either pointed out that the answer was correct and praised the student or showed that the answer was wrong and suggested the correct answer" (classroom observation).

In this instance, the teacher gave instant feedback. This has its advantages such as correcting students' mistakes immediately. On the other hand, the questions he posed were not open-ended-questions, which stimulate his students' critical thinking. In the same way, Aida gave face-to-face feedback during her lessons as well as giving written feedback on students' written work. She said: "after returning assessment papers to the students, I'll give feedback to the whole class on it in the next lesson" (Interview with Aida). However, by choosing random samples of six students' exercise books (also named notebooks, work folders or journals) from each class, it was observed that both Nasir and Aida did not check them. When they were questioned, they replied that they would check them later. This observation indicates that the teacher had focused on formal embedded assessment of homework. They did not use students' exercise books or assignments they had given as a FA source.

The analysis of how students used feedback revealed that the male students saw assessment as useful because it helped them to spot their weaknesses and strengths in performance. One of them said:

> "Assessment is useful as it can help you to know your own weakness in achievement, so you can answer a similar question in the final exam" (Student, Group 1).

Another student stated:

> "If I'm unhappy about my results, I'll go to the teacher to talk about the corrections he'd made to my work in order to get higher marks in the next exam" (Student, Group 1).

This excerpt shows that some students used feedback summatively to gain more marks. Similarly, the female students had the same idea. One of them said:

> "We prefer that the teacher clarifies the question and the way of solving it in order to be able to answer a similar question to it in the final exam" (Student, Group 2).

Another female student pointed out:

> "After receiving their marks, some students didn't like discussing the answers" (Student 2, Group 2).

These statements illustrate that the students focused on marks rather than comments in their answer papers.

Concerning self-assessment, Nasir practiced this process without knowing what FA means. He stated that at the end of the semester, he gave students questions and their answer keys and told them to correct their own answers. But, not regularly. In contrast, Aida did not show any evidence of self-assessment. In comparison, their students showed

different ways of dealing with this type of FA. Whilst the male students did not know what it meant, the female students had done it only by their own efforts as they said:

> "We do self-assessment by our own efforts. We check our answers by looking at the answer sheet" (Students, Group 2).

Therefore, it is clear that the teachers did not practice this type of assessment in a highly professional way.

In terms of peer assessment, both Nasir and Aida conducted activities that make students discuss the answers with their peers in groups as well as doing group work to open up discussion. Accordingly, their students supported this issue for example a male student said:

> "Our teacher carries out peer assessment in group work especially during lab experiments" (Student 2, Group 1).

Another student confirmed this statement:

> "In group work, we learn better from each other than from our teacher" (Student4, Group 1).

This is also clearly evident in female students' statements such as:

> Student 5: "In group work, I feel I can ask questions and help them out".
>
> Student 1: "We learn better from each other than from our teacher".
>
> Student 3: "The teacher gives us a question paper. Every student answers them. Then we exchange the papers and correct each other's papers".

From these excerpts' the concept of peer assessment was obvious in student 3's statement which was compatible with the definition of peer assessment as "Assessment by students of each other's work" (Student Assessment Handbook, p. 3).

The above has demonstrated the way that experience influences aspects of Nasir's and Aida's practice and this have an effect on the way that their students perceive assessment. It is necessary now, to discuss aspects of teachers' training. The underlying rationale for this is because it is imperative that teachers are supported in managing change to their classroom practice. Neither Nasir and Aida had access to opportunities for formal training in new assessment techniques that might help them develop various skills for dealing with assessment issues. Nasir and Aida voiced similar concerns about the lack of professional training, as follows:

> Nasir: I never get to take part in training regarding the new assessment practices.

> Aida "We haven't received any training in assessment except one that we received when we were at the university. I mean training at Bachelor level".

In terms of challenges and difficulties the teachers faced in this regard, both teachers showed that lack of training, scarcity of experimental tools and lengthy experiments posed difficult dilemmas for them, for instance the teachers pointed out:

> "The lab experiments are lengthy and most of them need two lessons to complete. But, the time allocated limits your choices" (Nasir).
>
> "We haven't enough time to complete some experiments" (Aida).

The students in Group 1 endorsed the views of their teacher by stating:

> "Lab. experiments take a long time to finish. We couldn't finish some experiments on time… we ran out of time" (Students, group 1).

With respect to a shortage of equipment, both Nasir and Aida expressed concern about this issue:

> Nasir: "The Biology lab is suffering from a lack of important equipment".
>
> Aida: "There's a scarcity of experimental tools… we've only one good microscope".

These quotations indicate that the Biology experiments were suffering from two challenges, which required an immediate solution, a scarcity of both time and equipment resources.

In addition, Aida experienced parents interfering with the way she assesses her students as she said:

> "Many parents object to the way we assess their daughters, for example they don't want us to give them extra formative activities or exercises because they see them as a heavy burden on their children or when we give students two equivalent versions of the test, they protest that their daughters' version was more difficult than their peers' so their marks were lower" (Aida).

This dilemma could affect the teacher's practices of assessment. Thus, this difficulty can be discussed during meetings with parents.

4.8 Conclusion

This chapter has presented the main findings of the study and revealed some interesting information about the assessment strategies and practices in Oman. It has discussed the participants' perspectives, ranging from assessment policy makers, through Biology teachers to students' perceptions by presenting data extracts from them related to key themes, such as findings relate to the top-down approach, pedagogical confusions

regarding aspects of the implementation of the Omani assessment system and types of feedback (written and oral feedback). In the subsequent chapter the key findings of this chapter are discussed in relation to relevant literature.

Chapter 5. Discussion of Findings

The rationale for the chapter's organisation is assessment as written, enacted and experienced. This chapter is divided into seven sections:

Section 5.1 provides an introduction to the chapter.

Section 5.2 identifies the key issues that the literature review raises and are related to the strong points that are made in the discussion

Section 5.3 tries to address the research questions.

Section 5.4 identifies teachers' and students' epistemology of the assessment process.

Section 5.5 discusses the concept of invisible ZPD as an original contribution to knowledge.

Section 5.6 indicates what the current assessment situation looks like in the Omani context.

Section 5.7 provides the chapter summary.

5.1 Introduction

Having presented the results of this qualitative dominant case study design in chapter 4, this chapter attends to a discussion of the main findings. This chapter compares key theories and concepts that emerged from the literature review chapter with the results obtained from the analysis of data from the interviews, classroom observations and the assessment policy document (presented in Chapter 4). The participants in this study on assessment change and practice in two Omani schools included assessment policy makers, PBE Biology teachers and students. Figure 5.1 illustrates the process of bringing together the literature review, the research methodology, and the research questions into a logical framework in order to analyse and discuss the research data in relation to the research questions.

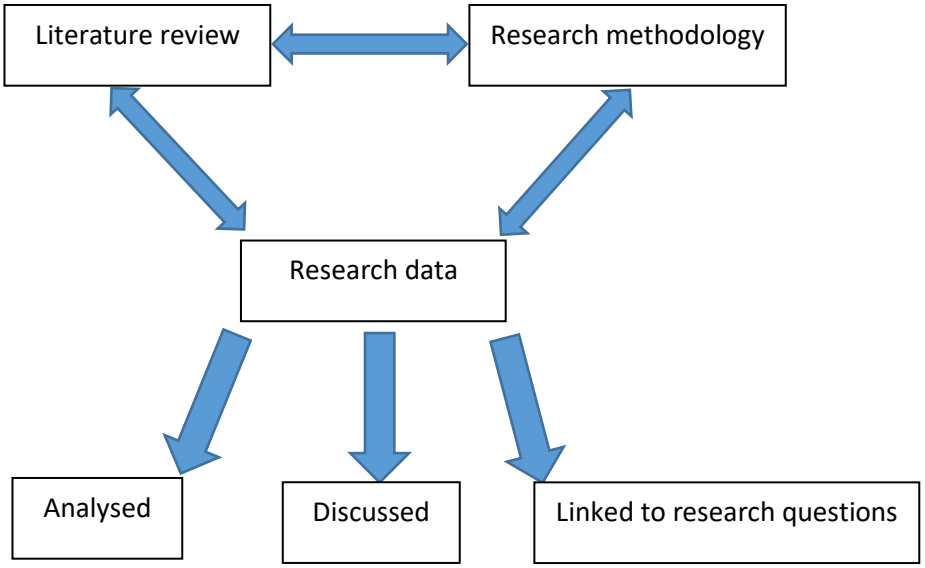


Figure 5.1 Process chart of the discussion

This chapter attempts to address the following research questions (which guide the rationale for the chapter's organisation) in light of the literature review and findings:

Main question:

How is the 2015/ 2016 written Biology assessment policy in PBE in Oman enacted by Biology teachers and perceived by students?

Sub-questions:

1.1. How do teachers in Nizwa schools in Oman enact and perceive assessment practices?

1.2. How do students in Nizwa schools in Oman perceive assessment practices?

In this chapter, the research questions are addressed in light of the findings considering both Biology teachers' practices and students' perceptions of assessment in relation to the intentions of the assessment policy makers. Methodological triangulation is used (document analysis, interviews, focus groups and observation) to validate research findings by comparing different sets of data, and different participants' perceptions of the topic under investigation (Torrance, 2012a). The findings represent the views of three main stakeholder groups: policy makers, teachers and students. This chapter highlights the consistency of these findings with previous educational assessment research and seeks to identify any new trends. The ultimate objective of this study, proposing an assessment framework, is addressed in Chapter 6 and includes input from the research data and the assessment literature reviewed. In this chapter, the key findings of this study are discussed and summarised so that the research questions of this thesis are addressed (sections 5.3). Each research question is followed by key themes.

5.2 The key issues raised by the literature review and the discussion

The literature review covers various themes and concepts related to the topic of the study. It provides theoretical structures to analyse the case study data. The key issues raised in the literature review include:

1- Bernstein's (1996; 2000) classification and framing theory which is used to explain power relationships in the enactment of educational assessment proposed by the MoE. Evidence from the study and literature shows that the top down (also referred to as hierarchical) approach to evaluating Biology, and the powerful effect this has on specification of attainment, is a key factor in terms of why the participant teachers adopt particular approaches to SA and FA.

2- The literature review includes a discussion of Vygotsky's ZPD theory (please see Section 2.3.2) and this chapter extends this notion further by using the idea of 'invisible ZPD'. Social interaction between students in collaborative learning emerged as a finding, bringing Vygotsky's theory to current educational practice in the classroom culture.

When students were working together, they demonstrated behaviours indicative of learning from each other, although their teachers were not aware of it.

3- It was a lack of professional development to support the assessment reforms that negatively influenced the ways in which teachers enacted assessment and that enacting assessment change is not possible without training opportunities tied into the new assessment system for Grades 11 and 12. The effective implementation of the planned reform requires considerable strengthening of the professional development for teachers. My findings also suggest that dialogic feedback between the teachers, provided the teachers with opportunities for reflection on teaching and learning and therefore provided a form of professional development (please see Sections 5.4 and 5.5).

4- Teachers' practices reflect their values and beliefs about the new reform. There is considerable evidence in the literature to support this claim (please see Section 2.5.3). There is evidence from my findings that the participants' values and beliefs influenced their practice in ways that impact upon choice and use of FA strategies (see Section 5.4). The assessment policy involves using assessment information, especially FA to feed into the teaching and learning processes. However, the teachers and students involved in this study believe that the main purpose of the assessment process that they use is to award marks (see sections 4.5 and 4.6). There is evidence in the study that teachers' views of learning lead them towards the use of assessment summatively SA. This then impacted on the type of teaching and learning strategies that they used, which were didactic and teacher-centred and that these teaching practices shaped students' experiences of Biology learning.

The following sections provide a discussion about the significance of the research findings from my study. The discussion was structured around the research questions.

5.3 Discussion of the findings in relation to the research questions

This section contains discussions and summaries of the key contributions of this thesis in relation to the existing literature in terms of the methodology employed and its findings.

5.3.1 The main question: How is the 2015/ 2016 written Biology assessment policy in PBE in Oman enacted by Biology teachers and perceived by students?

The analyses conducted in Chapters 4 has shown that the assessment policy affects how the four Biology teachers involved in this study use particular formative or summative

classroom assessment strategies. This section explores key themes related to the relationship between educational policy and its implementation. These are:

1) A top-down approach

2) Assessment reforms not being fully understood by the Biology teachers

3) Teachers' involvement with assessment change processes

4) The specification of attainment

A top-down approach

This study found that, the Biology teachers used the Student Assessment Handbook (2015) as a starting point for planning their CA. They translate the framework's objectives onto their semester plans. However, because these plans are completely prescribed and cannot be changed, they do not appear to be amended in light of assessment. Learning objectives and outcomes are specified by curriculum frameworks for each subject (MoE, 2015) and are unchangeable, regardless of whether or not students have achieved them. As a direct consequence of the 'top-down' mechanisms to the assessment of Biology, academic attainment is specified to students using a range of strategies. The top-down approach creates a sense of 'have to' change, not 'want to' change. The dominant top-down response involves implementing a rigidly inflexible process regarding the teaching of Biology and the pedagogy that arise from being involved in such approach. Similarly, Al-Tubi (2014) finds that:

> "The bureaucratic 'top-down policy, where decisions are taken centrally and applied by schools and practitioners, constrains creativity if it doesn't kill it and impedes development" (p.156).

In this regard, researchers (For example, Anderson, 2006; Thorne, 2011) suggest that stakeholder involvement allows a balance between top-down and bottom-up decision-making strategies. Using only top-down approaches has negative consequences for reform impact and outcomes. Literature on educational research usually indicates that top-down nature of reforms and lack of involvement in the change process are major causes of teachers' resistance to change (See Poole, 1991; Könings et al., 2007; Jenkins, 2014) and this would appear to endorse the finding from my study.

Assessment reforms not being fully understood by the Biology teachers

In seeking to understand why the teachers plans seem to focus predominantly on SA, it is reasonable to indicate that it could be the result of the assessment reforms not being understood. The introduction of the PBE curriculum has sent the unintended message that planning explains assessment criteria and descriptions of achievement without referring to the importance of FA. In addition, the Biology teachers have expressed concerns about the assessment changes. The findings indicate that the participants exhibited a limited understanding of the spirit of assessment change, except for Amina who conducted FA effectively in laboratory work (but she gained that skills from University). This infers that the targets of the Biology assessment were not clear to them. This lack of understanding among the Biology teachers about the focus of assessment instruments is evident from their enacting of both homework and practical activities (section 4.5). This view is supported by Könings et al. (2007) who attribute teachers' resistance to change to factors such as lack of training. As acknowledged by other researchers regarding education reform (see for example Southerland et al., 2011; Kirk and MacDonald, 2001), teachers' enactment of the change process requires that they understand and make sense of the spirit of that change. It is evident, from my study, that the PM and AW did not appropriately enlighten the teachers about the intended focus of Biology assessment. Teachers experienced challenges that arose from the conflict between FA and the exam-oriented climate. Schools need to change their culture regarding valuing exam achievements. This finding concurs with the results of Joong et al (2017) study (in China) that policy makers who want to enact change will have to pay attention to the voices of teachers and parents. Regarding parents' views, my study implies that there was parental pressure experienced by teachers in my study (see Sections 4.5.2.2.1 and 4.7), which could affect the teachers' practices of assessment and students' behaviour which is influenced by parental pressure on their children to get higher grades.

The Student Assessment Handbook includes the purposes of assessment, types of assessment (formative and summative), recording information, feedback and using information. However, teachers and students need to understand assessment criteria in order to implement them correctly. For example, students were actively engaged in the feedback process, so their teachers must play an important role in facilitating students' engagement with feedback through feedback-dialogue practices. This notion is supported

by the observations of Rust, O'Donovan, and Price (2005); Blair and McGinty (2013) that dialogic feedback requires special skills and knowledge to be enacted effectively.

My study gave particular attention to the fact that there is an area of concern with regard to the ability of teachers and students to understand the purposes of FA and feedback. This is in line with what the New Zealand Consortium (2017), who conducted a comprehensive review of the Oman's school education system, suggesting that the education reform in Oman faces the challenge of ensuring that the intended assessment system is understood by the teachers who implement it.

The World Bank (2012) attributed misunderstandings about the real purpose of assessment reform to the fact that CA was still a relatively new experience for Omani teachers as it was introduced in 2004/05. More recently, Kovačević, Rahimić, and Šehić (2018) have suggested that reforms in education often fail due to the influence of the preceding culture and insufficient time to implement them. My study concurs with these earlier findings as it has found that currently the focus is too strongly on marks and grades and not on the impact on learning. This issue shows the wide disparity between what is envisaged and what actually happens in the classroom. Policy makers need to interpret and communicate educational change during the process of learning about the changes. At the centre of this is the issue of encouraging assessment policy maker and teacher dialogue around the new assessment system by developing peer feedback that involves discussion and reflection. In this regard, researchers (for example, Blair, Curtis and McGinty, 2012; Higgins et al, 2001) argue that there is a need to develop a stronger dialogue in the provision of feedback between teachers and students to ensure that it is fully understood and therefore the advice provided is enacted correctly.

Teachers' involvement with assessment change processes.

Another noticeable theme developed through the data analysis is the lack of involvement of teachers during the change process. All decisions related to assessment were made without Biology teachers' consultation during the planning or design stage. The AW said: "We [the evaluation department] worked on the Student Assessment Handbook ourselves". Moreover, the participant teachers state that they had not been involved at any phase of assessment reform. The importance of involving teachers in educational change is supported by the findings of earlier studies, to create a sense of ownership in teachers who use the new curriculum (Craig, 2006; Jenkins, 2014). This notion is consistent with

the statement of The World Bank (2012) (which collaborated with the MoE to undertake a comprehensive study of the school education sector) that as it prepares new curriculum drafts, the MoE's Curriculum Development Directorate should continue to allow time for reasonable inputs from education stakeholders, such as supervisors and teachers.

Teacher participation in assessment decisions is considered an important factor in shaping teacher activities. Managing the change process, required by the reforms, and communicating the reasons and impacts of the changes to teachers requires a considerable amount of work to ensure those involved in the change are fully supportive of the reasons for change and ensure efficient implementation of the improvements. Researchers (e.g. Cross et al., 2002; Fullan, 2007; Craig, 2006; Bantwini, 2009; Baglibel et al., 2018) have shed light on the importance of involving teachers in educational change and show that neglecting teachers participation during the process of educational change could lead to critical negative consequences in the form of minimal teacher agency.

The specification of attainment

The specification of attainment is related to the previous section because it includes issues connected with the top-down approach in dealing with delivery of the curriculum and ensuring assessment matches the knowledge and skills specifications for students set out in the prescribed curriculum. The top-down approach to teaching Biology and the impact this has on specification of attainment could be used to explain why the participant teachers adopted particular approaches to assess their students. This notion is clarified by the Student Assessment Handbook and AW's statement. The handbook emphasised that "all exam papers will be prepared according to the official Exam Specifications" (Student Assessment Handbook, 2015, p.52). The AW pointed to this topic: "Assessment criteria/standards are specified and determined in advance". The specification of attainment is used to ensure that examinations reflect curriculum content and expected cognitive standards (MoE, 2015).

My study points to how, for participating teachers, specification of attainment exists at the centre of their assessment behaviour, and this can be attributed largely to the heavily prescriptive Biology curriculum in terms of how it is to be delivered. The teachers used an objective driven curriculum in their work. The curriculum is delivered largely through the Teacher Guides and student textbooks (Ref. field observation). This directly affects how the teachers then behave in their classroom. The Department for Curriculum

Evaluation potentially plays a critical role in the quality assurance of the curriculum via the development of Scope and Sequence documents, which contain the content and learning objectives (the New Zealand Consortium, 2017). Therefore, the Department for Curriculum Evaluation has a role to play in standardisation.

The literature regarding assessment often describes means of specification of attainment, for example Flórez (2014) explains that learning occurs in the context of very specific externally set boundaries and students are required to adapt to expected behaviours. The OECD (1998) indicates that a change in assessment practices might call for changes in curriculum and in teaching practice in order to be successful. However, there is often a gap between what is proposed and what is done. However, Flórez (2014) has expressed concern about the prescription of curricular contents which undermines creativity and the natural development of the student. Therefore, the curriculum should offer a balance between the set of expected behaviours, which all students must accomplish and the advocacy for a student-centred pedagogy that respects flexibility and the natural development of the student. This notion concurs with Black and Wiliam (1998) who describe means of specification of attainment, as they draw attention to the sharing of learning objectives with students as a feature of FA.

Most authors that have focused on FA (see for example Black and Wiliam, 2018; MacPhail, Halbert and O'Neill, 2018; Álvarez-González and Villarroel, 2018; Torrance, 2007) acknowledge a key facet of FA is the specification of attainment targets to students via the sharing of learning outcomes. The sharing of learning intentions can be an effective means of motivating students to learn as it enables the student to know the purpose of the activity, for example sharing goals with students motivates them to show what they can do and encourages student self- and peer-assessment and enables the student to know the purpose of the activity. This helps to transfer much of the responsibility for the learning from the teacher to the student.

5.3.2 Discussing the findings of the first sub-question: How do teachers in Nizwa schools in Oman enact and perceive assessment practices?

The analyses conducted in Chapter 4 has revealed how teachers implement assessment and develop an opinion about assessment practice. These findings advance our understanding of how Biology teachers see the value of the new assessment system.

Thereby, it has supported and extended the previous research which has focused in general on performance improvement when teachers use FA and feedback.

5.3.2.1 Tensions involved in assessment policy change

Firstly, the most notable finding to emerge from the analysis was that the new assessment practice caused a tension between policy makers and Biology teachers. Nasir explained that this difference had impacted on his practice which may contradict his beliefs and produce a tension between his supervisor and himself. Similarly, the two female teachers (Aida and Amina) said homework was not an accurate measure of performance because, they could not enact it as the PM planned. My study supports the findings of Hopfenbeck, Flórez Petour, and Tolo (2015) in that successful implementation of assessment for learning processes occurs where there is dialogue and trust between the stakeholders. However, implementation was challenged when the policy was interpreted as a way of controlling the schools. Furthermore, in their study in England, Black et al. (2003a) indicated that teachers reflected some level of anxiety in relation to the use of assessment for learning strategies because they did not see these strategies as consistent with the requirements of the school's administration. This indicates partnership between assessment policymakers and teachers is needed in order to support teachers' competence in their assessment of students' regular work in lessons (Gioka, 2009).

My study findings indicate that the implementation of the new assessment system was challenged when the assessment policy was misinterpreted as a way of marking exam scripts with minimal notes on the work. Where this is identified as a shortcoming, it appears that this is chiefly in the domain of communication with regard to the way that feedback is given (Blair, Curtis and McGinty, 2012), so in this context, I suggest that there is a gap between what the assessment PMs desired and everyday practices. This finding would appear to agree with the finding presented by Alton-Lee (2006) and O'Doherty (2014) that understanding the teachers' practices of assessment in the classrooms provides insights into the relationship between assessment as written and assessment as enacted. The findings of my study suggest that the tensions between the teachers' real practices of classroom assessment of Biology and the call for assessment change can be regarded as a central impediment to education reform. The challenge of addressing tensions between professional practice and assessment reform requires an

understanding that the teachers themselves are the ones responsible for the current state of their assessment practices because they set up the structure of their work and the expected modes of interaction in their classrooms (Hopfenbeck, Flórez Petour, and Tolo, 2015).

In my case, the problem is that teachers were required to interpret what is written in the Student Assessment Handbook. Therefore, it is necessary to recast assessment change as a pivot or driver in programmes of teacher training and ongoing professional development (please see Section 5.5) because when new assessment policies are affected, little is understood of the real spirit and intent of change and teachers try to fit the new system into their existing practices. Hence, teachers need to have a better understanding of the intentions of the assessment policy makers and better awareness of new pedagogies regarding the enactment of summative and formative assessment instead of just assuming that they should do whatever is asked of them. Comments in the teacher's interviews suggest that they felt that they had not been well prepared to implement the new techniques for assessing their students. This is similar to the findings of Towndrow et al. (2010) who identified that when new policies are produced, and teachers are uncertain about the real spirit and intent of change they try to fit the change into their existing practices, to comment and believe that the educational reform proposed is nothing more than giving an official name to what they are already practicing in their classrooms. Teachers need time to develop the skills regarding how to conduct FA and provide effective feedback (Towndrow et al., 2010; Blair, Curtis and McGinty, 2012). However, in some context, this time requirement is at odds with the pressures derived from external high-stakes assessment systems and administrative requirements of the school (Black et al., 2003; Au, 2007; Valli and Buese, 2007).

The concept of liminality

As suggested in Section 4.5, in the current situation in Oman teachers are waiting for training during a transition phase between the old assessment policy and the new one. During this phase teachers may feel uncertain and unsure of what to do regarding the new strategy. The concept of liminality (see Section 2.5.3) describes such a transitional period and status during the transition from an old situation to a new one. Teachers may experience anxiety or a lack of confidence or acceptance of the new methodology during this tentative phase. The mismatch between teachers' previous views and practices of

assessment and the demands of the new assessment policy may impact on their professional identities and teaching approaches.

In light of these challenges, a current study (e.g. Chang, 2018) has shown that the professional growth of teachers is a dynamic learning process and a continuous negotiation of their identities and beliefs within the policies, practices, and power relation of each particular teaching context. Therefore, attention should be paid to the identity development and transition of teachers who undergo a period of a new educational reform and enter a gap period between the previous and current assessment system. A liminal space is an unstable one in which the people experiencing it are unclear about their status. To overcome this notion of liminality, teachers require continuing professional development (CPD) and dialogic feedback and discussion, such as how can he/ she improve their new practices? What can be suggested to improve them? Then, the mentor or teacher supervisor should see the impact of their supporting plan. This finding is in line with McGinty (2007) who suggests that the transition frequently involves the humbling of the participant and all the participants should be collective and support each other.

5.3.2.2 teachers' beliefs and perceptions of the policy proposition

Secondly**,** the findings indicate that the way in which teachers interpreted the assessment procedures and enacted the new assessment policies in their classrooms reflected their views on teaching and pedagogical assessment. This is evident in the ways in which teachers interpreted how to assess homework and practical performance. The teachers pointed out that the aims of the Biology assessment policy (as written in the Student Assessment Handbook) was not clearly understood regarding how to assess both homework and practical performance. This finding concurs with previous studies (Marshall and Drummond, 2006; Bullock, 2010; Pajares, 1992; Dixon, Hawe and Parr, 2011) that the beliefs teachers hold about learning and teaching relate to the way they interpret and apply assessment policy documents in the classroom.

The general perception is that although formal policy documents call for reform, Biology teachers found it a new and difficult task. The participating teachers illustrated that the criteria were not clear. In Oman, a primary purpose of the CA was to introduce FA into classroom practice (MoE, 2015). If the CA was well used this could have a positive impact on both engagement with the assessment process and increasing learning outcomes. However, I found that the teachers used CA as a SA. This is not unanticipated.

Isaacs et al. (2013) state that in most countries, including the USA and Australia, educational assessment is associated in the minds of the teachers as a summative process because it is routinely used for school and national monitoring and accountability. I believe that in order to include FA in teachers' practices, the philosophy and practice of FA should be deeply embedded in the culture and practice of teaching in Omani schools.

5.3.2.3 Limited time for practical activities

Thirdly, the participant teachers stated that they did not always have time to enact all of the assessment practices, especially practical activities. They did not have enough time to discuss assessment feedback in sufficient detail, so that their students often did not receive formative feedback in sufficient time to enable them to respond to it and to assist with subsequent assignments. The teachers' complaint about the lack of the time was supported by their students' view that time was insufficient for both practicing mock exams and finishing the laboratory experiments.

Time constraints can be attributed to the teachers' overloaded working schedules. A student-learning day consists of up to eight lessons taught. Each lesson 40 minutes in length (see Section 3.6). Within a student-learning week, the teachers are asked to: teach a certain number of lessons, prepare for these lessons, attend to administrative duties, mark follow-up work and undertake substitution classes as required for absent teachers (Ref., fieldnotes). This finding concurs with Rolando, Salvador and Luz (2013) that teachers are subjected to time constraints due to their overloaded working. They suggest that enough time should be available for teachers to deliver their classroom activities. Although extended periods of time cannot guarantee a profound impact on student outcomes, opportunities for deep and real learning require it. Timperley et al. (2007) argue that if teachers are given sufficient time and resources, they will be able to construct lessons that are effective in promoting learning in ways that have positive outcomes for students.

Practical activities require more time for acquiring the necessary skills of laboratory experiments and group work. Time should also be given to the dialogue between teacher and students, and between peers in order to improve FA. This finding is supported by Wulfsberg, Laroche and Young's (2003) who emphasise the importance of students engaging with experimental observations and data, then constructing their own conception of the principles behind that data, then discussing (in small groups) and

drawing conclusions from the demonstrations. The practical demonstrations can take a lot of time to be conducted under the supervision of teachers with adequate safety standards, so that students can make discoveries (Wulfsberg, Laroche and Young, 2003; Blondel et al., 2019; Shumow, Schmidt and Zaleski, 2013). This is also in line with other studies, such as Hargreaves (1994) and Raminarain (2016) that time constraints play a considerable role in the implementation of scientific enquiry in the science classroom as the act of collecting information or asking questions (enquiry methods) can take more time. This issue is not exclusive to Omani schools, but generally found in other countries including developed countries. For instance, Capps, Crawford and Constas (2012) point out that largely enquiry-based-education is not used by most teachers in the US due to time constraints, although conducting enquiry investigations can lead to more in-depth understanding of science principles. Adequate time is needed for activities in which new skills can be learned, reflected upon, and improved over time (Leu and Price-Rom, 2006).

5.3.2.4 Feedback provided by teachers

Fourthly, the interpretation of the data shows that they were generally focusing on giving marks or grades (Section 4.5). The theme which can be derived here is that the focus of feedback was on the competition between students for higher grades. This action may inhibit students' attention to important comments or advice on making progress. Focusing attention onto external indicators of worth undermines performance compared to framing the same activity in terms of the intrinsic goal of gaining skills and understanding because individuals become concerned with proving their self-worth (Butler, 1987; 1988). The importance of formative feedback as a potentially powerful factor in enhancing the quality of teaching practice and student learning outcomes is well established in international research literature, for example (Sadler 1989; Hattie, 2012) suggest that the feedback must address 'the gap' between where students are in their learning, where they need to be in their learning and how to get there. However, Sadler (1989) advocates that students should develop skills in evaluating the quality of their own work in order to change from teacher-supplied feedback to student self-assessment.

It is important to focus on feedback, particularly in low-stakes tests as preparation for high-stakes tests. There is a need to differentiate between a low-stakes tests and a high-stakes tests. The high-stakes test is one that is very important for the person who takes it. A student can use the results of the test to influence their life chances either through

employment or choosing to continue their education. End of PBE tests are potentially high-stake tests for Omani students; the other tests can be considered low-stake tests. In years where high-stakes assessment are not needed, the focus could move from the reporting of grades to the reporting of progression. The phasing out of such summative grades would reduce the amount of marking and allow teachers time to focus on FA for effective learning. This would reinforce the idea of FA and allow teachers to focus on learning. As Handley and Williams (2011) suggest, this approach to learning encourages the student to engage with assessment criteria and feedback and develop a deep understanding of Biology concepts. However, the challenge here is to design meaningful assessment tasks that support higher level learning of an area of knowledge studied and challenge students' abilities to meet the learning goals and put effort into learning (Dweck, 2000; Jones, 2014; Elliott and Dweck, 1988).

I observed that the Biology teachers had given their students written exercises to do at home for formative purposes. However, they did not read through them and comment on their work (Ref., field notes). On the other hand, the Student Assessment Handbook suggests that:

> "The teacher can also gather useful information by looking closely at students' homework" (p. 19).
>
> "The corrections, comments and other notations that you [teacher] put on students' homework are also a kind of feedback" (p. 46).

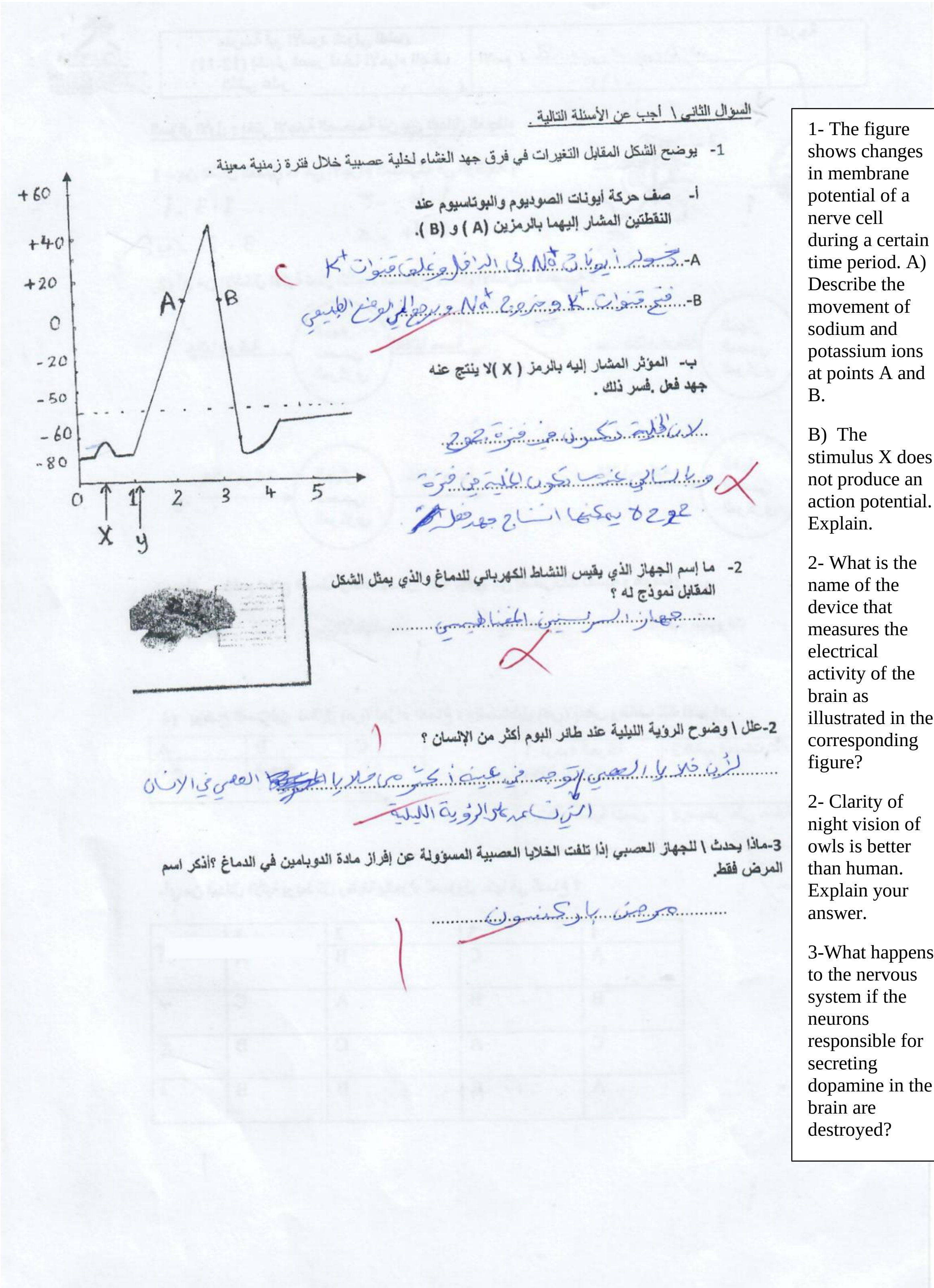
I have noted that the feedback provided by the participant teachers tends to be focused on grading homework rather than commenting on how the students might improve their future assignments or homework (Ref., field notes). This finding concurs with the findings of other researchers, such as Orsmond and Merry (2011), that the coursework feedback given by teachers have a tendency to focus on the content of the marked assignment rather than taking a more holistic approach towards the improvement of future work. Providing students with written feedback aims to help redirect teachers' and students' use of feedback. In this sense, feedback is a reciprocal arrangement in which teachers' written comments inform students about how well they are on course to their target, and students in turn use the comments to redirect their learning (Burke and Pieterick, 2010; Hill et al., 2018). However, in order to be effective, written feedback should be explained orally and discussed with the receiver of the feedback. The study

conducted by Blair et al. (2014) indicates that exam feedback should be dialogic and create opportunities for discussion about feedback comments. This type of feedback generates more transparent assessment where students can comprehend assessment criteria. This feedback-dialogue approach is collaborative or reciprocal because it is based on the student's real work, rather than telling them what they should have done.

Moreover, in the studied classrooms, I observed that the feedback provided was evaluative (judgemental) rather than descriptive. For this reason, the students might experience the teacher's comments as judgement rather than as information and thus, they might not perceive formative feedback to be as important as graded tasks. The participating teachers tended to tell students what the right answer was. This strategy for learning could be flawed as the comments on students' future work are often not acted upon. Furthermore, criteria-standards templates tend to prioritise specific qualities, which praise the correct close ended answer. Furthermore, this kind of assessment framework is greatly influenced by the concept of 'convergent' assessment. Torrance and Pryor (1998) suggest that 'Convergent' assessment focuses on discovering whether the student reaches the pre-set learning goals (see Section 2.2.3). In this situation, the student is subservient to the curriculum and his/ her aim should be to learn the Biology content. The intention of feedback is to help students learn (Brookhart, 2017; Sadler, 1989), so evaluative (judgemental) feedback is not always helpful. Thus, a formative interaction between the teacher's question, student's response and feedback can influence cognition (Black and Wiliam, 2009).

In the classroom FA, I have noted that the teachers' responses to the students' work took two forms: verbal feedback and written feedback (see Figures 5.2 and 5.3).

Figure 5.2 The teacher giving verbal feedback on a student's answer



السؤال الثاني \ أجب عن الأسئلة التالية

1- يوضح الشكل المقابل التغيرات في فرق جهد الغشاء لخلية عصبية خلال فترة زمنية معينة .

أ- صف حركة أيونات الصوديوم والبوتاسيوم عند النقطتين المشار إليهما بالرمزين (A) و (B).

A-

B-

ب- المؤثر المشار إليه بالرمز (X) لا ينتج عنه جهد فعل .فسر ذلك .

2- ما إسم الجهاز الذي يقيس النشاط الكهربائي للدماغ والذي يمثل الشكل المقابل نموذج له ؟

2-علل \ وضوح الرؤية الليلية عند طائر البوم أكثر من الإنسان ؟

3-ماذا يحدث \ للجهاز العصبي إذا تلفت الخلايا العصبية المسؤولة عن إفراز مادة الدوبامين في الدماغ ؟أذكر اسم المرض فقط.

مرض باركنسون

1- The figure shows changes in membrane potential of a nerve cell during a certain time period. A) Describe the movement of sodium and potassium ions at points A and B.

B) The stimulus X does not produce an action potential. Explain.

2- What is the name of the device that measures the electrical activity of the brain as illustrated in the corresponding figure?

2- Clarity of night vision of owls is better than human. Explain your answer.

3-What happens to the nervous system if the neurons responsible for secreting dopamine in the brain are destroyed?

Figure 5.3 A type of written feedback on a student's quiz shows that the teacher focused on marks

Figure 5.2 shows that the teacher communicated orally relating to information about the quality of a student's answer and how to improve it, for example:

> Teacher: Why did Mendel choose a pea plant to conduct his experiments?
>
> Yusuf: The presence of several plants, I mean, they are similar.
>
> Teacher: Excellent. Well done. Guys! the trait mentioned by Yusuf ok? In the pea plant, there are several opposite traits for example, Mendel had got pea plants. They were either long stem or short stem. There was a pea plant that gives fruits in the form of horns that may be long and may be short and may be green and may be yellow. Also, flowers… [Then the teacher indicated a PowerPoint presentation pointing to the graphic]. These traits are opposite [said the teacher]. Look at the opposite qualities…,etc.

Compared to written feedback, the teacher had given more detailed feedback orally. He used student's ideas to elaborate his explanation or description of the topic, for example the advantages of using pea plants for experimental breeding work. Such feedback can identify the problem as it happens (instant feedback). This fact is similar to the idea presented by Brookhart (2008; 2017) and Sadler (2013) that in oral feedback, the teacher can speak to the students at a place and a time in which they were willing and ready to hear what he had to say. Spoken commentary can offer more examples and strategies in improvement as a regular part of instruction. In my study, oral feedback is often given during observations of students doing their work, where feedback results in a conversation between teacher and student.

Verbal feedback has the advantage of being able to ask for clarification of feedback comments, collect non-verbal clues about the performance from the teacher and to enable students to engage in a dialogue about their work (Race, 2007; Blair and McGinty, 2013). In my research, due to the larger classes and incorrect implementation of the CA system, the marking load for teachers has been increased. Therefore, the teachers have less time to write detailed feedback on students' work (please see figure 5.3). In this regard, Nicol and MacFarlane-Dick (2006) suggest that that verbal feedback can compensate for the shortage of written feedback. For this reason, dialogic feedback needs to be a collaborative process that encourages teacher and student dialogue around learning (). For this type of feedback to work effectively students must feel comfortable and confident about asking questions when they do not understand (Pieterick, 2010). It is a medium which is potentially more effective for formative feedback.

My findings showed that teachers generally focus on providing grades rather than written feedback. This indicates that they may find it difficult to compose high quality feedback and many teachers feel discouraged or disconcerted because it requires them to put specific time, knowledge and ideas into it. Similarly, Murtagh and Baker (2009) suggested that teachers should invest time in providing feedback to students that is personalised. The provision of skilled teachers at conducting professional FA and giving high-quality feedback needs special training to ensure the successful implementation of the intended assessment system. The next section discusses teacher professional development.

5.3.2.5 Teacher professional development (TPD)

Fifthly, what is unexpected is that the results showed the participant teachers raised the theme of a lack of formal training in necessary skills to change the way they assess their students. They need to acquire techniques to communicate the reason for conducting FA with students (see section 4.5). The Biology teachers lacked abilities to ask higher-order questions, probe student comments and use student ideas. All participant teachers shared the opinion that they experienced the problem of lack of training in FA techniques. This issue arose, because the participants show little understanding of the intended focus of the new assessment system. When they were asked about that, they replied that they have not been well prepared and trained (in-service) to implement the new strategies of assessment. There is a considerable support in literature for involving teachers in professional development regarding educational and curriculum change. For example, Furtak, Morrison and Kroog (2014) state that teachers should be supported in learning various techniques for dealing with classroom assessment. Furthermore, the teachers need to prove their professional competence in assessment through professional development in how to provide clear feedback and guidance acts as a form of control that legitimises and regulates student behaviour.

The policy makers asked teachers to make challenging shifts in assessment practices and in order to make them happen, significant external support was needed. However, the interventions were not completely successful in convincing and supporting teachers to change their assessment practice to meet the intentions of the assessment policy. This is clearly evident in the statement of the PM and AW. They explained how challenging it was for the Ministry to waive some of its decisions as a result of teachers' protests against

the proposed changes in the assessment system. These statements indicate that the shifts that the teachers faced in terms of changes in the assessment system between 2007 and 2011 had been surrounded by disagreement between the policy makers and teachers. The teachers had remained unconvinced about the importance of changes to the assessment system. Making changes creates lack of interest in educational reforms among the teachers because they felt that they were instructed from the top to implement changes. Darling-Hammond and Ball (1998) highlight the importance of teacher education courses and emphasise that training should be well matched to both the subject that students study and teaching methods.

One of the interesting themes raised was the need for a closer and more constructive dialogue between teachers and policymakers. The findings reveal a lack of dialogue between the Biology teachers and policy makers that may explain the tension between the aims of the assessment policy and the wishes of the teachers. These results are in accord with Stewart's (2012) study. He found that the teachers perceived that policymakers employed an authoritative discourse that made it difficult for them to engage in dialogue with the policy mandates they received. Dialogue affords teachers opportunities to reflect on their professional practice in connection with personal experiences and experiences of others (Mantei and Kervin, 2011). Teacher-policymaker dialogue makes teachers understand more about policy-makers' perspectives of what shapes their decision-making (White, 2016).

Moreover, dialogue about FA and student performance could appear in both regular day-to-day work discussions between teachers and senior teachers and teachers and supervisors as well as on training centres stage in seminars. Authentic dialogue, generated through the diverse views of teachers, head teachers, supervisors and parents is critically important to address issues such as result inflation in continuous assessment. This is in line with Assen et al. (2018) findings which suggest that dialogues about teachers' actual teaching behaviour is effective. Showing teachers video-episodes of their actual teaching behaviour encourages them to start to reflect on the beliefs underlying their teaching behaviour. Looking at video-episodes enabled teachers to start a process of interpretation and reinterpretation of their dominant-positions. Hence, reflecting on teaching behaviour seemed to be an important activator to start the professional development of teachers.

5.3.2.6 The classroom as a social environment

Sixthly, the findings show that the teachers went some way towards conducting pair work rather than peer assessment when they provided the opportunity for their students to work in pairs (section 4.5.2.1) (Also illustrated in Figure 5.4):

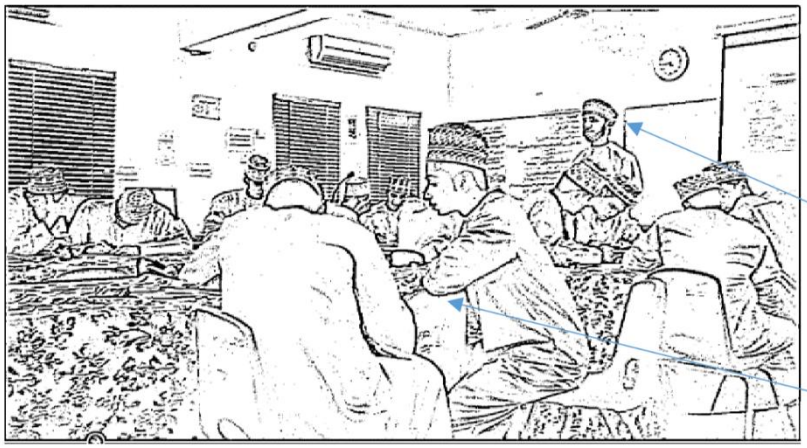


Figure 5.4 students working in pairs

During the investigation into what happens in classrooms regarding FA interactions, this theme has emerged: schools can be perceived as a social ecology in which the interactions between people are governed by formal rules and social conventions (See section 2.4 Bernstein's pedagogic theory). Figure 5.4 shows a Biology classroom, in which knowledge was structured strictly by the teacher as a result of implementing a formal curriculum written in advance by the curriculum policy, and students responded to the teacher's questions on the topic studied. Through my own observation in the classroom, prescriptive learning environments are dominant. The students are told exactly what to do. Taking Bernstein's (2000) notion of classification and framing, classification was strong. Furthermore, in the lesson, the teacher introduced the activity to students and clarified the procedure of the exercise. He got the students to do the exercise as pair work. Then the teacher collected the students' answer papers to correct them later and give them marks in the next lesson. In this situation we can look at the social context in the classroom as a strong framing (Bernstein, 2000). Such a learning environment, in which controlled assessment was conducted, can lead to a narrow view of feedback that relates strongly to graded tasks. This milieu can affect the teachers and students' behaviour in that they both emphasised strongly the marking system and the Biology teacher directed instruction and assessment of students' learning. Since the teachers wanted to take control

over the students' learning, there was little hope that students would seek to develop more creativity and independent thinking in their learning. The teachers would expose the students to pedagogic devices which emphasised transmission of knowledge and therefore, the students would expect their relationships with their teachers to reflect a form of class-consciousness determined by power relationships in their social culture. Barnes (2008) proposed that how teachers interact with their students is strongly related to their perceptions of school culture and the nature of the knowledge that they are teaching. If they see their role as simply the transmission of authoritative knowledge, they believe that students learn from the direct transmission of knowledge and are less likely to give their students the opportunity to explore new information. According to Bernstein (2000), these kinds of teachers frequently use strong framing (F+) pedagogy in the class. Fan's (2014) study found that this often happened in science subjects. She suggests that teachers in the strong framing discourse such as in science subjects tend to use SA.

The Biology teachers need to maintain a good balance in their class between their control and giving their students some control of their work. It would be useful for teachers to give students the opportunity of self-correcting by giving them chances to assess their own and their classmates' performance. The participant students expressed confidence in their peers as reliable feedback providers, and interest in the role of peer assessment to improve the quality of their learning. In addition, teachers should encourage seminar discussion groups and provide feedback in order to be constructive, to help students to reflect and to resolve issues. Success in creating pedagogic relationships in the process of FA is mediated by encouraging social interaction in the classroom. This can raise more constructive student-teacher relationships. Furthermore, enhancing critical reflection through feedback discussion with teachers and peers may be useful to help the teachers to give the students more control over their work, i.e. giving students more responsibilities towards their learning such as seeking feedback and interacting with it (Roman, Muñoz and Castuera, 2019; Biggs, 1999; Dochy, Segers and Sluijsmans, 1999).

5.3.3 Discussion of the findings of the second sub-question: How do students in Nizwa schools in Oman perceive assessment practices?

For the purpose of discussing students' perceptions of the processes of the new assessment system, the following main findings are identified:

1- students undervalue ungraded tasks.

2- students learn from their own mistakes.

3- students were not used to assessing and discussing other's work (peer assessment), although they believed that learning from their peers (peer learning) is useful.

4- self-assessment was not the focus of the assessment activities and the students were not trained to conduct this type of assessment.

5- the capability of students to understand the meaning of feedback and make sense of the feedback information has an impact on how they use feedback.

5.3.3.1 students undervalue ungraded tasks

The first theme emerged from analysing data of student perception is that the students undervalue ungraded tasks. This attitude negatively affected their advancement in the subject matter. It can be inferred from interviews and monitoring sample work that the students focus on memorising knowledge in order to get higher grades in examinations at the expense of high-quality learning or change in Biology learning practice. However, there are some data suggesting some openness to learning from each other. The findings related to students' perceptions indicated that the Biology students focused on SA and the extrinsic outcome of their grade in a competitive classroom environment. A public examination system has a strong impact on the learning process. My findings are similar to those of Alkharusi et al. (2013), who demonstrated that students are likely to develop strong self-efficacy when the scoring standards and criteria of the assessment task are clear to the students in advance. They suggest that involving students in the assessment process is likely to activate positive perceptions of the importance, utility, and value of the tasks. While grades are important, students can be helped to reflect on their performance on a particular task. This might help them understand why they were awarded a certain mark and how to improve it. Wiliam et al. (2011) attributes the limitation of FA opportunities to large classes. However, the OECD (2012) finds that that the quality of teaching is more important than the class sizes.

5.3.3.2 students learn from their own mistakes

The second most important theme with regard to CA is that participant students state that they learn from their own mistakes (see section 4.6.2). This is in line with the study of Yerushalmi et al., (2012), who find that the students diagnose their mistakes in tasks and learn from them when given some feedback on the solution. Similarly, Black and Wiliam (2005) state that students who are trained in self-assessment can understand the main

purposes of their learning and grasp what they need to do to succeed. However, the students' conception of learning is of the memorisation of facts and learning to the test. This situation explains why teaching in Oman is currently dominated by a didactic approach to teaching (the New Zealand Consortium, 2017). The ability of students to recognise a weakness in their performance in Biology tasks is an important skill for successful learning because they will exert more effort and search for additional guidance that is needed to increase their understanding and, therefore, avoid making similar mistakes in the future. In this regard, Cherepinsky (2011) believes that the grading method helps students develop their self-error-correcting skills and benefits their learning. Yerushalmi and Polingher (2006) suggest that to help students learn from their mistakes, they should be guided through a more active process of addressing their mistakes, so that students can promote their learning in that context.

My findings indicate that teachers used students' portfolios as evidence for awarding marks and reporting progress. In this case, it was used for SA. However, the students might use it (informally) for self-assessment and reflection, to chart their development and take ownership of their learning. As Yerushalmi et al. (2012) state, this activity is a type of FA, which emphasises process and feedback. In this instance, students would not focus their attention only on marks, but also on learning outcomes. Likewise, Belgrad, Burke and Fogarty (2008) suggest that portfolios places students at the heart of assessment as reviewers, critics, and evaluators of their own work and the work of their peers. Self-assessment as an ongoing activity is an important part to develop the ability to set academic achievement goals.

5.3.3.3 students were not used to assessing and discussing other's work (peer assessment), although they believed that learning from their peers (peer learning) is useful.

The third theme was derived from the idea of peer assessment (see sections 4.5 and 4.6), the students stated that they were not used to assessing and discussing other's work, although they believed that learning from their peers (peer learning) is useful (see section 4.6). However, when they were given the opportunity to work in groups, they discussed each other's work and assessed it, for example when asked about their experience of peer assessment in Biology, the students showed clearly that they enjoyed the peer

assessments of laboratory experiments. This pattern was reflected in the laboratory class observation, as the students engaged in doing this type of assessment. Furthermore, most students demonstrated a preference for working together (in pairs) on a task with the classmates who sat next to them and assessing each other's work. On the other hand, the teachers did not provide the students with opportunities to peer-assess (section 4.5). Hence, it is reasonable to infer that the students have the ability to work cooperatively and do peer assessment, although their teachers might not realise it or were not aware of its importance. Peer assessment is consistent with Vygotsky's theory of the Zone of Proximal Development (ZPD) (see section 2.3.2), which shows that sometimes a student is able to perform a particular task under guidance or assistance of a more knowledgeable person or in collaboration with more capable peers (Vygotsky, 1978b). Students can learn through dialogue with others, such as teachers or their peers. Some researchers (Black and Wiliam, 2009; Blair and McGinty, 2013; Blair et al., 2014; Blair, Curtis and McGinty, 2012) highlight the significance of peer assessment in shaping students' learning. They state that students learn through dialogue with others. Following Vygotsky's principle, Black and Wiliam (2009) suggest that ideas appear first in the social environment, then become part of the way the individual thinks. Peer assessment is a collaborative approach of learning by which students construct shared knowledge, either with peers or with peers and teachers (Wallace, 2015; Hayashi et al., 2011; Candy, Crebert and O'Leary, 1994; Boud, Cohen and Sampson, 1999).

The social construction of students' learning experience could help students to achieve their full potential. Researchers (for example, Bruner, 1990; Perry, 1999; Sheppard and Gilbert, 1991) indicate that most learning processes are communal activities that involve students working together and having an influence on each other by using their own language. How students think learning happens or how they interpret the world are concepts related to their epistemology. Students' ideas about the nature of learning influence their learning outcomes as they may successfully translate their own scientific knowledge into productive learning environments.

In my study, students commented that they benefited from formative peer assessment. They used the knowledge and skills they had developed to discuss their partners' work. They implied that their peers were often far better than their teachers in providing constructive feedback because they provided it in accessible language and their peers were 'closer to them' than their teachers. They were in a similar position to each other

and could ask each other what may appear to be silly questions. This finding agrees with Gibbs's (1999) results that students can receive more, and more-immediate feedback from peers than when dependent upon their teachers. Lea, Stephenson and Troy (2003) highlight that peer assessment helps students construct their learning through a social process, which is different from the acquisition of teacher-transmitted knowledge.

As mentioned above, the Biology teachers admitted weaknesses in implementing peer assessment, so they found it difficult to make it effective. This issue can be connected to lack of adequate preparation and their skills seemed inadequate to help them conduct peer-assessment activities. However, Amina illustrated a good peer assessment practice. She asked her students to work in groups. At the end of the group work, each group presented their work to other groups. There was interaction between the students. The teacher gave her students opportunities to give feedback to each other (See section 4.5.1). When asked, she indicated that she learned this technique adequately at the university, so the problem of lack of teachers' skills could be related to teacher training provision.

However, some researchers (Sainsbury and Walker, 2008; Hoogerheide et al., 2017) argue that the benefits of peer assessment have been questioned in that its feedback can lead to regressive collaboration where interactions between students with appropriate understanding and students with less appropriate understanding lead to conceptual confusion instead of clarification. In this instance, teachers should take this into account when conducting peer assessment and guide students to behave appropriately regarding negative feedback. It has been shown that summative assessment (SA) was more prevalent than FA in the two participating schools. Indeed, peer assessment can be considered unsuitable for SA because it (SA) influences feelings of competition and relationships between students. The next section will discuss the issue of self-assessment and explain how it holds particular interest for the Biology students.

5.3.3.4 Self-assessment was not the focus of the assessment activities and the students were not trained to conduct this type of assessment

Fourthly, the findings of the study indicate that the students perceived self-assessment was not the focus of the assessment activities and the teachers did not train them to conduct this type of assessment. Although self-assessment had not been part of Biology lessons, it played an influential role in Biology learning. Students were self-assessing. Many students check their work before handing it in. Furthermore, Biology textbooks had

provided examples for students to try out and check their answers. For example, ‘test your understanding’ quizzes and questions at the end of each chapter (Ref., fieldnotes). Such questions may encourage the students to think about and examine their academic subject knowledge and skills. However, in my study, self-assessment was not planned in advance and it was peripheral to formal assessment procedures. Self-assessment, could be more practical if more responsibility was given to students to monitor their own progress and evaluate their performance. Black and Wiliam (1998) regard self-assessment as an integral part of FA, in which students’ learning is enhanced by feedback through their direct engagement in assessing their own work (see section 2.2.2). Some researchers (Boud, 1995; Black and Wiliam, 1998; Sadler, 1989; Clark (2012) claim that involving students in self-assessment can improve their self-esteem, autonomy and confidence, so it should be part of a teacher's duty.

In this regard, researchers (Brookhart, 2008; Sadler, 2013) suggest that it is teachers’ task to teach students how to assess and modify their own work. Acquiring this skill usually needs repeated practice on a range of tasks as self-assessment skills may not come naturally. However, the idea of students’ ability to assess their own work can be challenged because students with limited knowledge in a subject matter may overestimate their ability most and make regrettable errors (Kruger and Dunning, 1999; Boud, 2007). Hence, self-assessment should be informed by external sources such as peers and teachers’ feedback in order to be accurate. The role of teachers is to guide self-assessment activities to encourage students to become actively engaged in continuous learning (Boud (2007; 1995).

My study implies that the predominance of SA affects students’ response to self-assessment because SA makes them passive recipients of assessment from the teacher. The interplay between students’ understanding of self-assessment and practicing it is an important factor in enhancing deep learning. This interesting observation on self-assessment is in line with Butler’s (2018) suggestion that students’ responses to self-assessment is connected to their previous experience of this type of assessment as well as kinds of information elicited from the students, so that teachers can consider how to use different types of self-assessment to facilitate student self-regulation and learning. Thus, self-assessment should be part of classroom assessment processes (Murtagh, 2007). In order to help students conduct self-assessment, it is important to have them keep records

of their performance and reflect on it. The next section explained how they use and reflect on feedback.

5.3.3.5 Factors that impact how students use feedback.

Fifthly, the results show that when the students were asked about how feedback was used, they showed some confusion about it. They did not clearly understand the concept of feedback nor the wide variety of feedback that they received (See section 4.7). The students did not have clear expectations about the usefulness of feedback, over the duration of their study. Students' views show that most of them value graded feedback because they were not familiar with formative written feedback, which can help them reattempt work for future learning. This finding is in line with Lin (2018) who finds that students were reluctant to reveal their uncertainties of the feedback information by asking clarifying questions. In addition, he shows that the difficulties of not being able to engage with feedback might arise when the feedback giver's intended meaning is not the same meaning that is interpreted by the receiver.

Verbal feedback was used during classroom questioning or laboratory discussion more constructively than written feedback (Ref. field note). Many participants took written notes during the group discussion. This issue can be explained by the statement of Murtagh (2007) that much written feedback was evaluative. This evaluative feedback is provided by using SA across tasks and marker is important to make comparisons (Gipps and Murphy, 1994). Most of the participant students used feedback to understand their marks or whether they had got the pass mark in an examination, rather than to improve their level of skill to demonstrate learning in particular assignments. It is apparent that the students were seeking and using feedback in summative ways. The students' perceptions reflected the way in which feedback was delivered by their teachers, who believed in the value of summative or graded tasks and this has implications for learning practices as transmission of knowledge. In addition, students, who were awarded higher marks may see formative feedback as of limited value. In my study, the students, especially females were afraid of feedback (Section 4.7). The students anticipate criticism. This is because they looked at feedback as evaluative (summative feedback), not developmental (Formative feedback). It could be because that is how they have experienced it. Blair, Curtis and McGinty (2012) suggest that this tendency can influence a grade transmission model of feedback to become the dominant practice rather than considering the wider

implications of the feedback offered. In this context, students focus on written feedback. Therefore, developing a stronger dialogue in the provision of feedback can help students to fully understand feedback and act upon it (Higgins et al, 2001). In order to reach students competency, researchers (Orsmond, Merry and Reiling, 2005; Perera, Nguyen and Watty, 2014; Heron, 2011) suggest that the needs of the students should be understood, so that they can be given meaningful feedback to enhance their learning.

In addition, the findings show that some students chose to have discussions with peers and teachers to acquire information and skills. The students used technology to support the feedback process. They created 'WhatsApp' groups for their peers so that everybody could share messages and photos. They exploited social media in discussing and sharing ideas about homework with peers, in order to modify their solutions and include more ideas in their final submission (Section 4.7). The students used social media to create a dialogue about feedback with their peers and teachers and to search for options to regulate their own solutions. This agrees with the findings of Hepplestone and Chikwa (2014, p. 41) who state that:

> Students recognise the impact of technology in enhancing the feedback process, especially in supporting dialogue around feedback.

Yang and Carless (2013) commented upon this issue that mobile devices and social networks are learning tools applicable to all disciplines. Students can answer questions through them and engage in 'peer instruction' to convince peers of their answer. However, the students may use the technology passively as they copied the answers from one another. Therefore, using technology to support peer feedback should be monitored by the teacher in order to prevent the students from cheating on assignments. In addition, the students should be sensitised to the value of formative feedback, which build their sense of responsibility and ownership for their learning by enhancing their engagement with feedback (Hamad, 2017).

5.4 Real and expected views regarding FA

A key issue reflected in some of the comments is that both the teachers and the students have assumptions (or views) that do not fit too well with the spirit of FA. This issue requires reflection from both teachers and students on the situations that they meet in their day-to-day work (see, for example Moon, 2013). The findings of my research suggest

that, with regard to teacher and student views, they (teachers and students) appeared to believe that there were fixed bodies of knowledge which are objective and that the teachers' job was to transmit, the students' job was to learn and reproduce and assessment should evaluate how well this was being done. However, the spirit of FA implies that knowledge is constructed and feedback from any source helps the construction of that understanding (See Table 5.1 below).

	Teachers' and students' views	Spirit of FA
Content knowledge	- Knowledge is fixed objective bodies.	- Knowledge is co-constructed
Approach/ job	Teachers transmit knowledge	Self-feedback, peer feedback, teachers-feedback and feedback from any source helps the construction of that understanding
	Students learn and reproduce.	
	Assessment evaluates how well this is being done.	

Table 5.1 The gap between real and expected views regarding FA in the participant schools.

Table 5.1 contrasts teacher and student views with 'the spirit of FA'. Biology teachers and students were both found to hold naive views regarding the nature of knowledge and how it can be constructed. Students' views were influenced by their teachers' beliefs (or views) about the nature of scientific knowledge and how it is transmitted. Teachers' beliefs shape teachers' choice of pedagogical practices (e.g., student-centred versus teacher-centred) and classroom tasks and assessment, which, in turn, influence students' views of classroom tasks. In my research, the teachers valued a single truth and perceived their role to be to act as an authority, to deliver facts and correct errors. They viewed differences in students' knowledge as errors rather than as individual interpretations (please see Section 4.5). Students who were exposed to these practices perceived themselves to be passive consumers of fixed, objective bodies of knowledge. Students lacked a deeper understanding of the goals of FA and feedback.

The spirit of FA indicates that knowledge is co-constructed through self-reflection (self-feedback) and social interactions between students and students (peer feedback), teachers and students (teachers-feedback). These types of evaluative activities and feedback interactions help the construction of understanding, deep learning and skills development. Therefore, it is important to attend to both teachers' and students' views and to nurture more sophisticated beliefs in teachers in order that students are enabled to develop sophisticated perceptions (or views) (Feucht, 2010).

5.5 Invisible ZPD

A further interesting finding regarding post-basic Biology pedagogy and assessment illustrated two characteristics. Firstly, the control of the teacher over the student was explicit rather than implicit (see section 2.4). Secondly, teachers arranged the pedagogical context for the student to explore, and, the students obeyed the teachers' instructions. However, despite these conditions, the students appeared to regulate their own learning during group work. When students in Grade 11, (both girls and boys), were engaged in group work (during the laboratory activities, see section 4.5.1) they worked together, discussed each other's suggestions, shared good ideas and learned from the process. The Biology students perceived that the process of producing feedback of peer's work enhanced their knowledge and skills of Biology. They benefitted from reasoning and repeating the criteria as they gave feedback and conversed with peers about the quality of their work. This particularly valuable finding indicates that both male and female students saw their peers as having a considerable role in helping them understand and learn in science-related activities (without having an understanding of learning theories). This may explain why student enjoyed group work where this did happen. During group activities, students communicated ideas to the group and learned from more expert problem solvers. Peer feedback and the views of others can encourage motivation and activate the learning process (Bandura, 2011; 1999). Successful interactions or dialogue between students or between students and their teacher can generate intellectual curiosity and new scientific discovery (Olitsky, 2005; Vygotsky, 1978a), even if the students and their teachers are not aware of or understand the process.

Teachers participating in this study seemed unaware of the benefits of self- or peer assessment, or of FA. There were missed opportunities to encourage this process, to talk about its benefits, or to encourage students to work in their ZPD (please see section 4.6.2). Teachers tended to use external summative feedback on written tasks such as homework and short exams as opposed to formative or internal feedback based on self- or peer assessment. This suggests a need for teacher development, so that the value of collaborative work is understood, and Biology teachers learn to adopt a facilitating and heuristic role in the classroom.

This pedagogy can be characterised as an invisible ZPD. The concept of Invisible ZPD is offered as an attempt to consider the differences in the capability of individuals to benefit from both informal and formal learning. In the Invisible ZPD, informal learning practices (learning through conversation) are encouraged by the exposure of the students to sources

of stimuli (tasks). This pedagogy requires weak classification and weak framing (see section 2.4). The degree of specificity of the criteria is more implicit and more diffuse in collaborative learning when students discuss their tasks freely. My results suggest that collaborative learning experiences contributed towards learners' ability to engage with FA (both peer and self-assessment) and learn from it. In the invisible ZPD each student scaffolds their learning through interactive feedback; knowledge is co-constructed in a more implicit approach as students discuss their tasks freely.

Peer support helps students to reach a developmental point which, independently they would reach later. In the interactions between students within the same group or between groups (as in Amina's and Suleiman's laboratory classes) (see section 4.5.1) students are released from the teacher's direct control and provided with ongoing mutual support in which learning is invisible, implicit and accelerated within the ZPD. Learning is implicitly shaped and contextualised by the student according to their interpretation and evaluation of the explicit external stimuli (task or problem). Interactive group work encourages students to discuss each other's ideas and helps them to "learn from shared discussions with teachers and from one another" (Black and Wiliam, I998, p. 13). This may be theorised as the development of students' understandings of scientific concepts as a result of interactions, such as the provision of reasoned peer feedback that encourages students to work within their ZPD. Feedback-dialogue enables knowledge and meaning to be generated from experiences and evolve through participation (Blair and McGinty, 2013).

Invisible ZPD is offered here as a new concept, building on Vygotsky's notion of the ZPD and Bernstein's theory of classification and framing. It involves a tacit process during which students' progression is not interrupted by explicit teacher control. In interactive group work, there is a shift towards weak classification, where the boundaries between students are weak and there are no power relationships between students. The teacher's observation and control become more invisible. This triggers self-reflection and evaluation. These findings may help us to prioritise the interaction with various levels of peers as it activates learning processes and triggers self-reflection and evaluation.

In the above paragraphs, I explained how my findings led to the development of this new concept (invisible ZPD). In these two paragraphs, I explain how this concept builds on the theories of ZPD developed by Lev S. Vygotsky and the classification and framing

developed by Basil Bernstein. The concept of invisible ZPD and both of the two theories are concerned with interactional, mediated practices. I add to Vygotsky's ZPD that an invisible (informal) method of discussing ideas in group work and collective social activity with interpersonal communication (conducted in the classroom) can scaffold and improve students' learning. I connect Vygotsky' ZPD pedagogy to the classroom setting where both teachers and students willingly or unwillingly create a particular social pattern for dialogic learning. This situation is in contrast to the dominant traditional class (in Oman) that has been guided by the teacher's and school's interests. I have built my concept of invisible ZPD on Vygotsky's notion that learning arises in particular social circumstances rather than just face-to-face interaction between teacher and student. Bernstein's classification and framing theory focuses on the concepts of boundary and category relations. The pedagogic context influences the social interaction between students in the classroom. Boundaries between students are weak which can be manifested in group work interaction (social interaction in the classroom). In my study, I have taken this notion as a point of departure in the development of the concept of invisible ZPD. Learning from informal dialogic feedback between students is an implicit method where the classification and framing of the pedagogic practice is weak, so the spaces used for instruction would be strongly demarcated. In invisible ZPD, implicit learning can take place in a social context in which relatively weak control on students' activities takes place. With weak classification and framing, the social relations between students will be less hierarchical and more clearly equal.

To sum up, learning via dialogic feedback helps to expand informal or implicit learning. Social interactions in the classroom (as in group work) encourage peer feedback. In this context, the role of the teacher in the classroom is to facilitate cooperative or collaborative dialogue. My findings suggest that students seek to understand feedback provided by their peers. Then they used the information to guide or regulate their own performance. The teachers serve as mediators, helping the students co-construct their experience.

5.6 PB Biology Assessment in Oman: the current situation

In order to create change effectively, it is important to ensure that the intended outcomes are clear and linked across all parts of the system (from the MoE to the Directorate

General of Educational Evaluation and through to schools, teachers and students) in a meaningful way. Assessment policy provides a context for exploring the practices of FA and SA in Omani schools. The findings suggest that it is important to understand the interrelationships between assessment and both micro (school and student level) and macro (the Ministry) contexts (Strandler, 2016; Priestley et al., 2012; Villegas-Reimers, 2003). Policy sets the platform for decision-making about the way that assessment delivered in Oman. Critical policy settings relating to assessment and teacher training and professional development in Oman are held centrally. Educational policy is co-ordinated from a central point within the Ministry of Education rather than being developed and presented for approval from separate sections and committees of the Ministry (MoE, 2006; The New Zealand Education Consortium, 2017; The World Bank, 2012). Providing up to date teacher education in terms of assessment is not easy. Lack of training was a common factor that justifies poor performance in FA. This quality is reflected in their students' behaviour in terms of assessment practices in the classroom and their perceptions regarding FA and the grading method.

Despite the efforts of the government (at a macro level) in terms of student-centred pedagogy and FA, teacher-centred methods and SA were the norm. There was a gap between the macro level expectations and the realities of practice in the classrooms (micro level). My findings suggest that teachers were not supported with opportunities for sufficient professional development with regard to a student-centred approach and FA practice. This issue imposed constraints on teachers' implementation of the reform. This is in line with some previous educational research (e.g. Rogan, 2007; Akar, 2014; Fullan, 2013; Fink and Stoll 2005; Gardinier, 2012) that suggests that if teachers are given the opportunity to engage in analysing data sets about their own beliefs and practices and take part in theory debates with one another about next steps, then they are likely to become the drivers of change for their own profession.

Assessment reform decision cannot be made in a vacuum. Schools are an integral part of their local communities. Wider society (e.g., parents and the local community) are involved in the education system and have an interest in its success. My research discloses that parents communicate with schools and discuss their children's progress with teachers. For example, Aida experienced parents interfering with the way she assesses her students (Section 4.7). Parental participation in their children's schools has a strong effect on student learning (Loring, 2015; Brunold and Ohlmeier, 2013;

Townshend, 1998). The MoE (macro level) uses the current structures of the regional Parents Councils to develop a parent stakeholder engagement in order to strengthen the relationship between school, parents and community (MoE, 2006; The World Bank, 2012; the New Zealand Consortium, 2017). The challenge for the schools is the need to develop and maintain a productive engagement with the parents and communities they serve in order to improve desired outcomes for students. (Williams and Sánchez, 2012; Lv et al, 2018; Hoover-Dempsey and Sandler, 1995). Further research into parental participation in their children's assessment and learning in Oman is encouraged to develop understanding and provide comprehensive evidence for both teachers and policy makers (see section 6.5).

Efficiency for policy makers does not necessarily mean efficient application of the policy at classroom level, for example FA is yet to be seen in practice in the classrooms (micro level). There was a more focus on SA and testing at the expense of FA. The data analysis at the level of teachers and classroom indicates that there was a problem with the implementation of the formative part of CA because the teachers lack enough ability, experience and knowledge to be able to enact FA well. This finding shows a great disparity between what is expected (at the macro level) and what actually happens in the classroom (micro level). The macro policy's purpose of the CA was to introduce FA into classroom practice. However, in practice it was found that CA was used as a SA, so this situation calls for action taken by the MoE to improve it or it (the issue) will continue (see Kolb, 2015; Sadler, 1989; 2010; 2013; Black and Wiliam, 2003).

The data analysis suggests that the Biology students, in general, showed care and effort in their work. They were clear in their answers of the teachers' questions and they followed the instructions of their teachers (Ref., field notes). High stakes final examinations and anxiety about their results' consequences led them to focus their attention on test scores and the areas being tested. Therefore, high stakes testing and the interpretation of CA (by teachers and students) undermined the assessment reform proposed by the macro system or macro policy (please see Figure 5.5 below).

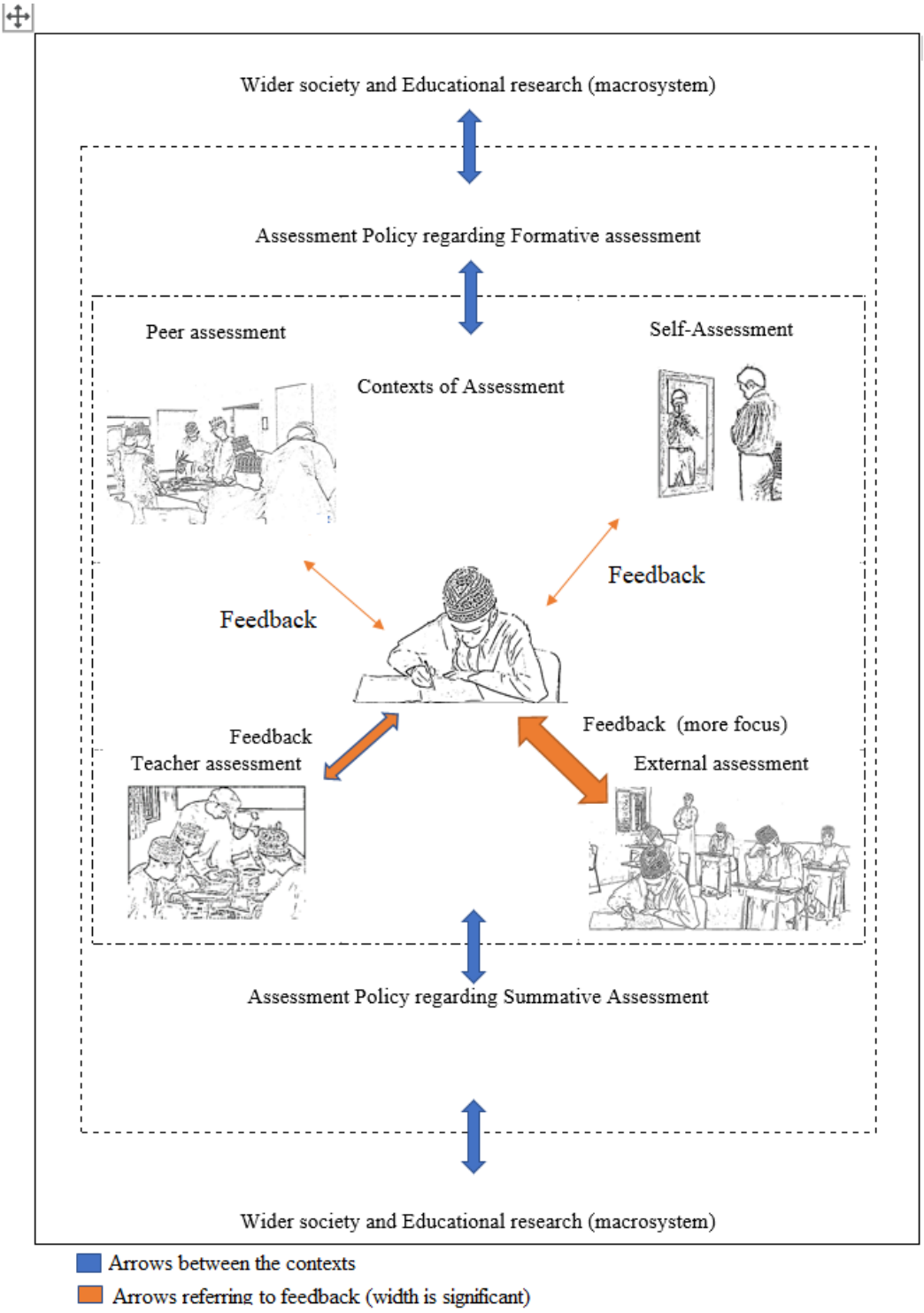


Figure 5.5 The current situation: Key areas of congruence between assessment processes (the width of the arrows illustrates the importance of Fb to the students).

Figure 5.5 summarises the whole process of assessment and the stakeholders involved in the assessment system, including wider society and national assessment policy (macro level) and teachers and students (micro level). The Omani education sector operates in a top down approach where macro policy has considerable control over assessment reform.

At a macro level (national level), educational research, globalisation and international testing (Section 1.2.6) had an important influence in shaping the assessment reform, defining what knowledge and skills should be assessed in the Omani schools. However, the process of reforms encountered resistance from the teachers. As a result of their views and beliefs, and due to pressure from wider society and parents to achieve high scores, teachers and their students (micro level) continued to focus on external assessment, SA and test scores, believing that schooling could be rationalized to produce desired results (see Sections 4.5.2.2.1 and 4.7). The tension between the macro level and micro school level, (teachers or students) continued to be an important element in the evolution of the national educational reforms. The desire for higher scores works against the spirit of assessment reform and the intention of macro policy to improve teaching and learning. In general, teachers are likely to resist assessment changes when they remain unconvinced of the need for those changes. This has resulted in limitations to the desired use of FA and formative feedback in PB Biology classrooms.

5.6.1 Dimensions of assessment change in Oman as revealed by the research

These findings together with those drawn from the education literature suggest that Omani PBE schools require a change in classroom culture, and that professional development would support teachers to adopt the new assessment policy in ways that are student centred to change the classroom culture. The successful enactment of the new assessment policy requires supportive conditions and assessment goals that fit. Whereas, summative tests are not appropriate. Assessment for learning is formative and constructive, and it should be supported by feedback from any source that helps the construction of that learning (the teacher, peers, learning resources or social media). However, external feedback can inform and steer students' learning and improve teachers' practices of assessment.

The process of integrating assessment theory with assessment practice is a challenging issue, considering those outside of the field of teaching (schools) often develop the policies for the many assessment settings in which teachers practice. The majority of assessments of student learning are conducted by teachers, who are challenged to implement decisions that may not be congruent with most of their values. This situation calls for connecting teachers' beliefs with policy and practice by conceptualising assessment policy as a background to the reform. See the figure 5.6:

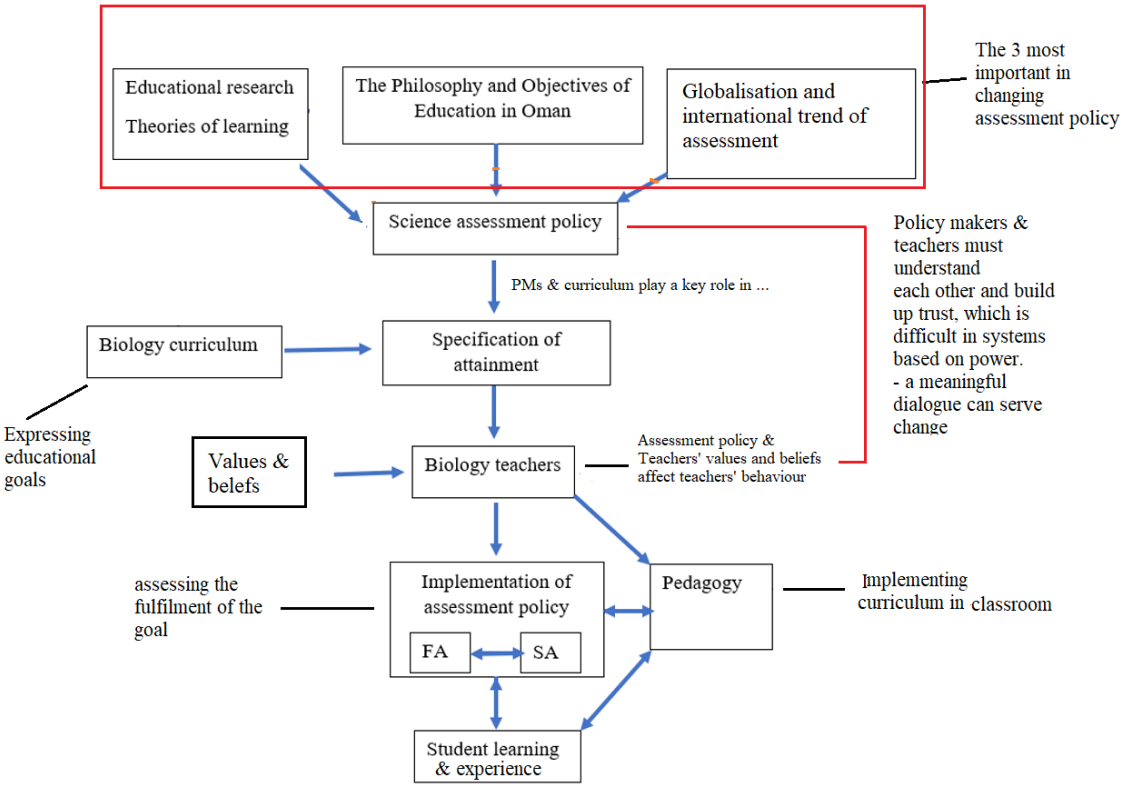


Figure 5.6 Dimensions of assessment change in Oman as revealed by the research

Figure 5.6 attempts to sum up assessment change in Oman as revealed by the research. The assessment system obviously does not exist in isolation from the broader educational context. Figure 5.6 depicts some of the key elements that interact with, influence, and are influenced by assessment. These encompass the assessment policy, curriculum, teachers, pedagogy and students. I suggest the three most important factors in changing the assessment policy are educational research, the philosophy and objectives of education in Oman; and globalisation and international trends in educational assessment. The starting point is the Science assessment policy wherein aspirant policy makers have initiated the programme of assessment reform. The policy makers and curriculum play a key role in the specification of attainment. The assessment policy, through the specification of attainment, and teachers' values and beliefs affect teachers' behaviour, especially how they implement the curriculum in the classroom (pedagogy). In their enactment of assessment policy, the teachers are influenced by their values and beliefs about the nature of Science and assessment. Corrigan et al. (2012) state that the teacher's interpretations of 'knowledge of worth' influences the implementation of system-level policies. The pedagogical approaches adopted by the teacher and implementation of assessment policy

have a reciprocal impact on each other, for example SA, especially high-stakes assessments and FA influence pedagogy implemented in the classroom. On the other hand, pedagogy adopted by the teachers, in turn, influences the teacher's enactment of assessment. Both teachers' assessment and pedagogy influence student learning and experiences. Teacher responses to student learning, in turn, affect the way teachers enact both pedagogy and assessment.

A theory-practice gap was evident, challenging the teaching profession in the Omani PB education system based on power relations and a top-down approach to policy development. Despite the prescribed nature of the new assessment system, teachers implemented the new policies in line with their own beliefs, values and preferred practices. No previous study has been conducted to understand the nature and dynamics of the theory-practice gap (The relationship between university-taught theory and its application in practice) in the preparation of Biology education teachers in the context of Omani schools. This research has value and relevance to teacher education, policy making and classroom practice to maintain a proper balance between theory and practice. It suggests that the assessment policy makers and Biology teachers must understand each other and build up trust and a meaningful dialogue, in order to develop an efficient assessment system.

5.7 Summary of the discussion

The main findings of the study have been discussed in the prior sections. The study has presented a number of findings in relation to formative and summative assessment that are applied in two post-basic Omani schools. Interestingly, it appears obvious that a key issue is that teachers were immersed in a top-down pattern of teaching, driven in particular by the demands of the PBE strategy. This top-down model leads the teachers to plan using objective-based criteria and specification of attainment. However, in spite of the constraints of working within such a prescriptive context, the teachers incorporate their personal teaching beliefs into this context. Moreover, in the preceding sections, I have discussed how the students use dialogic feedback in classroom interactions that can be interpreted as invisible ZPD to reduce the gap between a student's ability to learn on their own and the level of learning they can acquire with support, although there are a number of important topics associated with this in concerning disparities between summative and formative feedback and also student and teacher perceptions. The Biology

teachers perceived assessment change as innovative but found it challenging to put the assessment policy into practice. Teachers expressed that they felt uninvolved and untrained in assessment change.

The next chapter discusses the contribution to knowledge based on the research findings. The rationale for this is to demonstrate the complex and sophisticated relationship between the assessment policy, contexts, teachers' experiences and values and their assessment and feedback to students.

Chapter 6. Conclusion

6.1 Introduction

This study was conducted in the context of the reform of the Omani educational system. It focused particularly on the assessment of Biology in PBE (secondary school, Grades 11 and 12). The Omani Ministry of Education has initiated a variety of FA forms, such as self-assessment, peer assessment and portfolios since the introduction of the PBE system in the academic year 2007/ 2008. (MoE, 2008b; Issan and Gomma, 2010). This study has aimed to evaluate how the written assessment policy, and FA in particular, was enacted by Biology teachers and perceived by students in two post-basic schools in the interior region in Oman. The study paid special attention to FA because it is a key part of the new assessment policy and integral to pedagogy as it engages students in conversation and self-reflection (Black and Wiliam, 2005, 2010). As discussed in Chapter 2, although there has been work conducted with regard to FA, little is known about assessment policy and how it is enacted and perceived, especially FA. This study is the first of its kind to adopt a case study design to look specifically at assessment practice in Biology in Omani PBE. Notably, this study attempted to address a gap in the literature i.e. the lack of empirical studies researching FA practices (peer and self-assessment) in student-centred pedagogy in the context of Oman. This study emphasised two main things. First, the micro level, which involved changes in the approach to national classroom assessment that accompanied the implementation of the educational reforms. In the new assessment system, teachers are required to assess their students' performance according to specific criteria (objectives) (MoE, 2015). Second, at the macro level (i.e., assessment policy level) the educational reform of Biology assessment in Oman is critiqued in light of the wider educational policy in Oman and relevant findings and trends in international educational research.

In addressing these gaps, as explained in detail below, this current study makes a number of contributions to knowledge (Section 6.3), for example invisible ZPD is a key contribution. In this chapter, firstly, the implications of the study are considering (Section 6.4). Next, the limitations of the research are considered (Section 6.5), its practical implications are presented and suggestions are offered regarding potentially fruitful future directions for further inquiry. The reader will note that each of the sub-sections on 'implications', for policy (Section 6.4.1), for practice (Section 6.4.2) and for research

(Section 6.4.3) conclude with one or more recommendations, so there is no need for a further recommendations sub-section.

6.2 Summary and discussion of the key findings

The analysis of the main findings led to different conclusions about the participant Biology teachers' practices of the new assessment policy and their students' perceptions of Biology assessments. The context of assessment policy affected the teachers' implementation of the Ministry's aims regarding the assessment system. The findings suggest that post-basic school Biology teachers' practices of the new assessment system are predominantly teacher-centred and enacted didactically, focusing on learning through the transmission of knowledge. This reveals a gap between the intended student-centred learning and discovery learning approach in PBE (MoE, 2015) and the implemented curriculum. Such findings would suggest that the directions of the Biology curriculum have not been well understood by teachers. This outcome can be attributed to a lack of teacher professional development or CPD. The Biology teachers needed guidance and support as new changes were introduced to the PBE system. Information obtained during the classroom observations revealed that there were some challenges that the teachers faced in enhancing the students' science process skills and higher-order thinking skills in their classroom sessions, such as formulating a hypothesis; presenting the students' misunderstandings of predictions and assumptions; using the standardised language of science carefully. Therefore, offering teacher training in enquiry-based methods could improve the learning of students (Section 6.3). The Biology assessment policy indicates that assessment (formative or summative) should stimulate the application of higher-order thinking skills, both in the classroom and in final examinations (Ref. interviews with the PM and AW).

Student data suggests that the participant students were open to the assessment change (see Sections 4.5.1 and 4.6.2). They could see the benefits of talking with their peers to understand some topics related to Biology problems. On the other hand, their responses to assessment tasks indicated that they were focused on preparation for examinations in order to get higher grades, using rote learning methods at the expense of learning how to search for knowledge and acquire critical evaluation skills (Section 4.6). FA could play an important role in overcoming students' misconceptions about assessment function and convincing them that classroom assessment is also a means to guide their learning.

Students should be encouraged to take responsibility for their own learning with the help of peer and teacher feedback. In order to promote a change in the students' perception of assessment, the Biology teachers would also require guidance and support to change their attitudes towards assessment and their practices of assessment, which were formed by previous experience (Kafol, Kordeš and Brunauer, 2017).

Generally, the participant teachers met with difficulties related to the length of the Biology curriculum. It was hard for the teachers to reconcile syllabus delivery with assessment requirements because they did not have enough time (Section 5.3.4). During the enactment of the curriculum, the teachers were distracted by finishing the curricular content and assessing the students sufficiently. The education system in Oman was rigidly controlled centrally (Sections 1.2.4, 2.5.2 and 4.3), even in terms of delivering lessons, so the teachers had been given little autonomy in dealing with the mandated textbook. In this tightly-controlled system, the teachers may have found it difficult to make time to offer enquiry-based learning in an innovative and confident way (e.g. Figure 6.1).

Figure (6.1) A page of the teacher's book specifying what students are expected to learn.

There is an urgent need for more flexibility in the design of the curriculum to provide teachers with greater independence to enact it as they see fit (Al-Issa, 2007, 2005; Al-Ani, Al-Shanfari and Amzat, 2011; Wyatt, 2013). Addressing these factors should contribute to the effectiveness of the national curriculum and specifically the delivery of the Biology curriculum in Oman.

Feedback emerged as an important issue for students' learning. It was noted that the level of feedback the students received was low with no evidence of written comments on students' work (Please see Appendix H and Section 5.3.5). Furthermore, during SA, the teachers focused on awarding marks on students' work rather than giving formative feedback. The study showed that feedback was infrequent, except for laboratory work and peer assessment. Timely feedback is required in order to encourage students to review their work to find out where they went wrong (Rust, 2002; Mendes, Thomas and Cleaver, 2011; Brinkworth et al., 2009). The findings also show that peer assessment provides feedback through dialogic interaction. Students learn from making judgements of peers' work. However, lack of skills represented a barrier to making productive use of peer assessment and feedback. As discussed in Chapter 5, students engaged with feedback as dialogic interaction, although they did not fully understand the process.

6.3 Original contribution to knowledge

This study has investigated the relationship between Biology assessment policy and both assessment enactment and perceptions of assessment. This section outlines below evidence of the original contribution of this thesis to knowledge.

Although PBE Biology teachers know that they are expected to engage in and facilitate student-centred learning, teaching and assessment practices are currently dominated by a didactic approach to teaching and teacher-centred pedagogy. This study found that active learning methods, such as the use of group work and peer teaching were infrequently used in PBE Biology classrooms. Despite the MoE efforts in promoting student-centred reforms in pedagogy and assessment, practice in classrooms remains largely unchanged; that teaching and learning remains teacher-directed and didactic.

However, this study also suggests that students can adopt deep learning strategies when studying in an active learning environment. Hence, there is a strong relationship between students' approaches to learning and teachers' approaches to teaching. This result is in

line with previous studies (Uiboleht, Karm and Postareff, 2018; Prosser and Trigwell 2014) indicating that some students revealed that they focussed on words or text when involved in a learning and assessment task. However, in other tasks, they revealed engagement with collaborative learning. Much depended on the teaching setting. My study suggests that the didactic approach to teaching and a focus on SA practices encouraged the adoption of surface learning. In such instances, students perceived the teaching process as content-focused. In contrast, when student-centred learning was employed, students were more likely to adopt a deep approach to learning, through collaborative learning and peer-to-peer interaction. Few previous studies have researched this relationship in learning environments in Oman. The implementation of student-centred learning is seen as an important investment for the development of student engagement with learning and motivation to learn independently and creatively.

In this research I analysed the type of talk used by students, in group work, to solve problems together. The study proposes the idea of invisible ZPD. It analyses the way in which the students talked together. Students used dialogic feedback in group interactions that took place without the teacher's intervention. This mutually helpful behaviour can reduce the gap between the student's ability to learn on their own and the level of learning they can acquire with support. This finding that students were learning from each other inspired the concept of the invisible ZPD. This type of interaction between students was no longer the product of a teacher's conscious intervention. Hence, learning may take place, although it may not be visible to the teachers. Within the group, language was used in a dialogical and dynamic way to develop and maintain a shared learning context, with no hierarchy of involvement or contribution. The power relationship between students was quite equal. This process of informal learning demonstrated that the way in which students talked to each other was mutually helpful in progressing through a challenging group problem-solving task. This process may occur instinctively, i.e. not based on training or established ground rules for talk. However, they make progress by using dialogic feedback to solve problems together. Thus, if both teachers and students were aware of the benefits of this process, it could be encouraged and planned for more regularly within Biology learning and potentially more broadly across the PBE curriculum. Teachers need to be supported so that they are able to facilitate supportive learning contexts for peer learning in the ZPD- setting appropriate levels of challenge and encouraging groupwork for dialogic feedback to be more routinely part of Biology

learning. Students need to be supported to realise the advantages of peer feedback to their own learning so that they become motivated and committed to developing these practices. It could be argued that Biology teachers in Oman need to experience the ZPD themselves in order to understand fully its potential and to move from their very traditional ways of teaching curriculum, which emphasises content rather than quality of learning. Teachers in Oman, constrained by time and expectations to deliver a full curriculum content, rely on didactic forms of teaching to transmit knowledge through rote learning approaches that follow information in the prescribed text book. Teachers should be less constrained by the demands for curriculum delivery so that they are able to pay more attention to how students do and do not engage with the process and purpose of learning. If the teaching and learning processes enable more quality interactions between students, then those interactions must be understood and facilitated.

In this context, my study considers the need to teach specific types of higher order thinking in PBE. Higher order thinking requires active reasoning that takes place when students (e.g. in group work or laboratory activity) encounter a novel problem and must use active thought processes to respond to. In group work, the participant students talked to each other, discussing their ideas and opinions about the problem in order to solve it. In the invisible ZPD, students demonstrated specific thinking skills, such as thinking about a problem in Science and attempting to going through it. In this respect, this study recommends that students should be trained to practice basic scientific methods, so that they can more easily grasp the skills that are important to effective learning in the sciences, such as critical thinking skills, gathering evidence, forming reasonable arguments, communication and predict-observe-explain skills (Lati, Supasorn and Promarak, 2012; Cuevas, 2016; Widdina, Rochintaniawati and Rusyati, 2018). Given a suitable learning environment enables students to develop higher-order thinking. Whereas, unsuitable tasks encourage instrumental/surface approaches to learning.

With regard to professional development, it might be helpful to create support for teachers to facilitate their understanding and recognition of opportunities to enhance learning in the invisible ZPD. Teacher professional development initiatives encourage teachers to provide formative feedback (verbal rather than written feedback) on the higher order skills students demonstrate or need, creating a dialogue around thinking skills so that the invisible becomes visible and an explicit assessment goal. Ideally, if students learn to use these types of thinking skills and this becomes the goal in the classroom, then

they should be able to apply those skills across a wide range of problems and environments (Cuevas, 2016).

PBE Biology students can be supported to undertake both deep learning and strategic learning in line with the assessment expectations. They sometimes engage in a sense of learning from each other during group work in class, but they will also resort to copy from each other in homework assignments. My study finds that the approaches to learning and learning environments are related. Peer-to-peer learning sometimes support the deep approach to learning. However, the influence of competitive culture of learning in which high grades are highly valued above deep learning pushes students to adopt surface approaches to learning.

It is therefore encouraging to note that the assessment system in Oman is currently moving from a very examination-driven system to different, more student-centred forms of assessment. During this transition phase mastery of the new assessment system has yet to be achieved, as both teachers and students are resistant to change. This transition involves a period of liminality (the transitional stage (van Gennep, 1960 -please see sections 4.5 and 5.3.2.1). With regard to learning, Meyer and Land (2005) suggested that a liminal space is one in which the individual is being transformed, acquiring new knowledge, and a new identity between the old situation and the new.

Between the old situation and the new one, there is a phase where teachers and students feel uncertain and unsure of quite what they are doing with the new methodology. The concept of liminality addresses a state between perceived expertise (with regard to implementing the old system) and adoption of the new mode of assessment. Assessment reform requires a huge shift in the assessment practices of teachers and students need support in this liminal phase to accept fully and enact the new assessment system. In this case, the mentors and teachers' supervisors have a key role to play in supporting teachers. This suggests a new role for educational supervisors to mentor teachers and provide professional development so that they can enact the new assessment system effectively. This as a key contribution of my research, which I write about below (how dialogic feedback could be embedded in Continuing Professional Development (CPD) to enable teachers to support each other with 'best practice').

Teachers expressed a lack of formal training programmes regarding the proposed change in the assessment system, so they believed that the new assessment policies were not

feasible. This was reflected in their lack of skill in implementing the assessment policy. CPD can help to change teachers' beliefs regarding the proposed assessment policies and support them to become receptive to applying these policies in their practice. In this context, input on dialogic interaction should be an important part of the teachers' professional learning. Supervisors, headteachers or curriculum leaders could also support teachers to become reflective practitioners. If teachers routinely reflect upon their teaching and adjust the learning environment accordingly, reflection becomes an important part of their development. It enables them to become reflexive, i.e. to really enact their roles in a different way by making changes according to what has gone well (as they adopt the new policy or strategy) and accepting that, when learning isn't successful, some pedagogical change may be necessary.

There is a real role for me as a teacher supervisor in helping teachers in the transition from the old assessment system to the new one, to support improvements in their new professional practices of assessment. Having engaged in productive dialogue with the teachers during the research process, I can facilitate peer dialogue between teachers, in which they engage collaboratively, reflect on their own strengths and weaknesses and make informed decisions about what to do next. This dialogic interactive feedback between the supervisor and teachers, and teachers and teachers, can support professional learning and positive engagement with the new assessment system. Mentoring sessions can help to clarify the aim and practices of the new assessment system. Furthermore, this way of supervision moves from training that is conventional, i.e. enactments of direct training to training that is dialogic and reflective.

A further achievement of this study is that in seeking to understand the implementation of the assessment policy in classrooms, the findings suggest that there was a kind of naivety about the new assessment policy that it did not recognise the complexities about implementing something quite some new. For any future policy changes, it should be acknowledged, that the huge shift for teachers, the huge shift for students, the needs for adequate resources and the needs for professional development opportunities must be addressed if the policy is to be successfully enacted. It cannot be assumed that by changing a policy and writing a handbook, successful change will happen. Complex changes need far more in the way of support than that. The complex factors around the ways teachers teach need to be understood and addressed in any development of assessment policy.

Assessment policy decisions have to be seen not only as tools for classroom reform, but in their broader social and political function (Skourdoumbis, 2017). Teachers of Biology are experiencing changes in assessment policy that impact on their daily working lives, e.g. a requirement to use student peer assessment in the classroom. Such policy is not a decision made by teachers. It typically comes with authority. Teaching involves navigating these shifting policy environments whilst practising personal identity and associated beliefs about teaching (Ryder, 2017). There will inevitably be challenges to addressed in reforms that require a transition from traditional to student-centred modes of assessment. My finding suggests that those driving the reforms should consult with teachers from an early stage in the reform process. Top down approaches challenge existing, often deeply embedded pedagogical beliefs and practices. My study also suggests that assessment change involves numerous dynamic, interdependent and multi-level relationships. This links with Ryder et al.'s (2018) notion of teaching as an ongoing interplay between teachers' knowledge and skills, and the characteristics of the social and policy settings in which they work. They demonstrate that the sociocultural perspective provides insights into teachers' responses to education policy reform.

Assessment reform affects teachers' roles by changing, and thereby challenging, traditionally accepted assessment practices. Teachers' reactions to, and perception of the changes to the assessment system provided insights into how the management of change impacts on practice contexts, on teacher job satisfaction, engagement and sense of efficacy. Findings imply that teachers experience a sense of shifting role as assessment change is enacted. This notion is supported by Choi's (2017) study which shows that it is very difficult to change teachers' practices. Many teachers only implement the reform on a superficial level. The education reform has produced tensions between participant Biology teachers and assessment policy makers. Policy makers may not be aware of the possible effects or results of imposed changes to assessment, that require change in the teaching context and cause pressure on teachers' practices and roles. Lack of success in implementing the new assessment system may be perceived as incompetence or inadequacy, challenging teachers' previous roles and practices.

6.4 Implications of the study and recommendations

There are a number of practical implications from the outcomes of this study that Biology assessment policy makers, teachers and students may benefit from:

6.4.1 Implications for Policy

This study sheds light on several issues regarding the nature of the new assessment policy and how it is enacted and perceived in Oman. It suggests that professional development opportunities are provided to the Biology teachers in order to help them develop professionally and enact the assessment changes with regard to FA and a more student-centred approach. These issues have implications for the assessment policy-makers, who may use the findings of this study to improve policy and practice with regard to future assessment changes and teacher CPD:

(a) When making decisions about reform of the assessment system, the impact of the changes on those who must enact them need to be considered. Policy makers should recognise the complexities involved in implementing something radically different. For future educational policy changes, consideration of the potential impact on teachers' practices and identities is important. Appropriate support and professional development should be provided prior to implementation of the reform. Provision of necessary resources should also be ensured ahead of the enactment phase.

(b) CA, as required by the assessment reform, can serve both formative and summative purposes according to how assessment information is used. However, this study found that participating Biology teachers used CA summatively. There was ambiguity in the Student Assessment Handbook, regarding the formative aspect of CA. Therefore, it is recommended that assessment policy makers should ensure that written guidance for teachers illustrates clearly how practical or pedagogical change (such as CA and FA) should be implemented and provide for appropriate teacher support and constructive feedback on practice in ways that helps them to improve student learning. It is suggested that the Student Assessment Handbook is amended in order to clarify what is meant by CA and FA and provide examples of how this can be implemented in practice. The handbook should serve as a practical reference to all Biology teachers, to guide them in the efforts to implement the assessment reforms during the transition period from the old to new assessment system.

(c) The teachers are subjected to time constraints (please see Section 5.3.4). This research suggests that policy makers should review the time available for teachers to deliver Biology classroom activities, especially practical activities, as well as student led activities such as groupwork for deep and real learning. This would allow sufficient time

for dialogue between teacher and students, and between students and their peers in order to improve FA. Thus, policy makers should plan to increase the length of Biology lessons, or reduce the content of the curriculum so that it can be more realistically and appropriately delivered in the time available.

(d) The Directorate General of Educational Evaluation could implement a programme of activities designed to improve aspects of CA and FA, such as gathering information about teachers' understanding of CA and their experiences of enacting this type of assessment. The data gathered could assist the MoE to design and provide appropriate professional development and mentoring opportunities. Job-embedded mentoring and professional learning can contribute to teacher change (Crawford et al., 2017).

6.4.2 Implications for Practice

As well as having implications for policy, the study offers a number of practical recommendations that have implications for practice.

With appropriate professional development and mentoring, Biology teachers could achieve much clearer understanding of the purpose of CA and FA. The study found that the occurrence of feedback is low and that written feedback particularly, was of a low level, affirming that work has been 'seen' or awarding marks and grades. During classroom questioning, the teachers appeared to place greater stress on what had not yet been learned, rather than building on prior knowledge and achievement. Furthermore, they asked specific questions to get specific answers and confirmed correct answers, providing superficial and 'low-level' feedback such as 'well done'.

It is recommended that teachers should adopt differentiated teaching methods and learning activities for different student abilities in the same class (see sections 2.2.2 and 2.5.2). It is evident that support is required to teachers on how to provide students with better quality feedback, e.g. written analytical feedback; how to encourage peer assessment and feedback; how to facilitate dialogic interaction between students. Teachers should recognise the value of receiving feedback too, by listening to students ideas and perspectives on assessment issues that affect them (Black and Wiliam, 1998) and making pedagogical adjustments accordingly.

6.4.3 Implications for Research

It is intended that this case study should support the further development of PBE Biology assessment policy and practice in Oman. Further research might investigate and evaluate the challenges and issues of implementing educational assessment in the Omani context. This phenomenon of CA could be further researched in other PBE contexts to explore, for example, what factors influence how teachers go about CA, what evidence they use, and what criteria are used for assessing student's learning.

Since the reform of Oman's assessment system has not been accompanied by relevant teacher professional development, further research on novel forms of professional development and their impact on teacher motivation and engagement with assessment reforms would be timely.

Further research on teaching identity as an ongoing construction of a personal and professional biography to understand and explain school life, could be valuable to understandings of how top-down assessment reforms influence teachers and the enactment of their roles in a wider range of institutional and societal contexts.

Finally, while researching the aspect of how assessment policy change affects teaching identity was not the objective of this study, it is an area recommended for future research.

6.5 Limitations of this research

This study highlights some concerns regarding assessment changes in PBE in Oman that had not been previously identified in Oman. The findings from this study have important implications concerning the involvement of Biology teachers in the process of assessment change at a formative stage. It also highlights the importance of appropriate support and mentoring, together with professional development to support the implementation of assessment innovation.

As a researcher who also has a professional role in the MoE, I approached this study with existing knowledge about the organisation, and the participant teachers. It is possible that this affected how participating Biology teachers responded in the interviews and observed classroom sessions. As an insider, I was familiar with the local school system. On the other hand, I assumed the position of outsider who no longer had a role in the schools or a

right to supervise the teachers, has and attempted to maintain criticality by virtue of being a pair of fresh eyes (Thomson and Gunter, 2011).

The participants communicated with me in Arabic. Thus, it is acknowledged that the representation of data might be biased to some extent because of subjectivity in the process of translating the data from Arabic into English. To try to counteract the risk of subjectivity, I kept a reflective journal during the data collection. This enabled me to reflect upon and review my position and to make my thoughts and experiences visible and critical. In addition, I sent emails to the participants (teachers and policy makers) asking them to check whether my interpretations of their statements were accurate. The document writer was the only one who replied. I gave participants another opportunity to respond by sending one more personal email, but received no reply (see the Appendix Z). Therefore, I only modified the interpretations of findings related to the document writer.

Results attained through case studies may not be generalisable and indeed are not intended to be generalised. Case study findings offer the opportunity for a rich and deep interpretation of what has occurred in a specific context. Whereas the methodology could be applied in other cultures or contexts, this may produce different findings. The data is contextually bound. However, the qualitative detail may mean that it is transferable to other settings.

Finally, this study does not address the perceptions of Biology supervisors or parents which were beyond the scope of the study (please see section 3.11). Their views as key stakeholders could be addressed in future studies.

6.6 My learning through this study and conclusion

The study was conducted to acquire insights into how the 2015/ 2016 written Biology assessment policy in PBE in Oman was enacted by Biology teachers and perceived by students. The topic was of personal professional interest and relevance to me as an educational supervisor in this context. As I reflect upon my own personal and professional journey during the IPhD thesis, I found this to be both challenging and stressful. However, it was also quite enjoyable as it took me to new and challenging experiences and helped me to gain a deeper understanding of educational theories that promote FA practices. In my work as a supervisor, I was emphasising the importance of

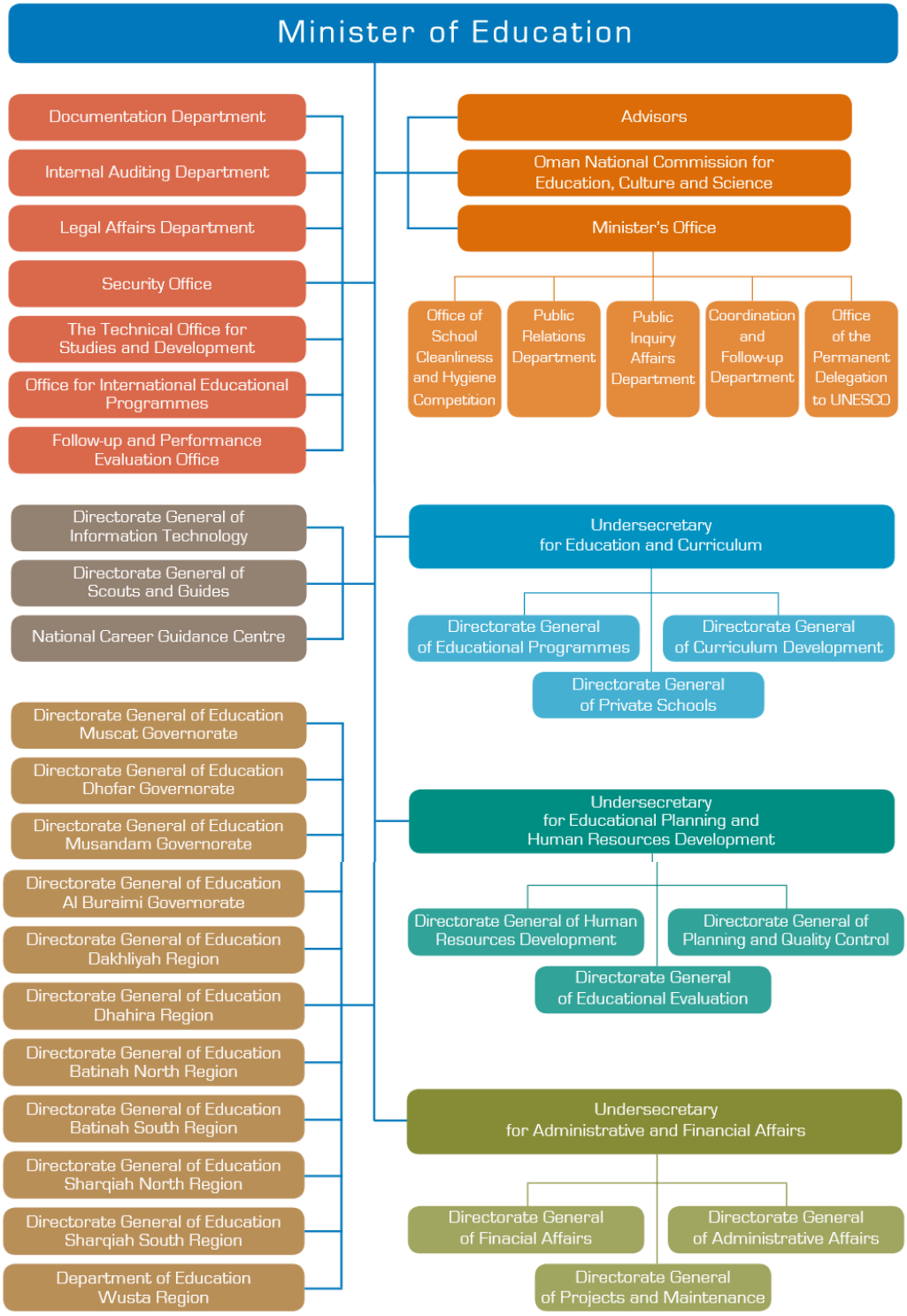
SA and graded tasks (marks), but during my studies in Britain, and during my analysis of the data, I realised that FA and constructive feedback are as important in the learning process as SA. In addition, reflecting on the experiences that I have gained through this study, I feel that I have realised my ambition of conducting academic research.

Pursuing studies in a diverse learning community and working with people from different cultures were beneficial both personally and professionally. Previously, I had studied in both Omani and Jordanian universities. I perceived that English modes of teaching and learning contrasted with that of the preferred modes of learning in Arabic universities. Studying in an English university helped me to engage in critical thinking, discussion and reflective practices. I acquired skills that are needed for independent study, such as library skills and information technology, in addition to research skills. My study offered me, as a Biology supervisor, learning experiences that contributed to changing my thinking about the Biology curriculum, pedagogy and assessment in Oman. As a teacher supervisor, I am able to give constructive feedback (during dialogic sessions) and practical suggestions which can help Biology teachers to improve classroom assessment. My supervision career has developed significantly. Before, I emphasised teacher classroom behaviour and management. Whereas, now I will focus on promoting learning processes and teacher professional development.

One important form of teacher professional development that will be helpful in my work is teachers' peer assessment, for example by arranging visits for new teachers to observe experienced peers for mutual learning, new teachers may learn from their older colleagues who have received more advanced theoretical and practical training. After the class visits discussions, sharing thoughts and learning the skills of peer assessment can help teachers to develop and highlight potential improvements. This may help to achieve the professional-support goals by building more on ideas of teacher training communities (McLaughlin and Talbert, 2006), allowing interested teachers to help one another discover how best to use FA and to develop a shared understanding of what it means to be proficient in this domain (Bennet and Gitomer, 2009).

Appendices

Appendix A: The organisation of the MoE



Source: www.moe.gov.om, 2016

Appendix B: Cavanagh et al (2005) Students' Perceptions of Assessment Questionnaire.

Dear Student,

Thank you for participating in this survey. I would like to draw to your attention that this questionnaire was prepared for scientific research only, it has no effect on your grade in the subject, and the data you provide will be confidential and you are free to participate or not. This questionnaire is concerned with your perception of the Post-Basic Education Biology assessment.

Mohammed Al Hadhrami (Doctoral Student at Newcastle University (UK)).

1-Biographical Information

Please put (✓) mark in the relevant box:

1- Gender: 1- Male 2- Female

2- Grade: 1- 11 2- 12

2- Directions: To complete the questionnaire, please read the statements carefully. On the scale of 1-4 (Strongly Disagree to Strongly Agree) please tick (✓) the option that best describes your perceptions of assessment. Please be aware that there are no right or wrong answers.

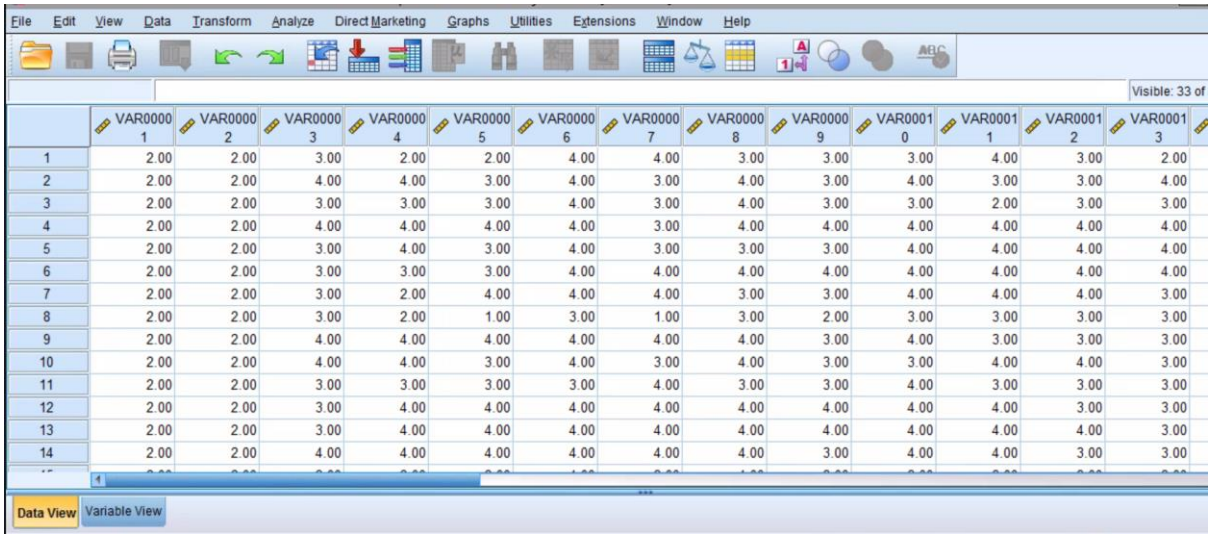
Students' Perceptions of Assessment Questionnaire

No.	Items	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)
	1- Congruence with planned learning				
1.1	My assessment in Biology tests what I know				
1.2	My Biology assignments/tests examine what I do in class				
1.3	My assignments/tests are about what I have done in class				
1.4	How I am assessed is like what I do in class				
1.5	How I am assessed is similar to what I do in class				
1.6	I am assessed on what the teacher has taught me				
	2- Authenticity				
2.1	I am asked to apply my learning to real-life situation				
2.2	My Biology assessment tasks are useful in everyday things				
2.3	I find Biology assessment tasks are relevant to what I do outside of school				
2.4	Assessment in Biology tests my ability to apply what I know to real-life problems				
2.5	Assessment in Biology examines my ability to answer every day questions				
2.6	I can show others that my learning has helped me do things				
	3- Student Consultation				
3.1	In Biology I am clear about the types of assessment being used				
3.2	I am aware of how my assessment will be marked				
3.3	I can select how I will be assessed in Biology				
3.4	I have helped the class develop rules for assessment in Biology				
3.5	My teacher has explained to me how each type of assessment is to be used				

3.6	I can have a say in how I will be assessed in Biology				
	4- Transparency				
4.1	I understand what is needed in all Biology assessment tasks				
4.2	I know what is needed to successfully accomplish a Biology assessment task				
4.3	I am told in advance when I am being assessed				
4.4	I am told in advance on what I am being assessed				
4.5	I am clear about what my teacher wants in my assessment tasks				
4.6	I know how a particular assessment tasks will be marked				
	5- Diversity				
5.1	I have as much chance as any other student at completing assessment tasks				
5.2	I complete assessment tasks at my own speed.				
5.3	I am given a choice of assessment tasks.				
5.4	I am given assessment tasks that suit my ability.				
5.5	When I am confused about an assessment task, I am given another way to answer it				
5.6	When there are different ways, I can complete the assessment.				

Source: Cavanagh et al (2005)

Appendix C: The Data viewer with the data from the assessment perception survey entered (only part of the set of the data is visible, in that only the first 14 respondents are visible).



File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Extensions Window Help

Visible: 33 of

	VAR00001	VAR00002	VAR00003	VAR00004	VAR00005	VAR00006	VAR00007	VAR00008	VAR00009	VAR00010	VAR00011	VAR00012	VAR00013
1	2.00	2.00	3.00	2.00	2.00	4.00	4.00	3.00	3.00	3.00	4.00	3.00	2.00
2	2.00	2.00	4.00	4.00	3.00	4.00	3.00	4.00	3.00	4.00	3.00	3.00	4.00
3	2.00	2.00	3.00	3.00	3.00	4.00	3.00	4.00	3.00	3.00	2.00	3.00	3.00
4	2.00	2.00	4.00	4.00	4.00	4.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00
5	2.00	2.00	3.00	4.00	3.00	4.00	3.00	3.00	3.00	4.00	4.00	4.00	4.00
6	2.00	2.00	3.00	3.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
7	2.00	2.00	3.00	2.00	4.00	4.00	4.00	3.00	3.00	4.00	4.00	4.00	3.00
8	2.00	2.00	3.00	2.00	1.00	3.00	1.00	3.00	2.00	3.00	3.00	3.00	3.00
9	2.00	2.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00	4.00	3.00	3.00	3.00
10	2.00	2.00	4.00	4.00	3.00	4.00	3.00	4.00	3.00	3.00	4.00	4.00	3.00
11	2.00	2.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	4.00	3.00	3.00	3.00
12	2.00	2.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00	3.00
13	2.00	2.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00
14	2.00	2.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00	4.00	4.00	3.00	3.00

Data View Variable View

Appendix D: Approval from the Directorate General of Education (Interior Governorate)

Sultanate of Oman
Ministry of Education
Directorate General of Education
AL-Dakhiliyah Governorate

سلطنة عمان
وزارة التربية والتعليم
المديرية العامة للتربية والتعليم
لمحافظة الداخلية

الرقم: ٢٦٧ / ١ / ٢
التاريخ:
الموافق: ٢٠٠٧/٢/٤

دائرة تنمية الموارد البشرية

الأفاضل / مديرو مدارس المحافظة ومديراتها المحترمون

السلام عليكم ورحمة الله وبركاته، وبعد:

الموضوع: تسهيل مهمة الباحث محمد الحضرمي

بالإشارة الى الموضوع أعلاه، يسرنا إفادتكم بأن الباحث محمد بن علي بن عبدالله الحضرمي طالب دراسات عليا دكتوراه بجامعة نيوكاسل يقوم حاليا بإجراء دراسة بعنوان "واقع التقويم التربوي في مدارس محافظة الداخلية" ويرغب الباحث في تطبيق أداة الدراسة على عينة من الطلبة والمعلمين ومديري المدارس التابعة للمديرية.

عليه نرجو التكرم بتسهيل مهمة الباحث في تطبيق أدوات الدراسة وذلك وفق الإجراءات المعمول بها لديكم، وفي حالة وجود أي استفسار يمكنكم الاتصال بالباحث على هاتف رقم (٩٩٢٠٩٨٩٧).

وتفضلوا قبول فائق الاحترام والتقدير.

سيف بن حمد بن خلفان العبدلي
مدير دائرة تنمية الموارد البشرية

سلطنة عمان - وزارة التربية والتعليم
دائرة تنمية الموارد البشرية
المديرية العامة للتربية والتعليم لمحافظة الداخلية

ص.ب: ٢٦- الرمز البريدي: ٦١١ نزوى - هاتف: ٢٥٤٣٣٠٠٠ - فاكس: ٢٥٤٣٣٠٨٠
P.O. Box: 26 - Postal Code: 611 Nizwa - Tel.: 25433000 - Fax: 25433080
Website: www.moe-gov.net : موقع الوزارة Website: www.moe-nizwa.net : موقع المديرية

Appendix E: Sample of students consents

استمارة موافقة طالب

عزيزي الطالب/ السلام عليكم ورحمة الله وبركاته وبعد،

أقوم بتطبيق بحث عن التقويم التربوي في سلطنة عمان في مدارس التعليم ما بعد الاساسي، كجزء من متطلب الحصول على درجة الدكتوراة في جامعة نيوكاسل، أرجو منك المشاركة في الاجابة عن استبيان الدراسة و عمل المقابلة التي تخص البحث.

الاجابات التي تدلي بها ستكون سرية ولن تستخدم في غير أغراض البحث.

إذا أردت التعرف اكثر عن موضوع البحث وكيفية تطبيق الاستبيان والمقابلة أرجو التواصل معي على البريد الالكتروني m.al-hadhrami@ncl.ac.uk او على هاتف رقم 99209897 سلطنة عمان.

شكرا على حسن تعاونكم.

وتفضلوا بقبول فائق الاحترام

محمد بن علي بن عبدالله الحضرمي

أوافق على المشاركة في عمل الاستبيان والمقابلة التي تخص الدراسة. التاريخ:

التوقيعات:

التوقع	التوقيع
أحمد	
أيمن	

Appendix F: Sample of parent consent

استمارة موافقة ولي أمر

الفاضل ولي أمر الطالب\ الطالبة، السلام عليكم ورحمة الله وبركاته وبعد،

أقوم بتطبيق بحث عن التقويم التربوي في سلطنة عمان في مدارس التعليم ما بعد الاساسي، كجزء من متطلب الحصول على درجة الدكتوراة في جامعة نيوكاسل، أرجو منك التكرم بالموافقة على السماح لولدك للمشاركة في الاجابة عن استبيان الدراسة و عمل المقابلة التي تخص البحث.

الاجابات التي يدلي بها ولدك ستكون سرية ولن تستخدم في غير أغراض البحث.

إذا أردت التعرف اكثر عن موضوع البحث وكيفية تطبيق الاستبيان والمقابلة أرجو التواصل معي على البريد الالكترونيm.al-hadhrami@ncl.ac.uk او على هاتف رقم 99209897 سلطنة عمان.

شكرا على حسن تعاونكم.

وتفضلوا بقبول فائق الاحترام

محمد بن علي بن عبدالله الحضرمي

أوافق لولدي بالمشاركة في عمل الاستبيان والمقابلة التي تخص الدراسة.

التوقيع: التاريخ:

١٧/٣/٢١

Appendix G: Example of a teacher's consent

استمارة موافقة معلم

الفاضل معلم الاحياء المحترم،

السلام عليكم ورحمة الله وبركاته وبعد،

أقوم بتطبيق بحث عن التقويم التربوي في سلطنة عمان في مدارس التعليم ما بعد الاساسي، كجزء من متطلب الحصول على درجة الدكتوراة في جامعة نيوكاسل، أرجو منك التكرم بالمشاركة في هذه الدراسة عن طريق المقابلة و حضور حصة صفية وتحليها والاطلاع على سجل الدرجات.

الاجابات التي تدلي بها ستكون سرية ولن تستخدم في غير أغراض البحث كما أن اسم المشارك لن يذكر أبدا في البحث ولا لأية جهة.

إذا أردت التعرف اكثر عن موضوع البحث وكيفية تطبيق الاستبيان والمقابلة أرجو التواصل معي على البريد الالكترونيm.al-hadhrami@ncl.ac.uk او على هاتف رقم 99209897 سلطنة عمان.

شكرا على حسن تعاونكم.

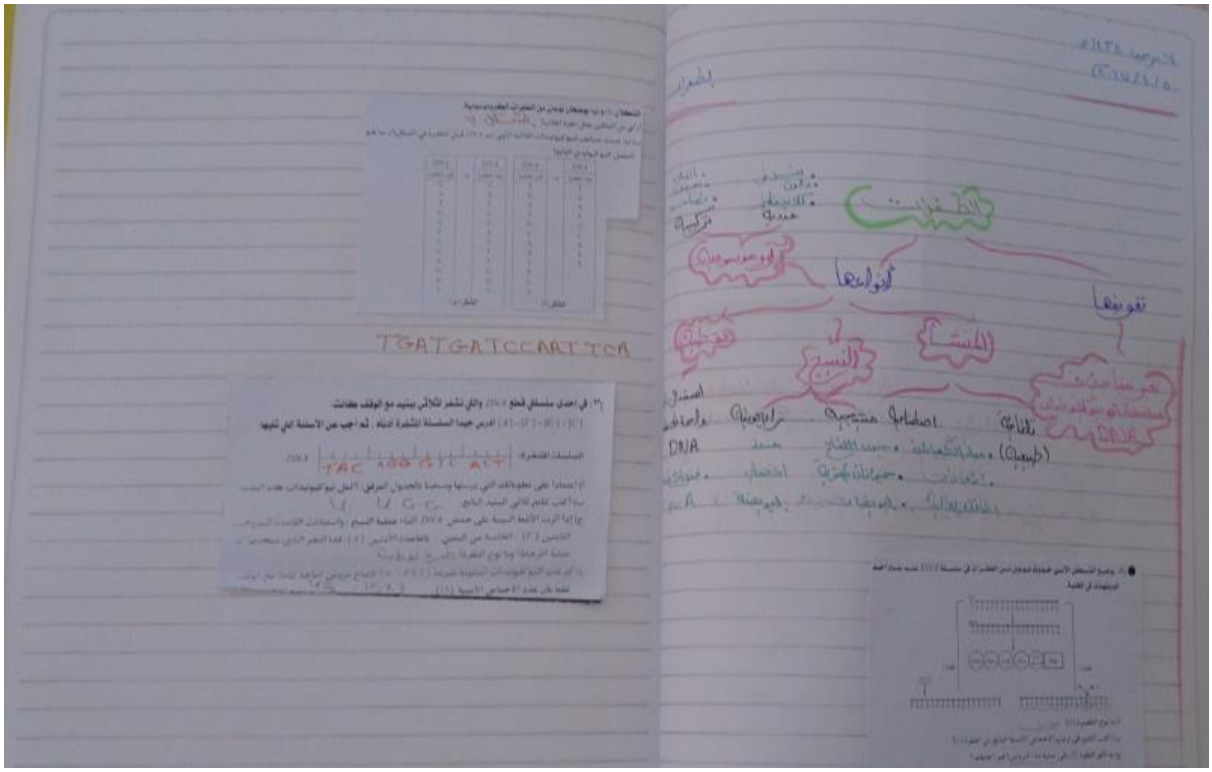
وتفضلوا بقبول فائق الاحترام

محمد بن علي بن عبدالله الحضرمي

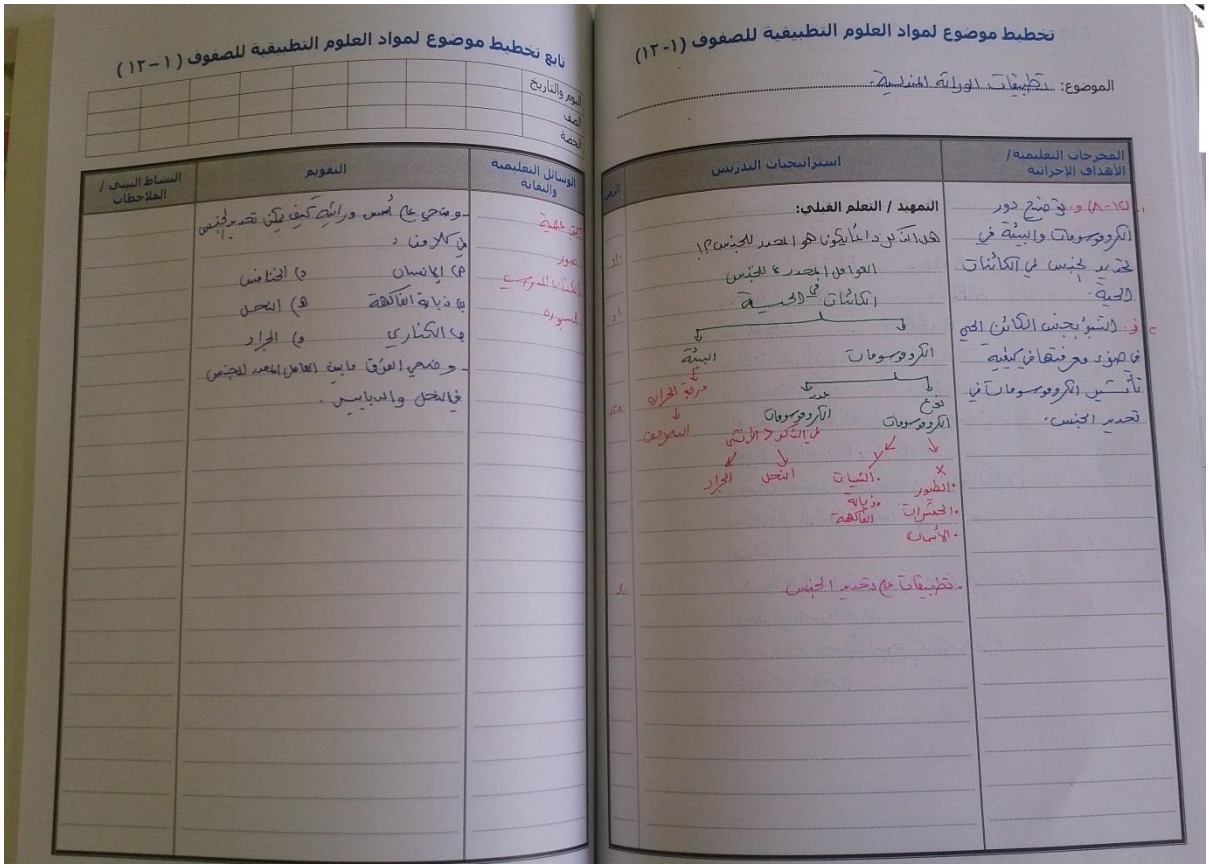
أوافق على المشاركة في عمل المقابلة و حضور الزيارة الصفية التي تخص الدراسة.

التوقيع: التاريخ: ٢٠١٧/٣/٢٢

Appendix H: Examples of students' work



Appendix I: Example of a teacher lesson plan for Grade 12 girls



تخطيط موضوع لمواد العلوم التطبيقية للصفوف (١-١٢)

الموضوع: تطبيقات الوراثة المندلية

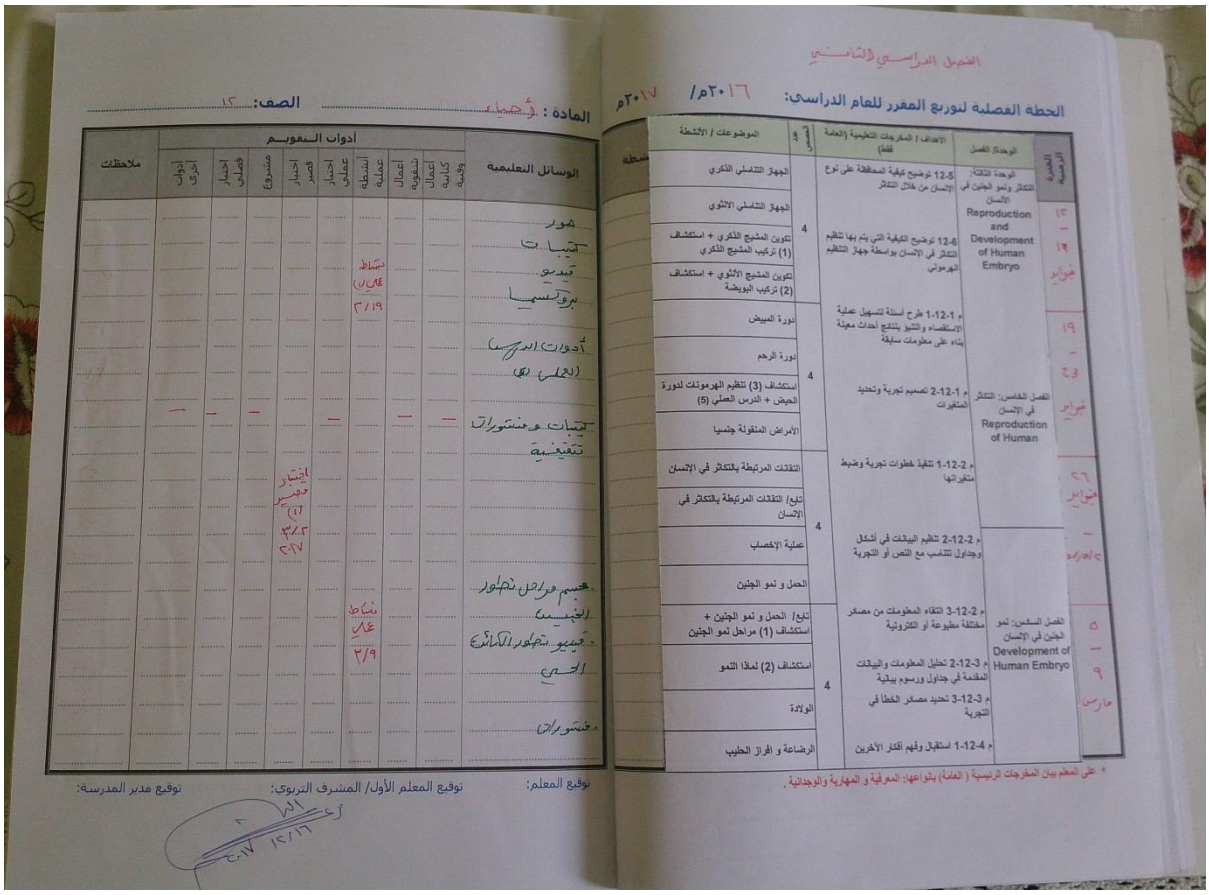
المحرجات التعليمية / الأهداف الإجرائية	استراتيجيات التدريس	التقويم
١. (١-٨) و يوضح دور الكروموسومات والبيئة في تحديد جنس في الكائنات الحية.	التمهيد / التعلم القبلي: هل الذكر أو الأنثى هو المصدر للجنس؟! العوامل المصدر للجنس في الكائنات الحية: البيئة: درجة الحرارة → السمك. الكروموسومات: نوع الكروموسومات: ٠ الطيور ٠ الحشرات ٠ الإنسان. جنس الكروموسومات في الذكر والأنثى: الذكر ← الثنائي، الأنثى ← الزوجي. الكائنات: ٠ النحل ٠ الذباب ٠ الفراشة. - تطبيقات على تحديد الجنس	- وضح على الحس ورائك كيف يمكن تحديد الجنس في كل من: أ) الإنسان ب) الفراشة ج) النحل د) الطيور هـ) الحشرات و) الزواحف - وضح الفرق مابين العامل المحدد للجنس في النحل والدبابير.

تابع تخطيط موضوع لمواد العلوم التطبيقية للصفوف (١-١٢)

اليوم والتاريخ								
الصف								
الحصة								

الوسائل التعليمية والتقانة	التقويم	النشاط السبق / الملاحظات
عين حلمية صور الكتاب المدرسي السبورة		

Appendix J: Example of teacher's second semester plan for Grade 12 girls showing assessment tools



الفصل الدراسي الثاني

الخطة الفصلية لتوزيع المقرر للعام الدراسي: ١٤٣٧/١٤٣٨هـ / ٢٠١٦/٢٠١٧م

العدد الزمنية	الوحدة/ الفصل	الأهداف / المخرجات التعليمية (العامة فقط)	العدد الحصص	الموضوعات / الأنشطة
١٢ – ١٩ فبراير	الوحدة الثالثة: التكاثر ونمو الجنين في الإنسان Reproduction and Development of Human Embryo	12-5 توضيح كيفية المحافظة على نوع الإنسان من خلال التكاثر	4	الجهاز التناسلي الذكري
		12-6 توضيح الكيفية التي يتم بها تنظيم التكاثر في الإنسان بواسطة جهاز التنظيم الهرموني		الجهاز التناسلي الانثوي
				تكوين المشيج الذكري + استكشاف (1) تركيب المشيج الذكري
				تكوين المشيج الأنثوي + استكشاف (2) تركيب البويضة
١٩ – ٢٦ فبراير	الفصل الخامس: التكاثر في الإنسان Reproduction of Human	م 12-1-1 طرح أسئلة للتسهيل عملية الاستقصاء والتنبؤ بنتائج لحدث معينة بناء على معلومات سابقة	4	دورة المبيض
				دورة الرحم
		م 12-1-2 تصميم تجربة وتحديد المتغيرات		استكشاف (3) تنظيم الهرمونات لدورة الحيض + الدرس العملي (5)
				الأمراض المنقولة جنسيا
٢٦ فبراير – ٥ مارس		م 12-2-1 تنفيذ خطوات تجربة وضبط متغيراتها	4	التقنيات المرتبطة بالتكاثر في الإنسان
		م 12-2-2 تنظيم البيانات في أشكال وجداول تناسب مع النص أو التجربة		تابع/ التقنيات المرتبطة بالتكاثر في الإنسان
				عملية الإخصاب
				الحمل و نمو الجنين
٥ – ٩ مارس	الفصل السادس: نمو الجنين في الإنسان Development of Human Embryo	م 12-2-3 انتقاء المعلومات من مصادر مختلفة مطبوعة أو الكترونية	4	تابع/ الحمل و نمو الجنين + استكشاف (1) مراحل نمو الجنين
		م 12-3-2 تحليل المعلومات والبيانات المقدمة في جداول ورسوم بيانية		استكشاف (2) لماذا التمو
		م 12-3-3 تحديد مصادر الخطأ في التجربة		الولادة
		م 12-4-1 استقبال وفهم أفكار الآخرين		الرضاعة و افراز الحليب

* على المعلم بيان المخرجات الرئيسية (العامة) بأنواعها: المعرفية و المهارية والوجدانية.

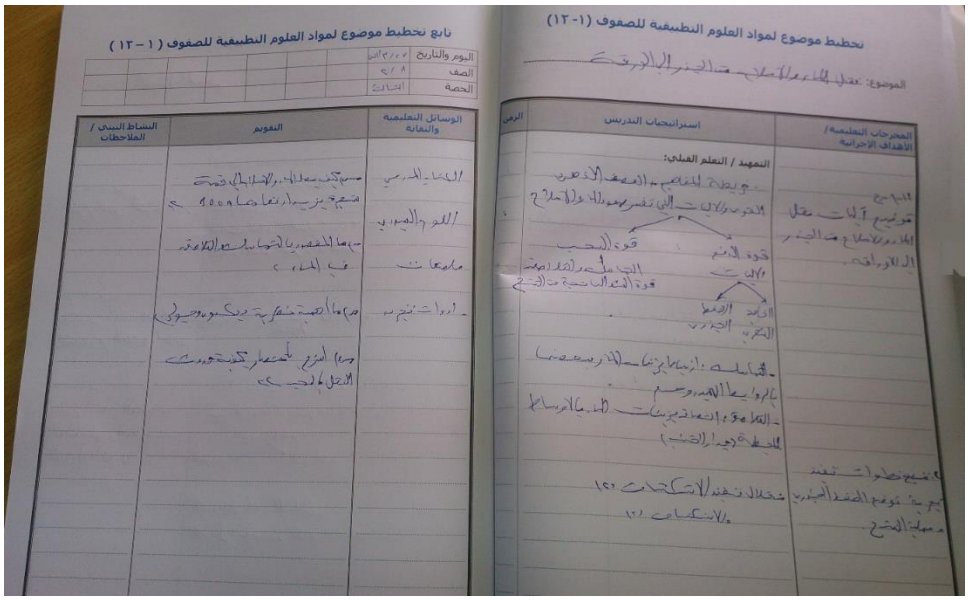
المادة : أحياء الصف: ١٢

الوسائل التعليمية	أدوات التقويم: كتابية وشفوية	أعمال شفوية	أعمال عملية	أنشطة	اختبار قصير	اختبار فصلي	اختبار مشروع	أدوات أخرى	ملاحظات
صور									
نباتات				نشاط على (١) ٣/١٩					
فيديو									
بروجيكتور									
أدوات الدرس (المجلس)									
نباتات ومشروعات تقنية	—	—	—			—	—	—	
					اختبار حضور (١) ٣/٥ ٣/٧				
جسم مراحل تطور الجنين				نشاط على ٣/٩					
فيديو تطور الكائن الحي									
مشروعات									

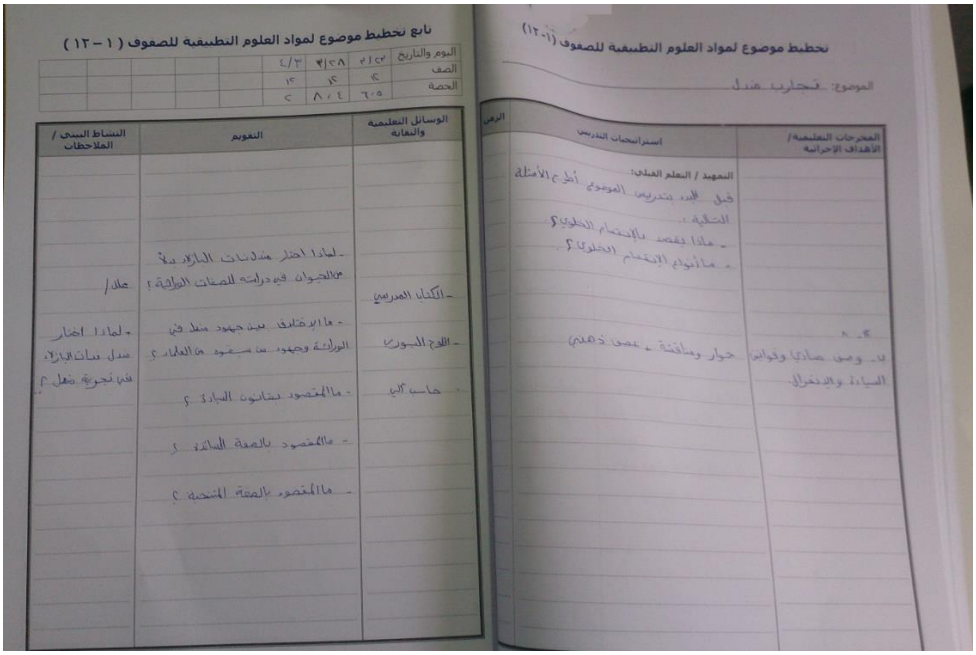
توقيع المعلم: توقيع المعلم الأول/ المشرف التربوي: توقيع مدير المدرسة:

Appendix K: Teacher's planning

K.1 Grade 11 (boys)



K.2 Grade 12 (boys)



Appendix L: Quantitative analysis of students' perceptions of classroom assessment

L.1 Assessment tests what I know

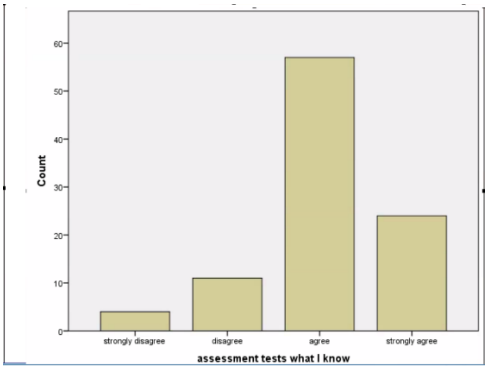
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
gender * assessment tests what I know	96	100.0%	0	0.0%	96	100.0%

gender * assessment tests what I know Crosstabulation

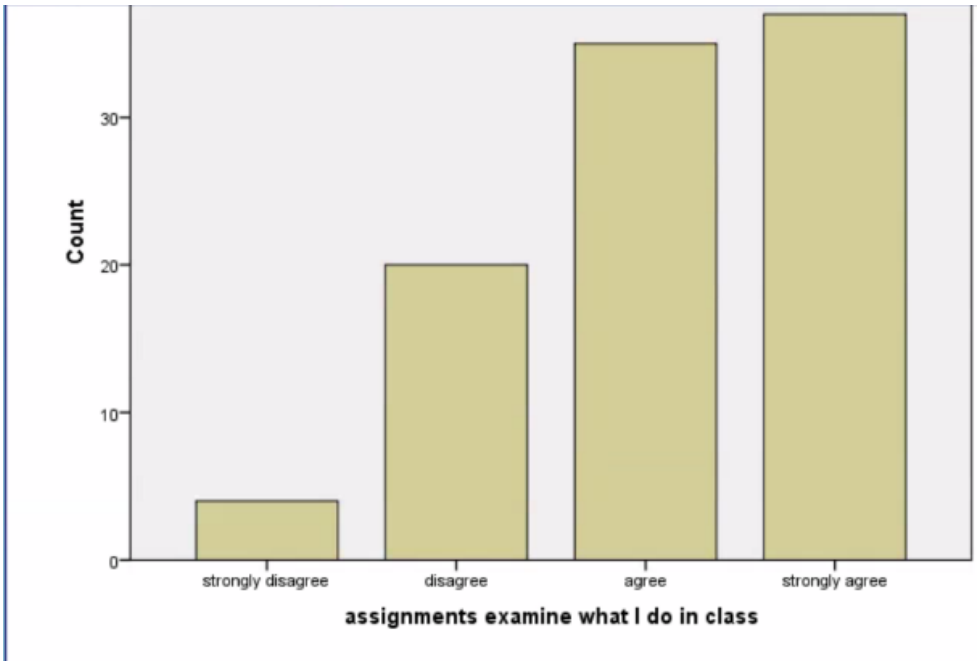
Count

		assessment tests what I know				
		strongly disagree	disagree	agree	strongly agree	Total
gender	male	4	8	28	4	44
	female	0	3	29	20	52
Total		4	11	57	24	96



Assessment of students' knowledge

L.2 Assessment is congruent with planned learning



Assessment examines what students do in class

L.3 I find Biology assessment tasks relevant to what I do outside of school

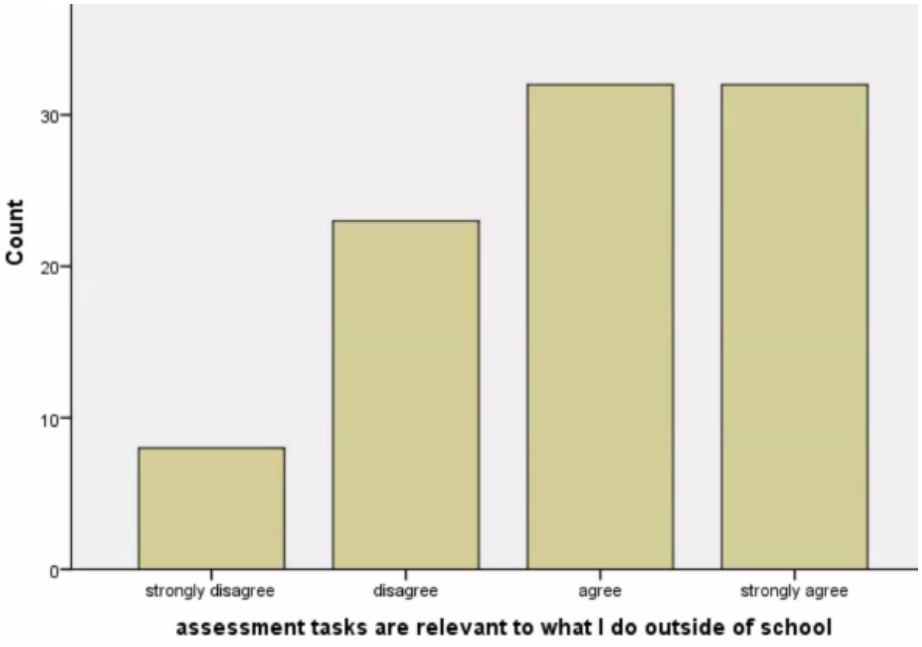
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
gender * assessment tasks are relevant to what I do outside of school	95	99.0%	1	1.0%	96	100.0%

gender * assessment tasks are relevant to what I do outside of school Crosstabulation

Count

		assessment tasks are relevant to what I do outside of school				
		strongly disagree	disagree	agree	strongly agree	Total
gender	male	5	14	9	16	44
	female	3	9	23	16	51
Total		8	23	32	32	95



Assessment tasks are connected to the wide world

L.4 I can have a say in how I will be assessed in Biology

		I can have a say in how I will be assessed in biology				
		strongly disagree	disagree	agree	strongly agree	Total
gender	male	6	22	10	6	44
	female	8	14	17	13	52
Total		14	36	27	19	96

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.831[a]	3	.120
Likelihood Ratio	5.888	3	.117
Linear-by-Linear Association	2.411	1	.120
N of Valid Cases	96		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.42.

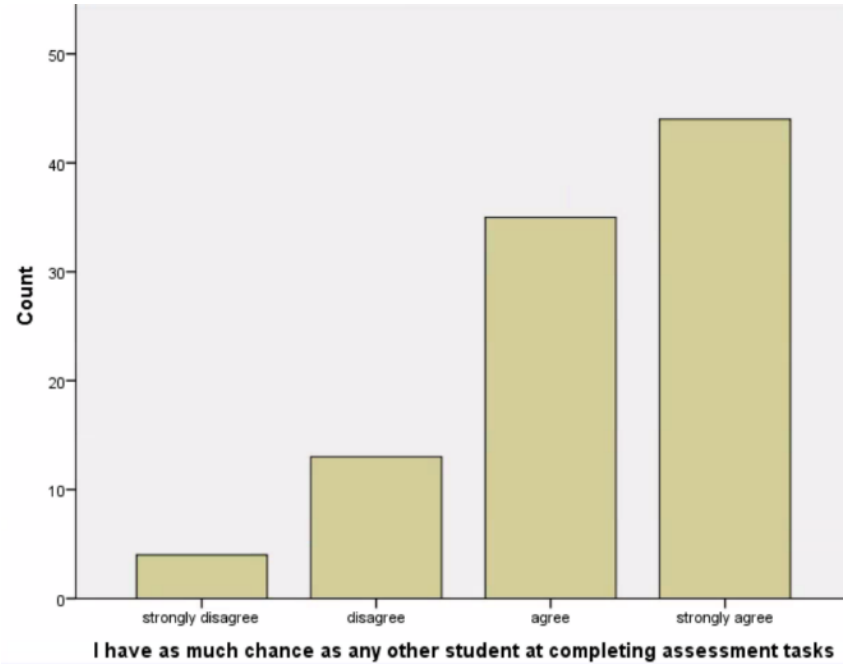
L.5 I know what is needed to successfully accomplish the assessment task

gender * I know what is needed to successfully accomplish assessment task Crosstabulation

Count

		I know what is needed to successfully accomplish assessment task				
		strongly disagree	disagree	agree	strongly agree	Total
gender	male	2	10	24	8	44
	female	0	5	28	19	52
Total		2	15	52	27	96

L.6 I have as much chance as any other student at completing assessment tasks



Assessment diversity

gender * I have as much chance as any other student at completing assessment tasks Crosstabulation

Count

		I have as much chance as any other student at completing assessment tasks				
		strongly disagree	disagree	agree	strongly agree	Total
gender	male	0	6	18	20	44
	female	4	7	17	24	52
Total		4	13	35	44	96

Assessment diversity

Appendix M Statistics related to students' perceptions

M.1 Congruence with planned learning

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
assessment tests what I know	96	3.0521	.73082	1.00	4.00	3.0000	3.0000	3.7500
assignments examine what I do in class	96	3.0937	.87152	1.00	4.00	2.2500	3.0000	4.0000
assignments are about what I have done in Class	95	3.0632	.94318	1.00	4.00	3.0000	3.0000	4.0000
How I am assessed is like what I do in class	95	3.1474	.91056	1.00	4.00	3.0000	3.0000	4.0000
How I am assessed is similar to what I do in class	95	3.0526	.84260	1.00	4.00	3.0000	3.0000	4.0000
I am assessed on what the teacher has taught me	96	3.5833	.69079	1.00	4.00	3.0000	4.0000	4.0000
gender	96	1.5417	.50088	1.00	2.00	1.0000	2.0000	2.0000

Mann-Whitney Test

Ranks

	gender	N	Mean Rank	Sum of Ranks
assessment tests what I know	male	44	37.73	1660.00
	female	52	57.62	2996.00
	Total	96		
assignments examine what I do in class	male	44	45.17	1987.50
	female	52	51.32	2668.50
	Total	96		
assignments are about what I have done in Class	male	43	41.58	1788.00
	female	52	53.31	2772.00
	Total	95		
How I am assessed is like what I do in class	male	43	35.77	1538.00
	female	52	58.12	3022.00
	Total	95		
How I am assessed is similar to what I do in class	male	44	43.95	1934.00
	female	51	51.49	2626.00
	Total	95		
I am assessed on what the teacher has taught me	male	44	46.01	2024.50
	female	52	50.61	2631.50
	Total	96		

Test Statistics[a]

	assessment tests what I know	assignments examine what I do in class	assignments are about what I have done in Class	How I am assessed is like what I do in class	How I am assessed is similar to what I do in class	I am assessed on what the teacher has taught me
Mann-Whitney U	670.000	997.500	842.000	592.000	944.000	1034.500
Wilcoxon W	1660.000	1987.500	1788.000	1538.000	1934.000	2024.500
Z	-3.963	-1.145	-2.192	-4.220	-1.439	-.981
Asymp. Sig. (2-tailed)	.000	.252	.028	.000	.150	.327

a. Grouping Variable: gender

M.2 Authenticity

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
I am asked to apply my learning to real life situations	96	2.9271	.77112	1.00	4.00	2.0000	3.0000	3.0000
assessment tasks are useful in everyday things	96	3.3958	.77431	1.00	4.00	3.0000	4.0000	4.0000
assessment tasks are relevant to what I do outside of school	95	2.9263	.95919	1.00	4.00	2.0000	3.0000	4.0000
Assessment tests my ability to apply what I know to real-life proplems	96	3.0417	.81971	1.00	4.00	3.0000	3.0000	4.0000
Assessment examines my ability to answer every day questions	96	3.0521	.74509	1.00	4.00	3.0000	3.0000	4.0000
I can show others that my learning has helped me do things	96	3.2083	.79361	1.00	4.00	3.0000	3.0000	4.0000
gender	96	1.5417	.50088	1.00	2.00	1.0000	2.0000	2.0000

Mann-Whitney Test:

Ranks

	gender	N	Mean Rank	Sum of Ranks
I am asked to apply my learning to real life situations	male	44	51.89	2283.00
	female	52	45.63	2373.00
	Total	96		
assessment tasks are useful in everyday things	male	44	51.03	2245.50
	female	52	46.36	2410.50
	Total	96		
assessment tasks are relevant to what I do outside of school	male	44	45.50	2002.00
	female	51	50.16	2558.00
	Total	95		
Assessment tests my ability to apply what I know to real-life proplems	male	44	47.64	2096.00
	female	52	49.23	2560.00
	Total	96		
Assessment examines my ability to answer every day questions	male	44	46.10	2028.50
	female	52	50.53	2627.50
	Total	96		
I can show others that my learning has helped me do things	male	44	52.98	2331.00
	female	52	44.71	2325.00
	Total	96		

Test Statistics[a]

	I am asked to apply my learning to real life situations	assessment tasks are useful in everyday things	assessment tasks are relevant to what I do outside of school	Assessment tests my ability to apply what I know to real-life proplems	Assessment examines my ability to answer every day questions	I can show others that my learning has helped me do things
Mann-Whitney U	995.000	1032.500	1012.000	1106.000	1038.500	947.000
Wilcoxon W	2373.000	2410.500	2002.000	2096.000	2028.500	2325.000
Z	-1.189	-.918	-.861	-.303	-.858	-1.561
Asymp. Sig. (2-tailed)	.234	.358	.389	.762	.391	.119

a. Grouping Variable: gender

M.3 Student consultation:

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
I am clear about the types of assessment being used	96	3.0625	.76520	1.00	4.00	3.0000	3.0000	4.0000
I am aware how my assessment will be marked	94	2.7872	.97133	1.00	4.00	2.0000	3.0000	4.0000
I can select how I will be assessed in biology	96	2.5312	.99423	1.00	4.00	2.0000	3.0000	3.0000
I have helped the class develop rules for assessment	96	2.7917	.86956	1.00	4.00	2.0000	3.0000	3.0000
My teacher has explained how each type of assessment is to be used	96	2.9167	.98051	1.00	4.00	2.0000	3.0000	4.0000
I can have a say in how I will be assessed in biology	96	2.5313	.97282	1.00	4.00	2.0000	2.0000	3.0000
gender	96	1.5417	.50088	1.00	2.00	1.0000	2.0000	2.0000

Mann-Whitney Test:

Ranks

	gender	N	Mean Rank	Sum of Ranks
I am clear about the types of assessment being used	male	44	45.57	2005.00
	female	52	50.98	2651.00
	Total	96		
I am aware how my assessment will be marked	male	42	40.69	1709.00
	female	52	53.00	2756.00
	Total	94		
I can select how I will be assessed in biology	male	44	46.69	2054.50
	female	52	50.03	2601.50
	Total	96		
I have helped the class develop rules for assessment	male	44	46.64	2052.00
	female	52	50.08	2604.00
	Total	96		
My teacher has explained how each type of assessment is to be used	male	44	40.52	1783.00
	female	52	55.25	2873.00
	Total	96		
I can have a say in how I will be assessed in biology	male	44	43.68	1922.00
	female	52	52.58	2734.00
	Total	96		

Test Statistics[a]

	I am clear about the types of assessment being used	I am aware how my assessment will be marked	I can select how I will be assessed in biology	I have helped the class develop rules for assessment	My teacher has explained how each type of assessment is to be used	I can have a say in how I will be assessed in biology
Mann-Whitney U	1015.000	806.000	1064.500	1062.000	793.000	932.000
Wilcoxon W	2005.000	1709.000	2054.500	2052.000	1783.000	1922.000
Z	-1.050	-2.271	-.610	-.649	-2.717	-1.630
Asymp. Sig. (2-tailed)	.294	.023	.542	.516	.007	.103

a. Grouping Variable: gender

M.4 Transparency

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
I understand what is needed in all assessment tasks	96	3.0104	.74685	1.00	4.00	3.0000	3.0000	4.0000
I know what is needed to successfully accomplish assessment task	96	3.0833	.72062	1.00	4.00	3.0000	3.0000	4.0000
I am told in advance when I am being assessed	94	3.6489	.65101	1.00	4.00	3.0000	4.0000	4.0000
I am told in advance what I am being assessed	95	3.3474	.82215	1.00	4.00	3.0000	4.0000	4.0000
I am clear about what my teacher wants in my assessment tasks	96	2.9688	.81374	1.00	4.00	3.0000	3.0000	4.0000
I know how a particular assessment tasks will be marked	95	2.8316	.89505	1.00	4.00	2.0000	3.0000	3.0000
gender	96	1.5417	.50088	1.00	2.00	1.0000	2.0000	2.0000

Mann-Whitney Test:

Ranks

	gender	N	Mean Rank	Sum of Ranks
I understand what is needed in all assessment tasks	male	44	43.99	1935.50
	female	52	52.32	2720.50
	Total	96		
I know what is needed to successfully accomplish assessment task	male	44	41.16	1811.00
	female	52	54.71	2845.00
	Total	96		
I am told in advance when I am being assessed	male	42	43.40	1823.00
	female	52	50.81	2642.00
	Total	94		
I am told in advance what I am being assessed	male	44	40.53	1783.50
	female	51	54.44	2776.50
	Total	95		
I am clear about what my teacher wants in my assessment tasks	male	44	45.44	1999.50
	female	52	51.09	2656.50
	Total	96		
I know how a particular assessment tasks will be marked	male	43	52.41	2253.50
	female	52	44.36	2306.50
	Total	95		

Test Statistics[a]

	I understand what is needed in all assessment tasks	I know what is needed to successfully accomplish assessment task	I am told in advance when I am being assessed	I am told in advance what I am being assessed	I am clear about what my teacher wants in my assessment tasks	I know how a particular assessment tasks will be marked
Mann-Whitney U	945.500	821.000	920.000	793.500	1009.500	928.500
Wilcoxon W	1935.500	1811.000	1823.000	1783.500	1999.500	2306.500
Z	-1.592	-2.631	-1.674	-2.720	-1.072	-1.501
Asymp. Sig. (2-tailed)	.111	.009	.094	.007	.284	.133

a. Grouping Variable: gender

M.5 Diversity:

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
I have as much chance as any other student at completing assessment tasks	96	3.2396	.84286	1.00	4.00	3.0000	3.0000	4.0000
I complete assessment task at my own speed	95	2.8000	.91791	1.00	4.00	2.0000	3.0000	3.0000
I am given a choice of assessment tasks	96	2.2812	.92569	1.00	4.00	2.0000	2.0000	3.0000
I am given assessment tasks that suit my ability	95	2.8105	.82893	1.00	4.00	2.0000	3.0000	3.0000
When I am cinfused about an assessment task, I am given another way to answer it	96	3.1354	.98001	1.00	4.00	3.0000	3.0000	4.0000
When there are different ways I can complete the assessment	96	1.9583	.92812	1.00	4.00	1.0000	2.0000	3.0000
gender	96	1.5417	.50088	1.00	2.00	1.0000	2.0000	2.0000

Mann-Whitney Test:

Ranks

	gender	N	Mean Rank	Sum of Ranks
I have as much chance as any other student at completing assessment tasks	male	44	49.68	2186.00
	female	52	47.50	2470.00
	Total	96		
I complete assessment task at my own speed	male	44	49.97	2198.50
	female	51	46.30	2361.50
	Total	95		
I am given a choice of assessment tasks	male	44	48.91	2152.00
	female	52	48.15	2504.00
	Total	96		
I am given assessment tasks that suit my ability	male	44	44.33	1950.50
	female	51	51.17	2609.50
	Total	95		
When I am cinfused about an assessment task, I am given another way to answer it	male	44	42.13	1853.50
	female	52	53.89	2802.50
	Total	96		
When there are different ways I can complete the assessment	male	44	41.30	1817.00
	female	52	54.60	2839.00
	Total	96		

Test Statistics[a]

	I have as much chance as any other student at completing assessment tasks	I complete assessment task at my own speed	I am given a choice of assessment tasks	I am given assessment tasks that suit my ability	When I am cinfused about an assessment task, I am given another way to answer it	When there are different ways I can complete the assessment
Mann-Whitney U	1092.000	1035.500	1126.000	960.500	863.500	827.000
Wilcoxon W	2470.000	2361.500	2504.000	1950.500	1853.500	1817.000
Z	-.414	-.681	-.139	-1.306	-2.215	-2.464
Asymp. Sig. (2-tailed)	.679	.496	.890	.191	.027	.014

a. Grouping Variable: gender

Appendix N: Assessment tools used to assess the performance of students in Biology in grades 11 and 12

Grade	CAtools					End-of-semester exam	Total scores
	Oral work	Homework	Practical performance		Short tests		
			Practical activities	Practical test			
11	-	5	5	10	20	60	100
12	-	5	5	10	10	70	100

Appendix O Exam Specifications for Grade Eleven for Biology

O.1 Semester One

Unit	Chapter	Relative weight %	Learning Levels scores			Objective Questions (40%)		Essay questions (60%)	Total
			Knowledge 30%	Application 50%	Inference 20%	No.	Score	Scores	
1	1	26	5	7	3	3	6	9	15
	2	21	4	6	3	3	6	7	13
2	3	28	5	9	3	3	6	11	17
	4	25	4	8	3	3	6	9	15

O.2 Semester Two

Unit	Chapter	Relative weight %	Learning Levels scores			Objective Questions (40%)		Essay questions (60%)	Total
			Knowledge 30%	Application 50%	Inference 20%	No.	Score	Scores	
3	5	29	5	9	4	4	8	10	18
	6	20	4	6	2	2	4	8	12
4	7	32	6	9	4	4	8	11	19
	8	19	3	6	2	2	4	7	11

Appendix P Specification of the end of school year exam for the twelfth Grade for Biology

P.1 First Semester

Unit	Chapter	Relative weight %	Learning Levels scores			Objective Questions (40%)		Essay questions (60%)	Total
			Knowledge 30%	Application 50%	Inference 20%	No.	Score	Scores	
1	1	27	6	9	4	4	8	11	19
	2	25	5	9	4	3	6	12	18
2	3	23	4	8	3	3	6	9	15
	4	25	6	9	3	8	8	10	18

P.2 Second Semester

Unit	Chapter	Relative weight %	Learning Levels scores			Objective Questions (40%)		Essay questions (60%)	Total
			Knowledge 30%	Application 50%	Inference 20%	No.	Score	Scores	
3	5	20	4	7	3	3	6	8	14
	6	32	7	11	4	5	10	12	22
4	7	25	5	9	4	3	6	12	18
	8	23	5	8	3	3	6	10	16

Appendix Q: criteria used for assessing students in the practical activities

Ability	criteria used for assessing students in the practical activities. the student is able to:	Mark
Initiative and planning	- understood the meaning of the objective or the scientific question - Design / Install the tools required to implement the activity - Prepare, in advance, materials and tools to carry out the activity - Predict what will happen in the activity	2
Implementation and note taking	- Deals with the tools correctly and safely - Follow the procedure of the activity or experiment step by step - Measure / weigh the required values in the activity - Read shapes or tables that help him in solving the activity problem - Note the changes that occur during the implementation of the activity - Record the readings obtained in a correct scientific manner - Draw the relationship between the variables of activity - Write notes in a scientific way - Determine his findings	3
Analysis and explanation	- Determine the rightness of their predictions. - Explain the notes recorded during the implementation of the activity - Explain interpretations in the light of the results (cause and effect) - Conclude the relationship between the variables - Present the relationship between the activity's variables graphically - Write a conclusion or generalisation in a scientific way. - Solve the problem through the results of the activity or experiment. - Reach some conclusions and generalisations.	3

	- Answer the questions of analysis and interpretation contained in the activity or exploration.	
Communication and team work	- Discuss the different ideas about the topic with his colleagues during the activity. - Cooperate with his colleagues positively in the implementation of the activity. - Communicates with colleagues during the activity (communication). - Make some suggestions and recommendations.	2

Appendix R: articles 13 and 26 of the Basic Statute of the State

Article (13)
The Cultural Principles

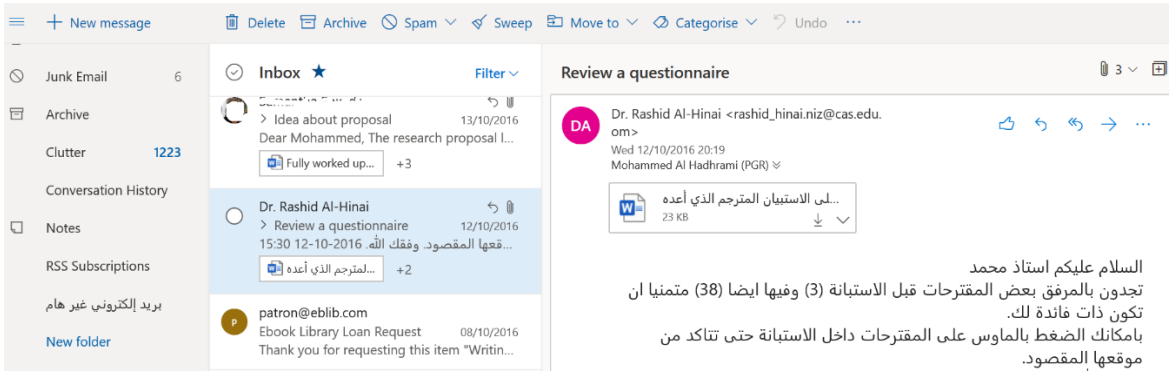
- Education is a cornerstone for the progress of the Society which the State fosters and endeavours to disseminate and make accessible to all.
- Education aims to raise and develop the general cultural standard, promote scientific thought, kindle the spirit of research, respond to the requirements of economic and social plans, and build a generation that is physically and morally strong, which takes pride in its Nation, Country, and heritage and preserves its achievements.
- The State shall provide public education, work to combat illiteracy, and encourage the establishment of private schools and institutes under its supervision in accordance with the provisions of the Law.
- The State shall foster and preserve the national heritage, encourage the sciences, arts, literature, scientific research and assist in their dissemination.

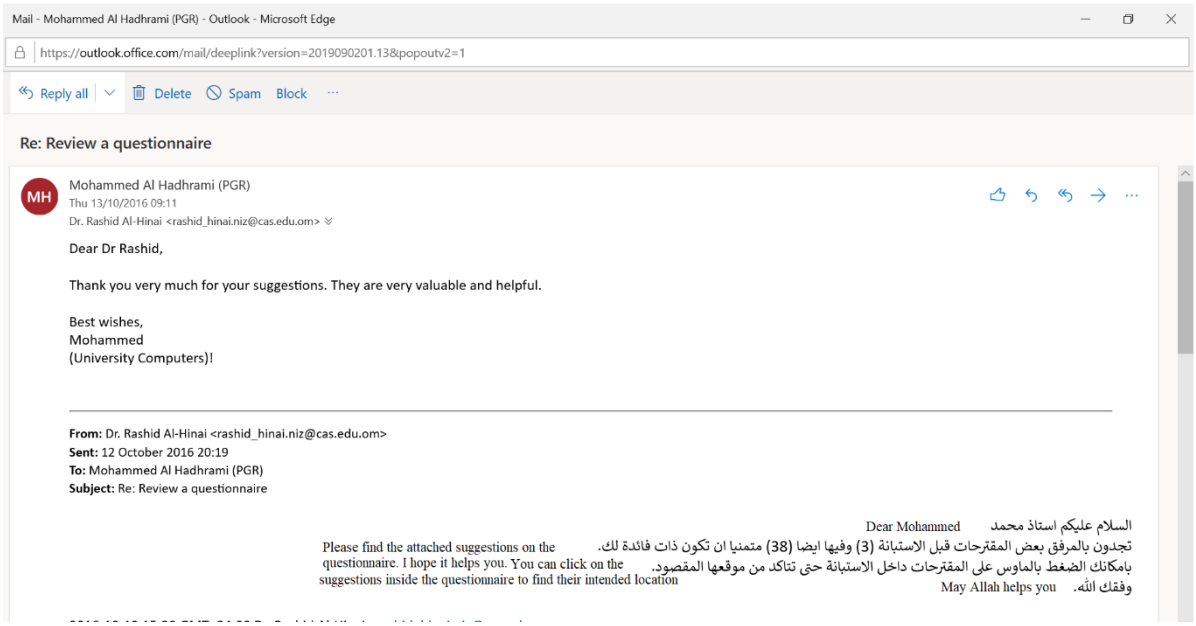
Article (26)

It is not permissible to conduct any medical or scientific experiment on any human being without his free consent.

Source: Basic Statute of the State, Royal Decree No. 101/96

Appendix S: a) Review a questionnaire





b) The attached:

مجهود طيب تم بذله في هذة الاستبانة متمنيا لك دوام التوفيق والنجاح.

المقترحات الاتية قد تكون مفيدة ايضا.

1. اقترح استشارة من هم بالميدان اي معلمي وطلبة الفئة المستهدفة وربما من الافضل عمل دراسة تجريبية مبدئية ان امكن لتساعدك على اخراج الاستبانة بصورتها النهائية. هذا الاجراء سيفيدك بشكل مباشر في الحكم على مدى مناسبتها لأعمار الطلاب ومستواهم واسلوب التقويم المتبع في البيئة المستهدفة. ظاهريا ارى ان الاستبانة منطقية ولا تخرج عن نطاق ومحتوى الاساليب التقويمية لكن عندما تطبق على الواقع قد تظهر اشياء اخرى.
2. تستطيع الاستعاضة عن تكرار مادة الاحياء في بنود كثيرة بذكرها في المقدمة قبل الاستبانة بحيث تكون معلومة لدى المستهدفين وهو ما يغني عن ذكرها لاحقا. كذلك لاحظت ان كلمة انا تكررت كثيرا وقمت باعطائك بعض المقترحات البديلة.
3. ربما تستطيع عمل مقابلات مع الطلاب او بعضهم بعد اجابتهم للاستبانه ان اردت التحقق من مدى مصداقية اجاباتهم او الحصول على اية ملاحظات تفيدك مستقبلا عند تحليلك للنتائج.

وفقك الله.

Comments

Rashid

مضمونا

بالاعتماد على الاستبيان المترجم الذي أعده Cavanagh et al., 2005 يرجى منكم التكرم مشكورين بمراجعة الاستبيان لغويا ومصطلحيا بما يتناسب مع اللغة المستخدمة في الحقل التربوي (المدارس) ومدى تكيفها وتطابقها مع البيئة المدرسية العمانية:

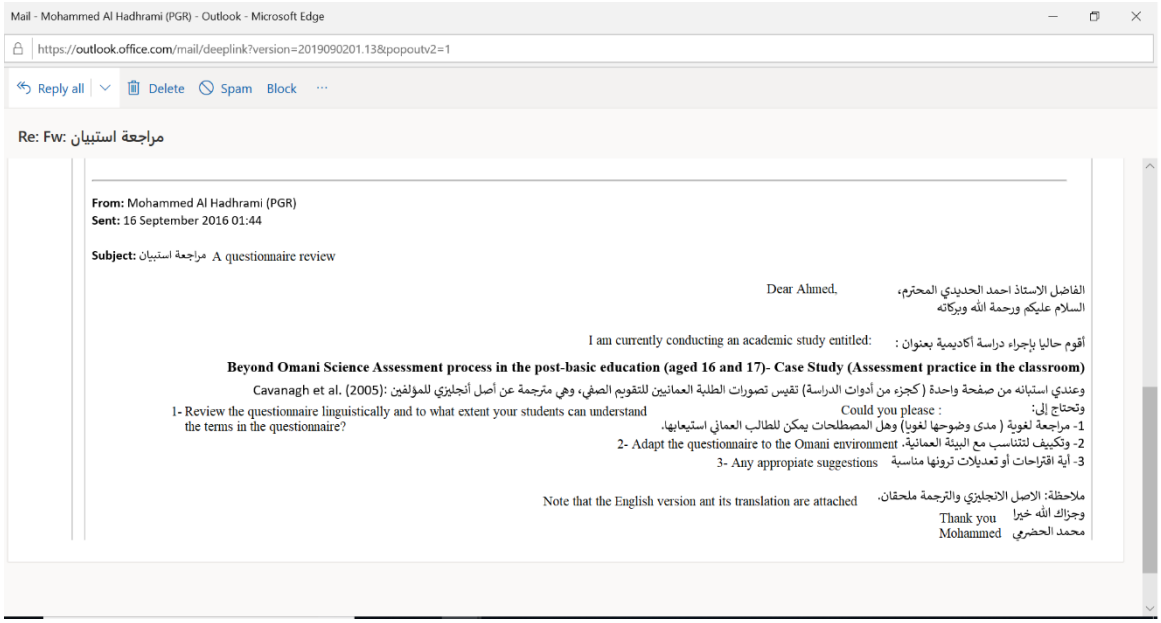
...عتماد على الاستبيان المترجم الذي أعده | Accessibility Mode | Print | Find | Immersive Reader | •••

Click to see this comment

استبيان تصورات الطلاب عن التقويم

	موافق بشدة	موافق	محايد/ متردد	غير موافق	غير موافق بشدة
تطابق التقويم مع خطط التعلم					
1- تقيس الاسئلة في مادة الأحياء ما أعرفه					
2- اختبارات مادة الأحياء تختبر ما أفعله في الصف.					
3- الاختبارات في مادة الأحياء تكون في ما قمت به (لحد تاريخ الامتحان) في الصف.					
4- كيفية التقويم في مادة الأحياء اقوم به في الصف.					
5- اختبر فيما علمني إياه المدرس.					
واقعية التقويم					
6- التقويم في مادة الأحياء يطلب مني أن أطبق ما تعلمته في مجالات الحياة الواقعية.					
7- أسئلة التقويم في مادة الأحياء مفيدة في الواقع الحقيقي للحياة.					
8- أسئلة التقويم في مادة الأحياء ذات صلة وثيقة لما أمارسه خارج المدرسة.					
9- أسئلة تقويم الأحياء تقيس قدرتي على تطبيق ما إعرفه في حل المشكلات الواقعية.					

c) Example of a teacher review:



Mail - Mohammed Al Hadhrami (PGR) - Outlook - Microsoft Edge

https://outlook.office.com/mail/deeplink?version=2019090201.13&popoutv2=1

Reply all | Delete | Spam | Block | ...

Re: Fw: مراجعة استبيان

From: Mohammed Al Hadhrami (PGR)
Sent: 16 September 2016 01:44

Subject: مراجعة استبيان A questionnaire review

الفاضل الاستاذ احمد الحديدي المحترم،
السلام عليكم ورحمة الله وبركاته

Dear Ahmed,

أقوم حاليا بإجراء دراسة أكاديمية بعنوان : I am currently conducting an academic study entitled:

Beyond Omani Science Assessment process in the post-basic education (aged 16 and 17)- Case Study (Assessment practice in the classroom)

وعندي استبانه من صفحة واحدة (كجزء من أدوات الدراسة) تقيس تصورات الطلبة العمانيين للتقويم الصفي، وهي مترجمة عن أصل أنجليزي للمؤلفين :Cavanagh et al. (2005)

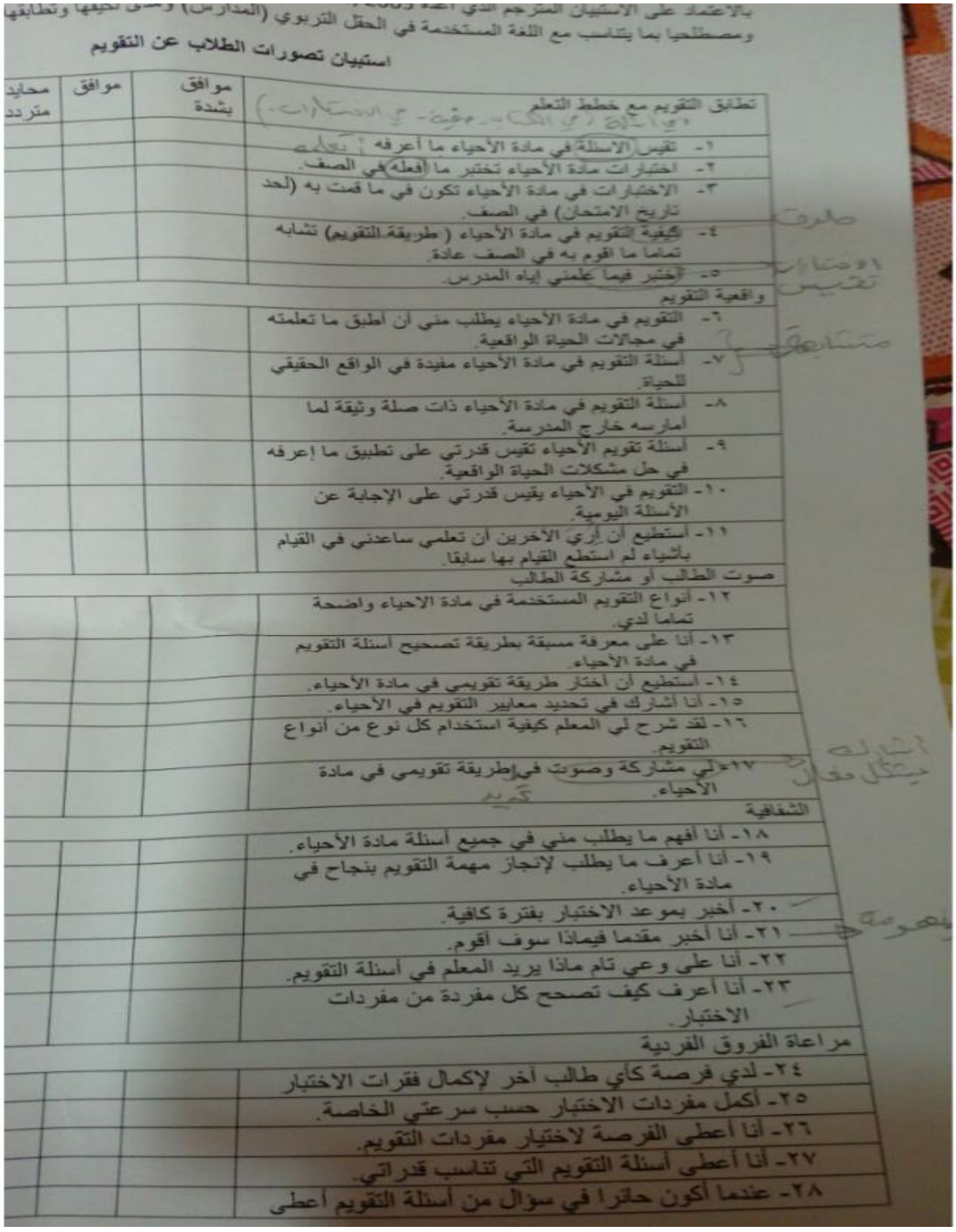
وتحتاج إلى: Could you please :

1- مراجعة لغوية (مدى وضوحها لغويا) وهل المصطلحات يمكن للطالب العماني استيعابها.
2- وتكييف لتتناسب مع البيئة العمانية. 2- Adapt the questionnaire to the Omani environment
3- أية اقتراحات أو تعديلات ترونها مناسبة 3- Any appropiate suggestions

1- Review the questionnaire linguistically and to what extent your students can understand the terms in the questionnaire?

ملاحظة: الاصل الانجليزي والترجمة ملحقان. Note that the English version ant its translation are attached

وجزاك الله خيرا Thank you
محمد الحضرمي Mohammed



بالاعتماد على الاستبيان المترجم الذي أعده [illegible] ومصطلحيا بما يتناسب مع اللغة المستخدمة في الحقل التربوي (المدارس) وسبل تكيفها وتطابقها

استبيان تصورات الطلاب عن التقويم

تطابق التقويم مع خطط التعلم	موافق بشدة	موافق	محايد متردد
١- تقيس الأسئلة في مادة الأحياء ما أعرفه.			
٢- اختبارات مادة الأحياء تختبر ما افعله في الصف.			
٣- الاختبارات في مادة الأحياء تكون في ما قمت به (لحد تاريخ الامتحان) في الصف.			
٤- كيفية التقويم في مادة الأحياء (طريقة التقويم) تشابه تماما ما اقوم به في الصف عادة.			
٥- أختبر فيما علمني اياه المدرس.			
واقعية التقويم			
٦- التقويم في مادة الأحياء يطلب مني أن أطبق ما تعلمته في مجالات الحياة الواقعية.			
٧- أسئلة التقويم في مادة الأحياء مفيدة في الواقع الحقيقي للحياة.			
٨- أسئلة التقويم في مادة الأحياء ذات صلة وثيقة لما أمارسه خارج المدرسة.			
٩- أسئلة تقويم الأحياء تقيس قدرتي على تطبيق ما إعرفه في حل مشكلات الحياة الواقعية.			
١٠- التقويم في الأحياء يقيس قدرتي على الإجابة عن الأسئلة اليومية.			
١١- أستطيع أن إري الآخرين أن تعلمي ساعدني في القيام بأشياء لم استطع القيام بها سابقا.			
صوت الطالب او مشاركة الطالب			
١٢- أنواع التقويم المستخدمة في مادة الاحياء واضحة تماما لدي.			
١٣- أنا على معرفة مسبقة بطريقة تصحيح أسئلة التقويم في مادة الأحياء.			
١٤- أستطيع ان أختار طريقة تقويمي في مادة الأحياء.			
١٥- أنا أشارك في تحديد معايير التقويم في الأحياء.			
١٦- لقد شرح لي المعلم كيفية استخدام كل نوع من أنواع التقويم.			
١٧- لي مشاركة وصوت في طريقة تقويمي في مادة الأحياء.			
الشفافية			
١٨- أنا افهم ما يطلب مني في جميع أسئلة مادة الأحياء.			
١٩- أنا أعرف ما يطلب لإنجاز مهمة التقويم بنجاح في مادة الأحياء.			
٢٠- أخبر بموعد الاختبار بفترة كافية.			
٢١- أنا أخبر مقدما فيماذا سوف أقوم.			
٢٢- أنا على وعي تام ماذا يريد المعلم في أسئلة التقويم.			
٢٣- أنا أعرف كيف تصحح كل مفردة من مفردات الاختبار.			
مراعاة الفروق الفردية			
٢٤- لدي فرصة كأي طالب آخر لإكمال فقرات الاختبار			
٢٥- أكمل مفردات الاختبار حسب سرعتي الخاصة.			
٢٦- أنا أعطى الفرصة لاختيار مفردات التقويم.			
٢٧- أنا أعطى أسئلة التقويم التي تناسب قدراتي.			
٢٨- عندما أكون حائرا في سؤال من أسئلة التقويم أعطى			

Appendix T: Demographic characteristics of the teachers participating in the research

Dear Biology teacher,

This survey is concerned with the practice and perception of the new assessment in relation to post-basic education reform. The information you give via the interview and classroom observation will be helpful in the research to understand the feelings and attitudes of those who are responsible for implementing assessment. All information will be confidential and anonymous.

Thank you for your contribution and time.

Mohammed Al Hadhrami

m.al-hadhrami@ncl.ac.uk

IPhD student at Newcastle University

Biographical Information

Please put (✓) mark in the relevant box:

1. Gender:

☐ i. Male

☐ ii. Female

2. Age group

☐ i. 25-30

☐ ii. 31-35

☐ iii. 36-40

☐ iv. 41-45

☐ v. 46-50

3. Academic qualification:

☐ i. Bachelor

☐ ii. Master

☐ iii. Other

4. Teaching experience:

☐ i. 5-10 years

☐ ii. 11-15 years

☐ iii. 16-20

☐ iv. 21-25

☐ v. 26-30

5. Please answer the following questions:

   i. Where did you graduated from?

   ii. What is your specialty?

   iii. How many schools have you worked with?

   iv. What classes are you teaching?

Thank you

Appendix U Interview Protocol (PM and AW Authorities)

1. What are the reasons for development of education in general and assessment in particular?
2. What is the government policy about assessment change?
3. Basic education was linked to the path of student-centred learning. What does this principle focus on assessment process? Or What is the reflection of this principle on the educational assessment?
4. Among the principles of the new assessment is the introduction of self-assessment and peer assessment. How do you assess the success of this principle in public schools?
5. Introducing the student portfolio is a new idea in educational assessment in Oman. How can this be used in assessment?
6. What are the criteria for success and failure in post-basic education?
7. What is the Ministry's role in training teachers in the new assessment system?
8. What is the role of the external moderation committee in monitoring the teacher's implementation of the CAmechanism?
9. What is the opinion of the Ministry about the way of assessing both: homework and practical activities? When I asked the teachers and the students about these tools, they said: They do not distinguish between students' abilities. Because all students have taken the final grade.
10. When writing the assessment document, how did you balance between FA and SA?

Appendix V Interview Protocol Biology teachers

1. Do you refer to the "Student Assessment Handbook" when you assess your students? How?
2. What is your impression of the assessment document? Do you find it helpful? How? Why?
3. Do you use FA in the classroom more than summative? How? Why?
4. How do the policy makers focus on FA or SA?
5. Have you got time to discuss students' work?
6. What type of feedback do you use frequently? Summative or formative? Why and how?
7. How do you record the results of assessment? Do you use the cp to record the marks?
8. Are there many students in your classrooms? Do you think that forms a challenge to you or difficulty? How? Why?
9. How often do you ask students to explain their answers? How?
10. What assessment methods do you use in the classroom?
11. What is your opinion about the way these are assessed: homework, the practical activities, the practical test, the short questions (quizzes) and the final examination?
12. How is the student portfolio employed?
13. How do you conduct both self-assessment and peer assessment?
14. Have you taken training courses in assessment either from the local Directorate or from the Ministry?

Appendix W Focus Group Protocol (Post-Basic Education Students)

1. What is the relationship between the assessment process and what is actually being taught?
2. How have you been trained in answering the questions posed by assessment tasks? Or how often have you had mock exams before the real one?
3. What type of feedback does the teacher use?
4. Does the teacher encourage self-assessment?
5. Does the teacher encourage peer assessment?
6. What are your opinions about how these assessment instruments are carried out: homework, the practical performance, and the quizzes?
7. When did your teachers tell you about your assessment plan?

Appendix X Lesson Observation:

X.1 Nasir's lesson (Nasir): lesson 1:

Date: 23 March 2017

Venue: The Learning Resource Centre

Grade: 12

Teacher: Almost, yesterday, we finished learning the second chapter: "Fertilization and the development of the foetus". We learned about many things: how the foetus is formed in the womb of his mother, how fertilization occurs, how twins are formed. Fertilization and Pregnancy Technologies. How to help couples who complain of infertility, things you know in general. But, do not know the details. The assessment questions do not have any use. I do not need to waste a lesson on it, if you have any question, return to me. In addition, go back to the models of last years' exams. As I told you, after any unit, study it on Friday and Saturday. We agreed, guys? When is the exam?

Students: Thursday

Teacher: Next week. From which chapter?

Students: First

Teacher: The first chapter. In addition, the second chapter about the study of pregnancy and foetal development. Is it clear?

Students: Yes

Teacher: Studentbirth is not included, studentbirth is not included. If you want to record, the chapter of the menstrual cycle. In addition, chapter II "fertilization". Followed by pregnancy and foetal growth, to page 53.

Close the book and the notebook. Close. Today we will start genetics. A quick introduction, ok? At first, we will start with an actual beginning and until almost 20 /5 we

will be on the unit about inheritance. The genetics unit is fun and interesting, you get to learn many things. Regardless of the logic of grades, you will recognise many things. Before that, it takes about 8 minutes to ask questions. Solve these questions in pairs. Write down the names and then submit them. Do not open the book and the note book or anything else.
Student: Which lesson?
Teacher: Twins lesson, technologies, family planning, birth control. Are we agreed? Time is important. Work in pairs. Do not look at other peers.
(The teacher distributes the activity papers). Teacher: Mazen and Yusuf together, Idris and Mohammed and so ... Musab Come with Malik
Mazen: I was absent.

Teacher: You were absent. what can I do for you?
Teacher: When you've finished answering the questions, hand me the paper with your names written on it.
[Students solve questions in pairs. Each pair with each other. The teacher goes past the groups and watches the time.]
Teacher: Before you do anything, write down your names.
The teacher stands in front of the classroom: guys, just three minutes.

(Students discuss the answers in pairs). During the test, the teacher said: There is another question. Another question. Move. The teacher looks at the clock.
Teacher: Now the second sheet (the teacher distributes the papers of the second activity)
Teacher: I will collect all the papers at once.

Teacher: The second, second. You have time.
Mohammed: It's not clear teacher
Teacher: Think about it. It's clear. Think.
(The teacher continues to give papers to the rest of the students)
Teacher: Mohammed. The second question is clear. Your peers answered it.
(Students discuss in pairs).
Teacher: How is the part referred to as Y formed? That is one of the embryonic membranes. What is the layer of cells forming the part referred to as Y called? Question C guys.
Teacher: Yes, one of the embryonic membranes. How many layers from embryonic

membranes?
Student: Three layers
Teacher: I explained the question to you, of course.
One student asked the teacher, the teacher said: Good work.

The teacher observes the students and tries to clarify the question for some groups.
Teacher: Well done Musab. You did it Musab?
Teacher: You have two layers in the palastiola, guys. Two layers. Which layer does the embryonic membrane consist of? So, what is the question?
Teacher: Now Osama collect the papers please.

(Osama collects the papers from his peers).

Teacher: Unity of Genetics. From this date to almost 20/5, in the genetics unit, we will study how genetic traits are transmitted. How genetic diseases are transmitted. Beginning with genetics. What is genetics?
Age: Similarity
Teacher: Similarities? Your friend says: similarity. You mean similarity and difference. Good answer.
Osama: It's the same thing
Teacher: Well done
Zed: Transferring genes
Teacher: Matching genes. Gene transfer
Sound: Gene similarity
Teacher: Gene similarity. Sweet
Yunus: Transfer of traits
Teacher: Transfer of attributes. Well done. Does anyone have another answer?
Muhannad: Gene transfer
Teacher: Well done. Transferring genes from parents to offspring. Therefore, transfers the attributes of the fathers to the sons. Ok? So, we want a broader definition of genetics.
Nasr: Transfer of genetic traits and genes from the father
Teacher: From parents to sons. Well done. Transferring genetics from parents to offspring. Well done, thanks.

We will study genetics, as an introduction. Is the slide clear? (referring to the blackboard). The teacher reads from the slide: Often people use science in their lives

before they know its foundations and laws.
I mean, our ancestors were practicing genetics although they did not know the genetic laws that we study such as Mendel's laws and the laws of modern heredity. But, they knew that if they planted a palm tree of a certain type, they would grow a palm of the same type. For example, they planted a banana plant, and what did it give?
Students: Bananas
Teacher: Bananas. It did not give, for example, dates. But it would be of the same class. For example, in horses, they were bred among horses. What will the resulting individuals be?
Students: Horses
Teacher: Horses. Not donkeys or beasts. OK? They were bred between good horses to give good breeds, and they did not know the origins of inheritance. For example, the fertilization process is performed between a good bull and an excellent cow, so the breeds are excellent. But did they know the laws of Mendel and others?
Students: No

Teacher: They didn’t not know. For example, they cultivated a good lineage of palm trees, which then produced a fine quality palm. They did not creat a bad breed, they used genetics. However, they did not understand the laws. Clear? These qualities are transmitted from parents to sons, by what?
Talal: DNA
Teacher: Yes Mohammed, by?
Mohammed: DNA
Teacher: DNA. This is DNA, where did it come from?
Hashem: Father and mother
Teacher: Well done. From father and mother, through what process?
Student: Fertilization
Teacher: Through fertilization. Philosophers had long observed the transmission of these genes and were studying it. However, they were not lucky enough to come up with fixed laws, which they could record? OK? They were not lucky until the father of genetics, "Mendel" came along. Mendel was the one who laid the foundations of genetics. Next week, we will study Mendel's laws. After that, we will study modern genetics.

Teacher: What is genetics?
The students raised their hands

Teacher: Idris

Idris: Matching the genetic characteristics of parents and students

Teacher: Well done

Teacher: Musab

Musab: It’s the science that studies the transmission of genetic traits from parents to students

Teacher: Well done. Whether they are similar or different

Teacher: Who’s the founder of genetics?

Hamad: Mendel

Teacher: Well done. Mendel is the father of genetics

Teacher: How was Mendel's life? What do you know about Mendel?

Hamza: Mendel was a scientist in mathematics

Teacher: He was a scientist in mathematics and science

Teacher: Another profile? Yeah

Talal: He was a monk

Teacher: Well done

Teacher: Also? Mohammed?

Mohammed: Why did he study genetics on pea plants?

Teacher: I mean Mendel's life. Do you know anything else about his life?

Mohammed: No

Students laugh

Teacher: Ok. Why do I study genetics on pea plants? I’ll tell you: When Mendel studied the laws of genetics, he studied peas, why?

The students raised their hands

Teacher: Yousef

Yousef: Because he was working

Teacher: Was he at school? On a farm?

Teacher: Nasir.

Nasir: Pea plants are hermaphrodites

Teacher: What do you mean by hermaphrodite?

Musab: The male and female organs are found on the same flower

Teacher: Well done

Teacher: Another reason to choose a pea plant for conducting his experiments?

Amr: Short life cycle

Teacher: The time period between planting pea seeds and the plant bearing fruit is short. This helped him to obtain seeds and cultivate them and observe the qualities of the next generation.

Mahmoud: Pea plants are easy to cultivate

Teacher: Well done. It doesn't require much work

Joseph: In pea plants, there are several opposite traits. For example, Mendel got pea plants, some with short stems and some were tall. Some pea plants give fruits in the form of long pods or short ones and they may be green and may be yellow. Also. (The teacher showed some shapes of the traits of pea plants)

Teacher: Notice how the traits are opposite. See, (indicates the display) opposite traits. There is a plant with purple flowers and another with white flowers. These traits are opposite. The colour of the seed may be yellow and may be green. Look at the shape of the seed, too, some seeds are smooth and others are curly. The shape of the pods, may be smooth or may be curly, the colour may be green and may be yellow. The stem length, may be tall or may be short. These opposite traits helped Mendel in the study of genetics. Overall, how many laws have come out?

Students: Three

Other students: Seven

Teacher: Three laws. Does anyone remember these laws? You studied them in ninth Grade. Does anyone remember them? Does anyone remember Mendel's laws?

Students: No

Teacher: The law of dominance, the law of segregation, and the law of independent assortment.

X.2 Nasir's lesson (Nasir): Lesson 2: Testcrosses

Male class

Date: 3/ 4/ 2017

Venue: The classroom

Grade: 12

Time: 8 am

Testcrosses

1- Written Question
2- Students answer it
3- Feedback on it
4- Teacher wrote genetic proble on board to discus the lesson
5- oral questions
6- Feedback

The classroom was a caravan. The students were sitting in rows as shown on the picture. "I will give you a question about Mendel's laws. It is on the paper which I will give you" said the teacher at the beginning of the lesson. He wrote it on the whiteboard as follows:

1- If pollination occurred between two pea plants one was purple (dominant trait) and the other was white (recessive trait), show through genetics the results of this pollination.

While the students were answering the question, the teacher wrote this genetic problem on the whiteboard:

In one of trees, the trait of red flowers is dominant over the trait of white flowers. How can this be determined if the genotype of the plant with red flowers is homozygous or heterozygous?

The teacher then checked how students were answering the question and gave advice and hints. He did not allow that students to open their books during the assessment. He told them that there was no need to open the book (the question was related to a previous lesson). “Write down your name” he said “Hamed collect the papers”. “Musab help him”. “Muntasir finish and hand over paper”. Two students were collecting the students’ papers. Some students did not finish their tasks.

“Tomorrow I will check the homework and your books” said the teacher. He told his students that in this kind of question, speed is required.

Then he began his lesson:

“We will study testcrosses today and then we will try to solve a genetic problem. The problem written on the whiteboard is related to today’s lesson” said the teacher. He outlined the problem and then he proceeded to answer it in detail with his students. He wrote on the whiteboard:

Red flowers dominant: R White flowers recessive: r

He asked one student to choose a symbol for the dominant trait and a symbol for the recessive trait. Then he illustrated the techniques of choosing the symbols of both dominant and recessive traits as shown on the whiteboard above.

Teacher: How do you solve these kinds of problems using genetics? What are the steps?

A student stood up and said: “first we should write the phenotype down”. The teacher wrote:

Phenotype: red flower X white flower

Some students were looking at the book without the teacher realising because he had not allowed them to open it while he was delivering the lesson.

“What is the next step?” the teacher asked. Another student stood up and said: “Genotype”. The teacher praised the student for his answer. “Thank you” he said.

Genotype: R? X rr

“What is the third step?”

“Gametes”

The teacher wrote:

Gametes: First probability	Second probability
Gametes: RR X rr	Rr X rr
“What should we do?”	“How many gametes?”
A student stood up and said:	“2” said Saif. “Why?”- “Not identical”
Gametes: R r	R r r
First generation:	
Genotype: Rr	Rr rr
“What are the phenotypes?”	
Phenotype: red flower (heterozygous)	red flower: white flowers
100%	50% 50%

After solving this problem, the teacher asked his students to identify what is meant by the term testcrosses.

Then the teacher told the students to copy the problem and its answer from the whiteboard. The students copied as the teacher wrote the definition of “testcrosses” as a conclusion.

The type of questions the teacher asked were convergent questions.

X.3 Suleiman's Lesson 2: Nutrition in Plant: Photosynthesis

Male lesson 2

Date: 3/ 4/ 17

Time: 9: 20 am

Grade: 11 Biology

Venue: The classroom

The teacher wrote on the whiteboard the topics that will be covered in the lesson:

-The concept of photosynthesis

- Chemical equation for photosynthesis

- Autotroph

At first the teacher asked the question: Do you remember photosynthesis? Did you study it?

Students: Yes, in Grade nine

- sixth Grade

Teacher: Yes, in Grade six, but in this class, we will go deeper into it.

Students wrote these points in their books and the teacher moved around them.

The teacher asked the students to close the textbooks and notebooks and concentrate with him.

The teacher asked what has been previously studied:

T: Which organisms perform photosynthesis?

S: Plants

T: What does the plant contain for photosynthesis?

S: Chlorophyll.

T: What are the organelles that are found in plants and are not found in the world of animals and fungi?

S: Chloroplasts

T: Well done

T: Now we will ask a very important question. In order for the plant to photosynthesise, it needs things including the sun. What is the importance of the sun?

S1: Making food

S2: It provides the plant with light

S3: The sun gives the plant carbon dioxide

T: Does anyone have another answer?

S: The sun is the source of energy

T: The sun is the main source of plant energy through which the plant can perform photosynthesis and make food for itself and for living things.

A student asked: Teacher I have a question. The energy that comes from the sun to the plant will be in the shape of what?

Some students answered: Light and heat

Teacher: Chlorophyll benefits from the light that falls on the plant and the next lesson we will show a video about photosynthesis

“When sunlight falls on chlorophyll, the energy of electrons is converted to higher energy” the teacher added.

S: Like solar cells when light falls on them, they release electronic energy, which makes the electron more active.

Teacher: Who can give us a short definition for the concept of photosynthesis?

Hamza: The process by which plants use solar energy from the sun

Mazen: The process by which the plant benefits from sunlight

Salam: The process carried out by the sun to supply plants with energy to make glucose

Zaid: The process by which the plant uses light energy to make glucose.

Teacher: Look at the figure in the book p.78. Now I will ask you this question: the Figure shows a leaf and the sun. From the figure, what the arrows point to?

Abdullah: The arrow that came from the sun: absorbing light energy.

Ibrahim: The blue arrow points to the Oxygen

Yousef: Violet carbon dioxide

T: How did you know?

Mohammed: yellow sunlight, violet carbon dioxide; because it is clear that the stomata open, blue water.

T: How did you know?

Another student: because the stem has xylem which is attached to the leaf blade.

Another student summed up all the answers: Yellow: light energy, pink carbon dioxide, blue: water and violet glucose

The teacher thanked him

Teacher: Now close the book. Now can a student write an equation? David go to the whiteboard and write the equation, a verbal equation

David went to the whiteboard and wrote: Glucose $\leftarrow$ CO_2 + Energy

Others were asked to answer

Teacher: Ismail

Glucose $\leftarrow$ water + CO_2 + Energy

write it again David

O_2 + Glucose $\leftarrow$ water + CO_2 + Energy

Teacher: Ahmed take over the whiteboard and write the balanced equation.

Ahmed wrote:

$$6CO_2 + 6\,H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6O_2$$

The teacher gave him a card of excellence because he was able to infer the equation.

Teacher: Look. So, the equation is as your colleague says. The teacher explains the equation written by Ahmed and adds chlorophyll. So, who will give us the definition of photosynthesis from the equation?

S: The process by which the plant uses light energy, water and carbon dioxide to produce glucose and oxygen

The teacher wrote the definition of photosynthesis on the whiteboard

Teacher: There is still an important point to learn, which is the types of autotrophs. What do you know about the autotrophic organism?

S1: Any organism capable of self-nourishment

S2: It makes food for itself and others

Teacher: Well done an excellent conclusion and an excellent answer

T: Autotrophic organisms are two types: photoautotroph and chemoautotroph. What do we mean by photoautotroph?

The students raised their hands to answer

S: Gets its energy from the light

T: Well done

T: And chemoautotroph?

Ali: Uses materials found in soil

T: Substances in soil and inorganic chemicals. On this subject, of course, you have a lesson in the book about chemosynthesis. They are types of bacteria we will explain in detail and know their equations and how they get energy.

T: So in short an autotrophic organism your colleague said is .....

S: An organism that makes food for itself and others

T: We said there are two types.

S: Photoautotroph and chemoautotroph

T: Photoautotroph and chemoautotroph. And we said that photoautotroph, what?

S: Gets energy from light

T: Gets energy from light

T: Now we will move on to photosynthesis pigments. What do you know about them?

T: Mohamed, what do you know about the pigments found in plants?

Mohammed: chlorophyll
Teacher: Well done

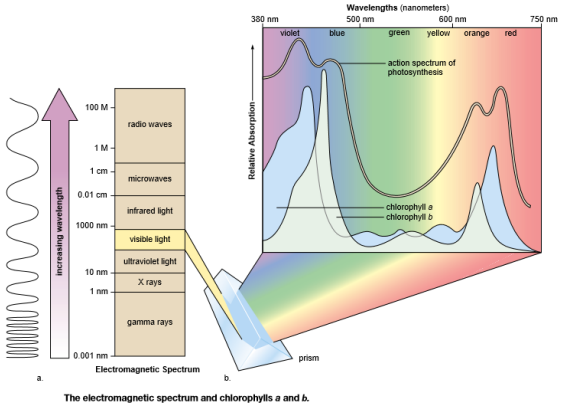
Teacher: There are two types of chlorophyll: chlorophyll a and chlorophyll b
Chlorophyll a is capable of converting light energy into chemical energy
Teacher: What is chlorophyll B?

S1: Gives the plant a green colour
T: Something else
S2: converts absorbed energy into chlorophyll a
T: Well done

T: How many colours are there in visible light?

Omar: Spectrum colours
T: And the number
Mazen: Seven

T: The sunlight looks white to us but we can understand it in two ways: the rainbow, the second method is the prism which synthesises the light of the sun to seven colours. Chlorophyll b is different from chlorophyll a. Chlorophyll a has a higher absorption of sunlight in the red region of visible light while chlorophyll b is in the blue region of visible light.



The electromagnetic spectrum and chlorophylls *a* and *b*.

Teacher: Why do we see leaves as green and fruits in other colours, such as red and yellow?
Mohammed: Because of the reflection of the spectrum

Another question: Why is this absorbed and that reflected?

Ahmed: Body composition?

M: How?

Ahmed: Because of its constituent materials

Zaid: Pigments

T: Well done

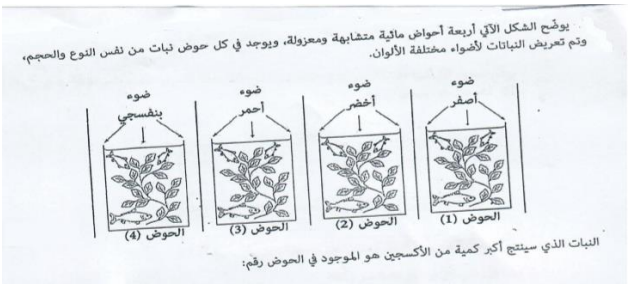
T: Pigments do this work. How?

Yellow in a plant, like carotenoid pigment, absorbs all colours and reflects yellow, chlorophyll absorbs all colours and reflects green

Hamdan: A carrot is underground. How does it absorb radiation?

T: When it comes out of the ground, it absorbs all colours and reflects yellow one

After that, the teacher gave the students an activity.



The teacher illustrated the activity and explained it to the students.

Then he gave another activity

Students answered the questions in both activities

The teacher then discussed the answers with the students

The bell rang.

X.4 Aida's lesson (Aida) Lesson 1: Mendelian Genetic Application

A sample from Grade 12 (female)

Female school

Time: 9:15 am

Grade: 12 Biology

Venue: The classroom

Revising homework: In the previous lesson, the teacher gave students this question:

Depending on the table on page 82, what is the relationship, if any, between the organism's number of chromosomes and its size?

يوضح الجدول التالي عدد الكروموسومات في بعض أنواع الكائنات الحية :

عدد الكروموسومات	الكائن الحي	عدد الكروموسومات	الكائن الحي
8	ذبابة الفاكهة	46	الإنسان
14	البازلاء	70	الجمل
34	التفاح	60	الماعز
21	الطماطم	32	التمساح
21	الأرز	24	السلمندر
14	العدس	78	الدجاج
20	الذرة	12	الذبابة المنزلية
14	الشعير	18	الخس
48	البطاطا	24	الفلفل

No. of chromosomes

Organism

The teacher gave a written activity to link the last lesson with the current lesson:

Write down the number and types of potential genotypes for the following gametes: AAbb?
The students used the rule taught in the previous lesson to solve the problem: 2^n
(Applying the rule directly does not require higher thinking).
Then a student went to the whiteboard to answer the question.

(memorising the rule and applying it to solve the problem)

During the lesson, the teacher asked short verbal questions and students tryied to answer them, for example:

T: We will move quickly on an important point. What is it?

S1: Sex determination

Teacher: What's the factor?

Yes Athra

Athra: Male is the specific factor for sex because it contains XY

Teacher: That's true but male is the specific factor because it has diversity because the male has two types of chromosomes X and Y while the human female does not have this diversity (3.5)

Teacher: So, male has diversity while the female does not. So, the male is the determining factor for the emergence of this diversity.

Do all mammals follow this rule?

students: Yes

Teacher: organisms are different. What is the determinant of sex in Drosophila?

S2: The male

Teacher: In contrast there are organisms in which the female is responsible for diversity because it has different sexual chromosomes (pause 4secs.).

Teacher: Sara what looks like a human being?

(Some students wrote notes in their notebooks and some in the textbooks).

Teacher: In some organisms, females are responsible for diversity. Tasneem?

Tasneem: Because the female has XY diversity while Male has XX

Teacher: So, they are responsible for diversity, some types of birds some kinds of ornamental fish and some types of insects. So, the type of chromosome is a determinant sex factor.

What makes it a determinant factor Aida?

Aida: There is a diversity in sexual chromosomes.

Teacher: Well done.

The teacher provided an opportunity for students to ask questions:

Sheikha: Why is the queen bee the only female which is fertile while the rest of the females are infertile?

Teacher: Royal Nutrition, Special Nutrition.

At the end of the lesson, the teacher gave a final assessment of what was learned in the lesson:

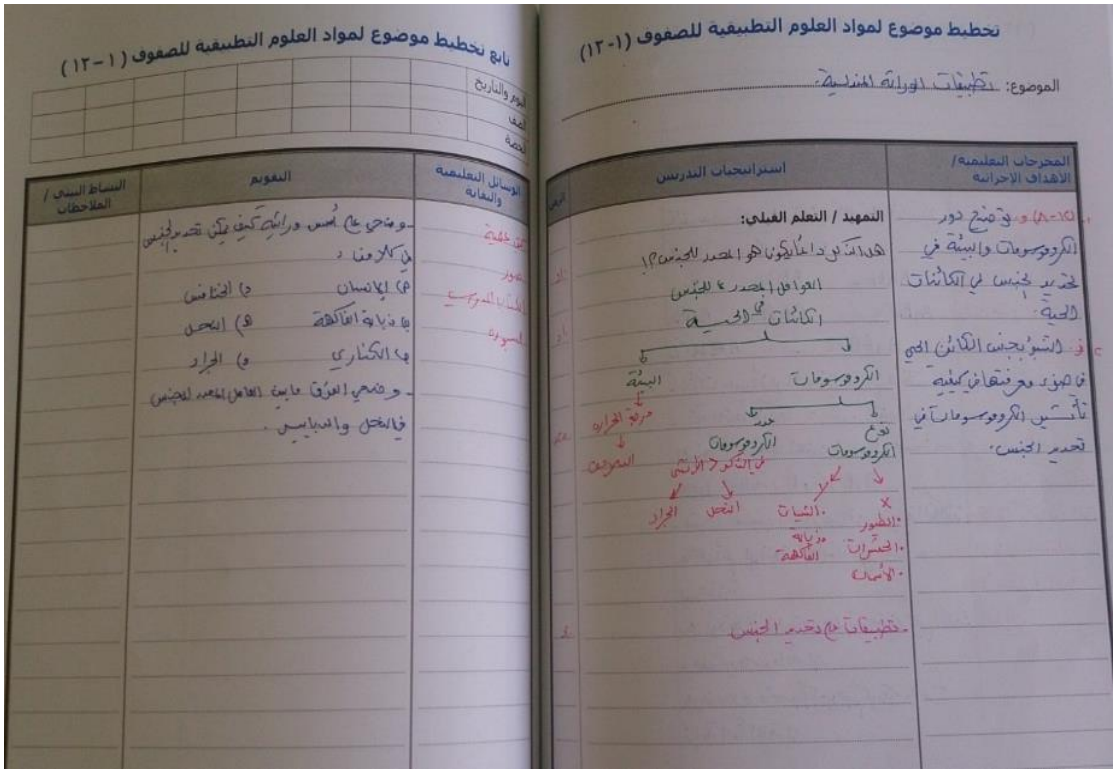
Teacher: Of the three factors, which factor determines sex in the following creatures:

The teacher showed the following images:





The teacher had planned for the lesson in her planning book which was provided by the Ministry:



She related assessment to the lesson's objectives (the educational outputs/ objectives) are already given to the teacher in the "Teachers' book'', which is written by the Directorate General for Curriculum:

Educational objectives:

1- (12-8) w Clarifying the role of chromosomes and environment in determining the sex (gender) in living things.

Assessment:

Clarify, genetically, how gender can be determined in:

a) Human

b) Drosophila

c) Bes

d) Canary

e) Beetles

f) Locusts (grasshoppers).

Assessment Activities in the classroom:

1) Homework revision

2) Teacher questioning and observation.

3) Teachers feedback.

X.5 Amina Lesson 1: How plants meet their needs (Adaptation)

A sample from Grade 11 (female):

Date: 29/ 3/ 2017

Grade 11

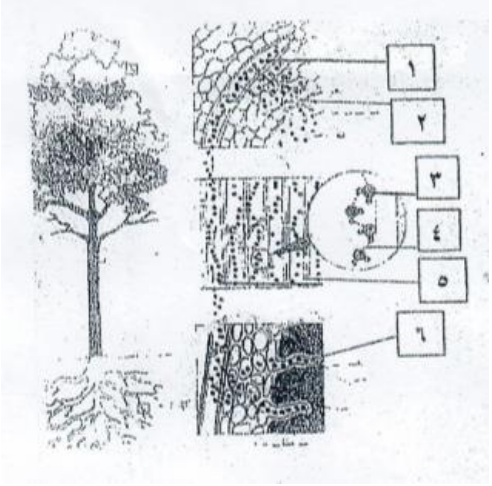
Number of students: 26

Venue: the lesson was in the laboratory**.**

Use of Interactive Whiteboard

At the beginning of the lesson, the teacher distributed question papers among the students as an introduction to the lesson.

During a period of silence for about 5 minutes, the students answered the questions on the given papers.



A) The opposite shape illustrates the transport of xylem fluids from the root to the leaves. Study it and then answer the following questions:

i) What is the number that indicates:

a- cohesion force

b- the origin of pulling force

ii) What is the effect of water loss in the form of vapor on the osmosis pressure occurred in the part indicated by number 1?

iii) Explain why we regard the water path in part 5 as an Extracellular path.

The teacher was moving around the students when they were answering the questions noticing them and answering their questions.

Working groups. 5 students in each group

The teacher connected the computer to projector (the interactive whiteboard display).

The teacher answered the questions from the activity that she gave to students

It was observed that the questions were convergent and closed ended.

Then she named each group a station like:

Station 1: Desert Environment

Examine the plants in front of you then complete the following diagram:

The adaptation of desert plants to water shrtages

Living in a water-scarce environment	reducing the rate of water loss through
- Leaves	- transpiration
- Stem	- Stomata
- Roots	- Leave

Station 2: Water environment

- Examine a sample of algae in a petry dish through the microscope.
- Write your observation about:

  Their roots

  Their leaves

- Do aquatic plants need the following things and why?:

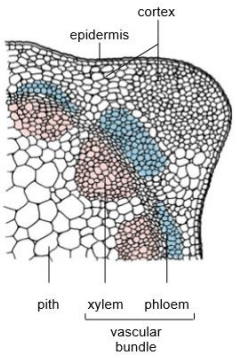
  Stomata

  Cuticle

  Xylem
- What is the importance of the vacuoles that are found in the cortex cells?

Station 3: Agricultural environment

- Examine the slide of a cross section of a stem in front of you
- What can you see about the arrangement of vascular bundles?
- What type of plant do you classify it as?
- Explain why agricultural plants need xylem.



Station 4: fertile soil

What I know about Nitrogen fixation?	What I need to know?	What I have learned?	How can I know more?

Station 3 group, put the slide under the microscope, which was connected to interactive whiteboard.

Station 2 group worked with the teacher using the microscope. The teacher helped the students to focus the slide under the microscope. After that, the students began to observe the slide and record the results.

Station 1 group surfed the Internet, extracting information about the adaptation of desert plants.

Other students examind a variety of desert plants.

After doing the activities, the teacher assessed the performance of one of the four groups according to this form:

A practical performance form in Biology for the 11th grade

Name: …….

Class: …….

Title of enquiry:

(……)

First: Initiative and planning

1. The enquiry question:

2. What are the tools needed for the experiment?

Second: Implementation and note taking:

1. Clarity of the sample ( )

2. Draw what you can see under the microscope.

Third: Analysis and explanation

1. Do aquatic plants need stomata? Why?

2. Do they need cuticles? Why?

3. Do they need xylem? Why?

Fourth: Communication and team work:

1. Group cooperation ( )

If an aquatic plant is transferred to land what will happen to it? Explain your answer.

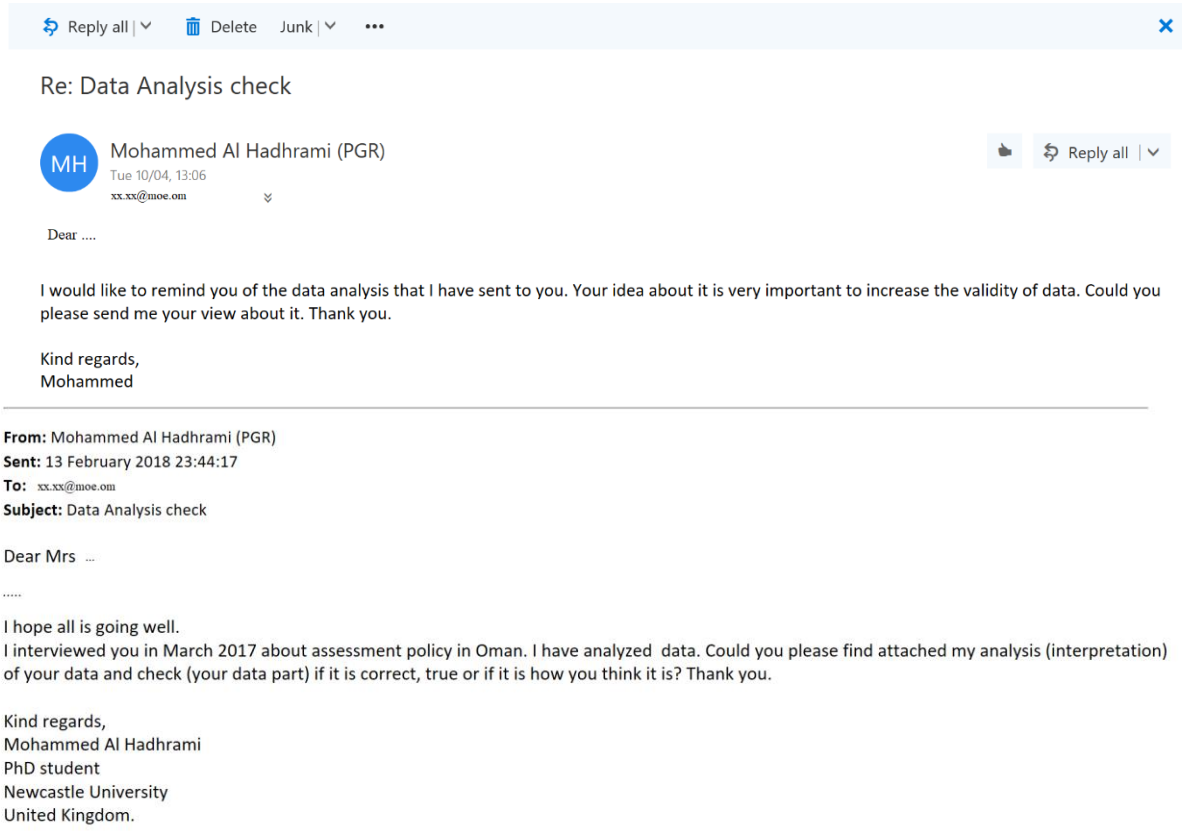
Then the teacher sat with the students who were working on the combuter. After that she went to see the students who were examining a microscopic slide under a microscope. She helped them to focus the slide under the microscope so it was clearer on the interactive whiteboard which was connected to the microscope. Two students pointed to the screen and talked to the teacher.

Then each group presented its work. During the presentation, there was interaction between the students, for example some students asked questions and the group answered them and vice versa (peer assessment). At the end, the teacher commented on students' answers and performance. She pointed to a desert plant to illustrate the adaptation of the its leaves then she asked what the benefit was of the capillaries on the leaves. Then she pointed to the interactive whiteboard to show the adaptation of a plant root. The bell rang announcing the end of the lesson.

Appendix Y- The front cover of the science assessment document used for the document analysis and as a model for discussion during interviews and focus groups.

Appendix Z Emails

Z.1- Email to the Assistant Director General for Evaluating Attainment Achievement regarding reviewing the analysis of her interview:



Reply all | Delete Junk | ...

Re: Data Analysis check

MH Mohammed Al Hadhrami (PGR)
Tue 10/04, 13:06
xx.xx@moe.om

Reply all

Dear ....

I would like to remind you of the data analysis that I have sent to you. Your idea about it is very important to increase the validity of data. Could you please send me your view about it. Thank you.

Kind regards,
Mohammed

From: Mohammed Al Hadhrami (PGR)
Sent: 13 February 2018 23:44:17
To: xx.xx@moe.om
Subject: Data Analysis check

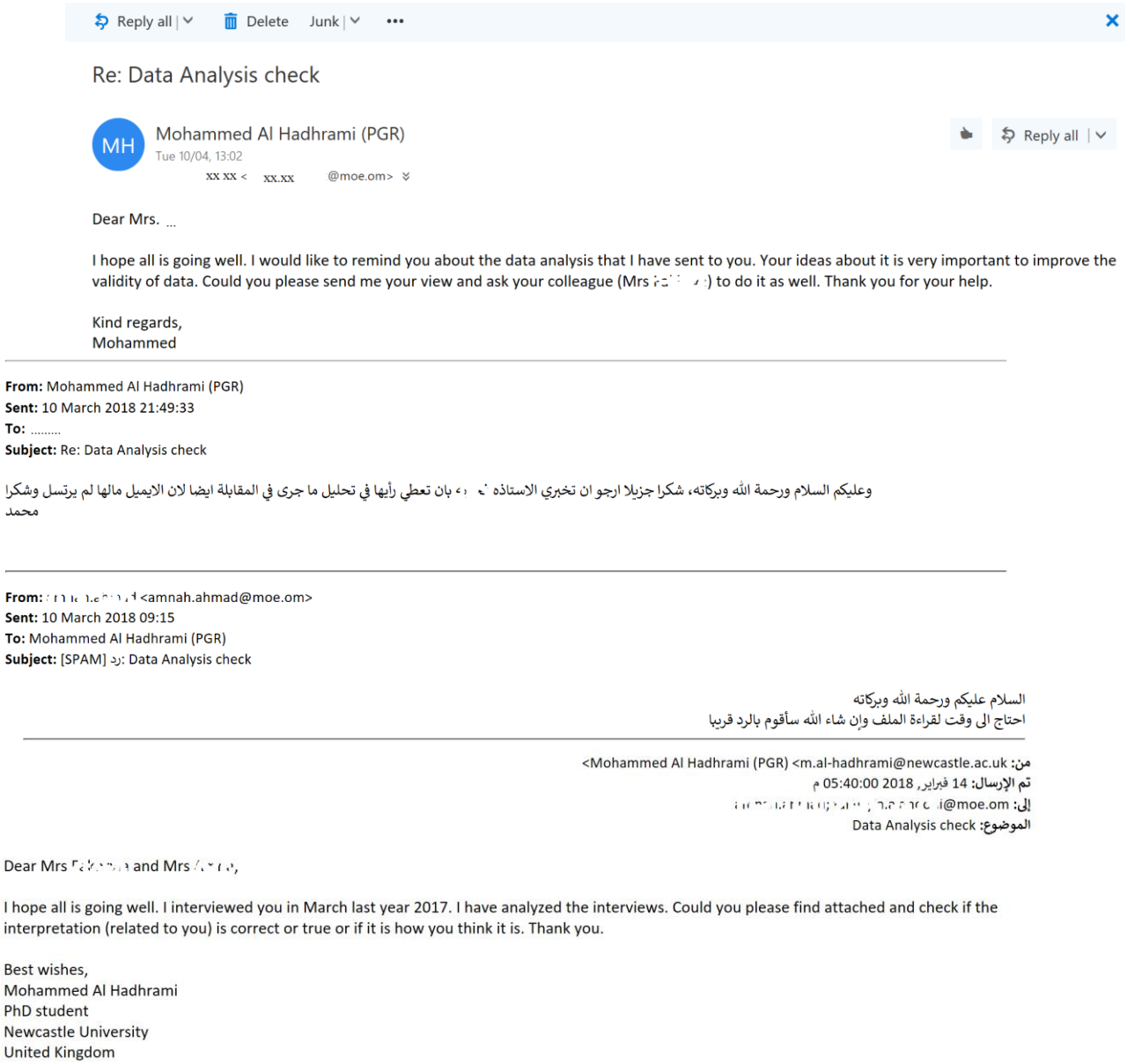
Dear Mrs ...

.....

I hope all is going well.
I interviewed you in March 2017 about assessment policy in Oman. I have analyzed data. Could you please find attached my analysis (interpretation) of your data and check (your data part) if it is correct, true or if it is how you think it is? Thank you.

Kind regards,
Mohammed Al Hadhrami
PhD student
Newcastle University
United Kingdom.

Z.2 Email to Biology teachers regarding reviewing the analysis of their interviews:



Reply all | Delete Junk | ...

Re: Data Analysis check

MH Mohammed Al Hadhrami (PGR)
Tue 10/04, 13:02
xx xx < xx.xx @moe.om>

Reply all

Dear Mrs. ...

I hope all is going well. I would like to remind you about the data analysis that I have sent to you. Your ideas about it is very important to improve the validity of data. Could you please send me your view and ask your colleague (Mrs ...) to do it as well. Thank you for your help.

Kind regards,
Mohammed

From: Mohammed Al Hadhrami (PGR)
Sent: 10 March 2018 21:49:33
To: .....
Subject: Re: Data Analysis check

وعليكم السلام ورحمة الله وبركاته، شكرا جزيلا ارجو ان تخبري الاستاذه ... بان تعطي رأيها في تحليل ما جرى في المقابلة ايضا لان الايميل مالها لم يرتسل وشكرا
محمد

From: ... <amnah.ahmad@moe.om>
Sent: 10 March 2018 09:15
To: Mohammed Al Hadhrami (PGR)
Subject: [SPAM] رد: Data Analysis check

السلام عليكم ورحمة الله وبركاته
احتاج الى وقت لقراءة الملف وإن شاء الله سأقوم بالرد قريبا

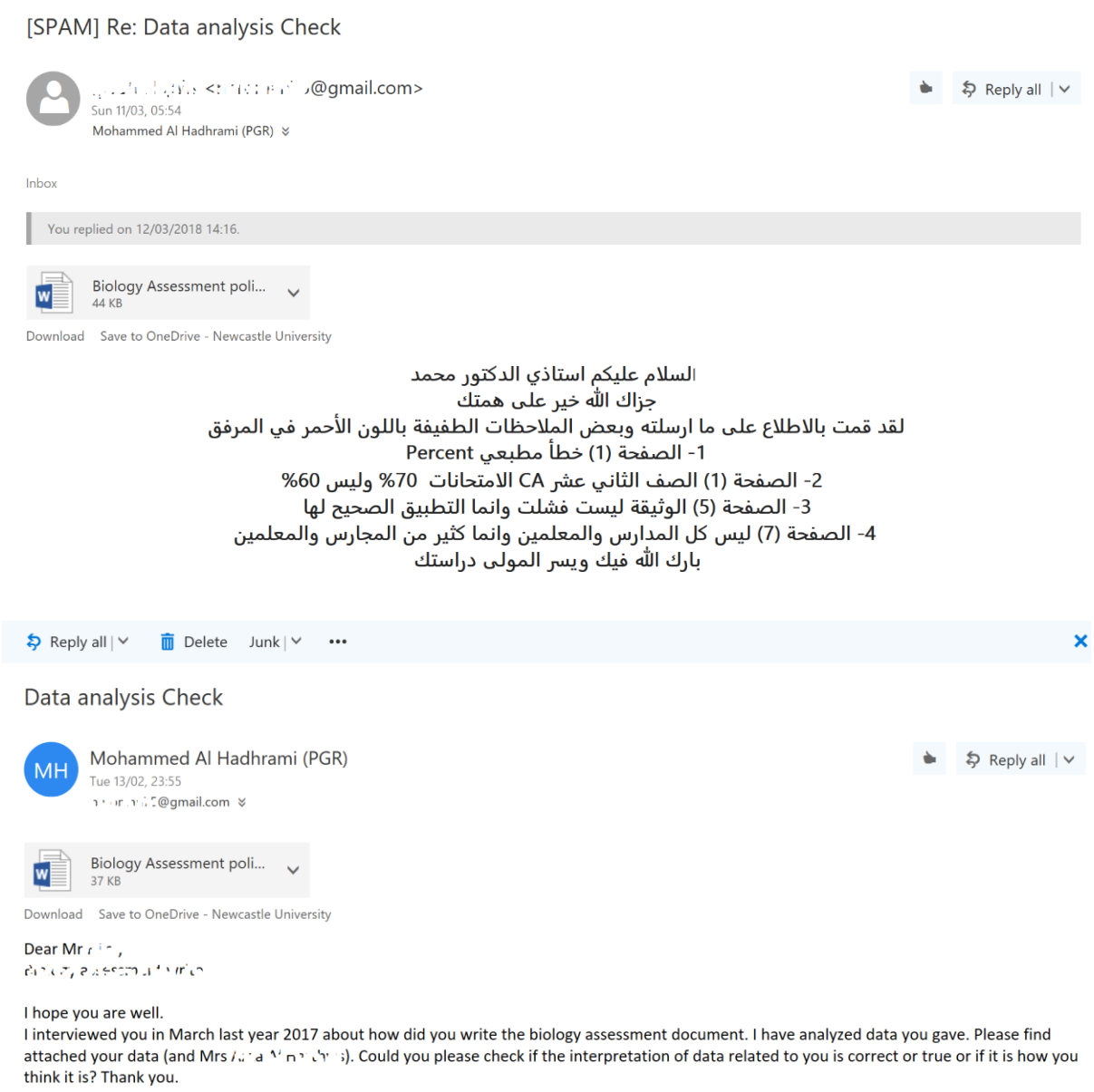
من: Mohammed Al Hadhrami (PGR) <m.al-hadhrami@newcastle.ac.uk>
تم الإرسال: 14 فبراير, 2018 05:40:00 م
إلى: ...@moe.om
الموضوع: Data Analysis check

Dear Mrs ... and Mrs ...,

I hope all is going well. I interviewed you in March last year 2017. I have analyzed the interviews. Could you please find attached and check if the interpretation (related to you) is correct or true or if it is how you think it is. Thank you.

Best wishes,
Mohammed Al Hadhrami
PhD student
Newcastle University
United Kingdom

Z.3 Email to the Biology Assessment Writer regarding reviewing the analysis of their interviews:



[SPAM] Re: Data analysis Check

<redacted>@gmail.com>
Sun 11/03, 05:54
Mohammed Al Hadhrami (PGR)

Reply all

Inbox

You replied on 12/03/2018 14:16.

Biology Assessment poli...
44 KB

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السلام عليكم استاذي الدكتور محمد
جزاك الله خير على همتك
لقد قمت بالاطلاع على ما ارسلته وبعض الملاحظات الطفيفة باللون الأحمر في المرفق
1- الصفحة (1) خطأ مطبعي Percent
2- الصفحة (1) الصف الثاني عشر CA الامتحانات 70% وليس 60%
3- الصفحة (5) الوثيقة ليست فشلت وانما التطبيق الصحيح لها
4- الصفحة (7) ليس كل المدارس والمعلمين وانما كثير من المجارس والمعلمين
بارك الله فيك ويسر المولى دراستك

Reply all | Delete Junk | ...

Data analysis Check

MH Mohammed Al Hadhrami (PGR)
Tue 13/02, 23:55
<redacted>@gmail.com

Reply all

Biology Assessment poli...
37 KB

Download Save to OneDrive - Newcastle University

Dear Mr <redacted>,

I hope you are well.
I interviewed you in March last year 2017 about how did you write the biology assessment document. I have analyzed data you gave. Please find attached your data (and Mrs <redacted>). Could you please check if the interpretation of data related to you is correct or true or if it is how you think it is? Thank you.

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