Functions of translanguaging instances in Biology lessons held in the Maltese educational context.

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Abstract

This dissertation analyses the bilingual reality in the Maltese classroom during Biology lessons. Biology, in the Maltese context, is solely assessed in English and all textbooks are provided in English. It is a known fact that language distribution tends to be different in the three local educational contexts, that is in State, Church and Independent schools. The analysis is based on recordings of ten observed Biology lessons delivered in the three different sectors. A detailed analysis of how teachers use language to explain the lesson content is based on a transcribed corpus. It appears that particularly in the State school context, Maltese needs to be heavily resorted to in order to ensure access to the curriculum. English is by far the dominant language used by the Independent school Biology teachers and it is also the dominant language in the two observed Church schools, where code-switching is however also very apparent. An interpretation drawing upon Maltese socio-linguistic realities is provided for these different language choices in an attempt to explain these language choices. This research looks in depth at the functions fulfilled by the languages used as medium of instruction and of interaction by both teachers and students. Results indicate that language choice is a subjective factor, depending largely on the speakers' preference, background and on the school context.

Keywords:

TRANSLANGUAGING **BILINGUALISM** **DIFFERENT SCHOOL CONTEXTS**

CODE-SWITCHING **BIOLOGY**

To the memory of my cousin Daniel, for giving me the strength and courage to keep going.

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1. Introduction

1.1. Introduction

Language use in education is a frequent topic of discussion, especially in a bilingual country like Malta, where both Maltese and English have a prominent place in society. This dissertation is relevant in 2018 more than ever, when the world has truly become a global village, connected by media and the internet. English needs to be given utmost importance, because of its dominance in the world, and at the same time, care needs to be taken to ensure that our native language is not pushed aside in the educational system as far as it can be helped.

The NCF (Ministry of Education, 2012) highlights the significance of bilingualism and gives particular importance to strengthening language fluency in both Maltese and English. However, when considering the language the students are being assessed in, the balance between Maltese and English is far from equal. Apart from Maltese, Religion, Social Studies and Maltese History, examinations in the rest of the subjects are solely provided in English (excluding foreign languages).

Translanguaging and code-switching are common phenomena present in a bilingual society. This requires, and at the same time is, the result of people being proficient in both languages, so that each, or perhaps, both together can be used successfully according to the circumstances. While these phenomena are similar in meaning, one is not equivalent to the other. This will be elaborated on in the coming chapters.

1.2. Motivations for the Study

Language use has always been a topic which interests me. As someone who has studied both Maltese and English at University level, I am personally interested in the dynamics of these two languages in Malta. The motivation to embark on such a study stemmed from a particular interest in code-switching as a phenomenon in Malta, from its presence in everyday conversations and its presence in social media.

Choosing science as a field was of interest to me as it is a subject which proves to be more of a challenge to students than other subjects, and because all textbooks related to this subject are solely provided in English. Choosing the subject of Biology specifically resulted from lack of studies in this particular field.

1.3. Research Aims

This dissertation will focus on the subject of Biology, and will specifically look at language use by teachers and students in the classroom. This subject is solely assessed in English, and all textbooks are provided in English. As a researcher, I will enter the classroom and observe how teachers use language to explain the lesson content, particularly if Maltese, English or a mixture of both are used. Possible reasons for this choice will be explored. Language choice is subjective, depending largely on the speakers' preference, background and schooling, thus this dissertation is naturally dependent on the context and on the individuals who participated in the field research. The results may alter if the same research were to be done in different schools in Malta. The results are therefore only an indication of language tendencies in Maltese schools.

In a nutshell, the research aims to answer the following questions:

- When and how does translanguaging occur in the Biology classroom?
- What are the reasons for the presence of translanguaging, or lack of it, during Biology lessons?

1.4. Dissertation Overview

Chapter 2 will take a closer look at the literature concerning bilingualism and translanguaging as phenomena in themselves, and within the educational system, particularly in the scientific field. This chapter will also look at other studies written about the subject of translanguaging and language use, particularly in the science classroom.

Chapter 3 will outline the method used to conduct this research, highlighting the reasons for choosing the particular type of methodology adopted. The limitations associated with such a method of research will also be highlighted.

Chapter 4 will present the research findings resulting from the classroom observations together with the feedback sessions held with the teachers involved. The differences and similarities found between schools will be observed and commented upon. The instances where translanguaging occurs and the functions that these instances serve will be analysed in this chapter.

Chapter 5 will discuss the research findings projected in Chapter 4, hoping to find reasons for the differences between the results in the school sectors. As previously stated, the results are

subjective and limited to this research, however a possible trend which might explain these results will be discussed.

A general conclusion for this dissertation is found in Chapter 6. It will synthesize the most important findings of this research. The limitations of the study are identified and suggestions are given for future studies which can further develop the results of this study.

2. Literature Review

2.1. Introduction

One cannot deny the importance literacy holds not only in the educational system, but also in everyday life. The power of literacy does not only lie in the ability to read and write, but also in the ability to apply these skills effectively in life. In developed and developing countries, literacy is associated with "progress, civilization, social mobility and economic advancement" (Baker, 2001, p.319), and with promoting competencies such as developing the power to reason and developing critical awareness. Literacy is needed for day-to-day tasks like reading labels on food packaging or understanding signs at an airport, and it is also crucial in education where students need to be able to read textbooks and examination papers in order for learning to take place.

Literacy is a fundamental academic skill, a cross-curricular theme present in all academic areas of schooling and not just language teaching. It is highlighted through the fact that "all learning happens primarily through language" (Ministry for Education and Employment, 2014, p.21), meaning that literacy is the foundation of all areas of studies.

One of the essential abilities of people in a bilingual country like Malta, is their ability to switch effectively from one language to the other. In the school context, this requires that people are literate in both languages, so that each, or perhaps, both together can be used successfully according to the circumstances.

2.2. Bilingualism in Education

2.2.1. Definition of bilingualism

Bilingualism cannot simply be defined as the ability to speak two languages, as a number of questions and concerns arise when trying to define such a complex phenomenon. Baker (2001) argues whether bilingualism means that the speaker knows two languages at the same level, or whether you can still be referred to as bilingual if the person knows how to speak but not write one of the languages. The distinction between language ability and language use is one that Baker gives importance to when discussing the meaning of bilingualism.

Two opposing views dominate the discussion of explaining the definition of this phenomenon. Bloomfield's definition revolves around the belief that a bilingual person has "native-like control" (1933) of the two languages while Diebold (1946) introduces the concept of 'incipient bilingualism' which allows people with minimal competence in the second language to be considered bilingual as well. The latter refers to Diebold's belief that people who know a few words or a couple of phrases in another language may be considered bilingual as well. This concept is believed to be too inclusive, as the majority of the population in the world do know some phrases in other languages. So, considering these opposing views, who can be considered bilingual?

2.2.2. Types of bilingualism

When a person is approximately equally fluent in both languages, meaning that he acquired the four language abilities that are listening, speaking, reading and writing, he is for some thought to be a 'balanced bilingual' (Baker, 2001). However, Fishman (1971) claims that this is an

"idealized concept" (p.9) which rarely exists since each language will be used in different contexts and situations for different reasons. He says that when considering bilingual usage, one must remember the importance of the social environment: when, where, and with whom the languages are being used.

Bilingualism can be achieved through two processes – simultaneously and sequentially. This separates "children who are exposed to two languages from birth from those who acquire a second language later" (Baker, 2001, p.10). When dealing with sequential bilingualism, one is dealing with second language acquisition, which Baker claims will not always lead to the speaker becoming fluently bilingual.

When considering my personal view of bilingualism, I believe a bilingual person is one who has knowledge of more than a couple of phrases in a language other than his native one, thus moves as close as possible to Bloomfield's belief of having a "native-like control" of the two languages.

2.2.3. The situation in education

The presence of bilingualism and bilingual education is, by far, not a new phenomenon in the world. Mackey (1978) confirms that bilingual education has existed in one form or another for 5000 years or more, mentioning the US as an example where a variety of indigenous languages existed long before European immigrants arrived. Baker (2001) explains that bilingual education is a complex phenomenon which exists in different ways according to whether the classroom environment seeks to foster bilingualism or else if bilingualism is present but is not supported through the curriculum. Baker mentions two types of situations that can occur whenever

bilingualism is present. 'Transitional bilingual education' aims to shift the child from the minority language spoken at home to the dominant one present in the school, keeping social and cultural assimilation in mind. On the other hand 'Maintenance Bilingual Education' attempts to nurture the minority language in the child, encouraging and affirming the presence of an ethnic minority group in the school population (Baker, 2001).

Ferguson et al. (1977) list a number of aims that bilingual education may hold in a society. These aims vary according to different situations and are not concerned with a balanced use of the two or more languages involved. Bilingual education can be effective in unifying a multilingual society while providing language skills that will help employment, thus elevating the social status of a population. However, Ferguson also states that bilingual education can serve the purpose of spreading the use of a colonial language and strengthening elite groups.

Baker (2001) claims that bilingualism is often blamed wherever underachievement is present in schools. There are frequent occasions where language minorities are found to underachieve and debates amongst teachers and others seek to attribute the blame to various circumstances, one of which is 'cognitive confusion' that some claim is caused by bilingualism (Baker, 2001, p.309).

In his article 'Myths about Early Childhood Bilingualism', Fred Genesee rejects the claims that bilingualism can have a negative impact on children and claims that "bilingual individuals enjoy certain neurocognitive advantages in comparison with monolinguals" (Genesee, 2015, p.6). Genesee explains that one of these advantages is 'selective attention'. Bilingual children minimize interference between the two languages by making attentive distinctions between

them, which develops their control processes. According to Bialystock (2001), this has been found in bilinguals who use the two languages they know on a regular basis and thus have advanced proficiency in both.

In the article, Genesee discusses various concerns that parents, health care professionals and educators amongst others have about raising children bilingually. Genesee claims that these beliefs are 'myths' and he provides evidence to disprove them. A concern which is prevalent is that of the 'monolingual brain' – the belief that an infant's brain is monolingual and the fear that the presence of bilingualism will result in language incompetence or developmental delay. "Bilingual codemixing by children is often taken as evidence that they are unable to separate their two languages" (Genesee, 2002, p.7). According to a research conducted by Maneva and Genesee (2002) in a study of a 10-14-month French-English infant, the milestones reached by the mentioned infant were similar to that of a monolingual child; the child engaged in babbling with each parent, one of whom spoke in English and the other in French. Contrary to popular belief, the child's babbling varied according to which parent he was speaking to and in each case the babbling was similar to that of a monolingual child.

Research on adult bilinguals has shown that they rarely produced incorrect mixed sentences (Myers-Scotton, 1997) and research on French-English children in Montreal showed that codemixing occurred less than 4% of the time and even when this was the case, no grammatical errors did occur (Sauve and Genesee, 2000).

Research on code-switching shows that its effect on understanding and message production is positive and helps students in their educational journey. During a science lesson in a first and

second grade bilingual classroom consisting of five Spanish-speaking fifth graders in America, students were faced with fewer language barriers than those students put in an immersion classroom where they were not allowed to code-switch to Spanish and speak solely in English (Pollard, 2002). When discussing subject matter, the latter came to abrupt stops in their speech and often had to claim they did not know the answer when, in reality, they only did not know how to express it in their second language. When the same students were allowed to code-switch, they showed increased interest in the subject and knowledge that had not previously appeared before. Students did not feel the need to cut their conversation short because of the language barrier, so were better equipped to answer any question related to the subject.

The results show that "learning two languages simultaneously is as natural as learning one" (Genesee, 2015, p.12) and full competence similar to that of a monolingual speaker can be obtained in the right environment. The right exposure to both languages is essential in order for children to become fluently bilingual. Abrupt changes in exposure can be detrimental to language development.

2.3. The Translanguaging and Code-switching Phenomena

2.3.1. Definitions

While 'translanguaging' and 'code-switching' have been used interchangeably in some situations, it is important to note that they are two separate phenomena having diverse meanings and are used in different situations.

In its Welsh origins, the term 'translanguaging' referred to a pedagogical practice in bilingual education "that deliberately changed the language of input and the language of output"

(Williams, 1994, as cited in Garcia and Lin, 2016, p.3). Lewis et al (2012) thought of translanguaging as "using one language to reinforce the other in order to increase understanding". These definitions reinforce the idea that the two languages are being used separately from each other even though they are in the same situation. Garcia and Lin (2016) have contradicted this belief, expressing that when translanguaging takes place, "both languages are used in a dynamic and functionally integrated manner" in order to facilitate thought processes and understanding, not just learning (p.4).

With this definition, Garcia and Lin highlight the difference between 'translanguaging' and code-switching' by stating that the latter is based on the "monoglossic view" that bilingual speakers have two separate linguistic systems while 'translanguaging' is based on the "heteroglossic view" that bilinguals do not have two separate linguistic systems but one dynamic system that incorporates both languages (Garcia and Lin, 2016, p.4). Thus, while code-switching may simply refer to a 'switch' between two languages, translanguaging reinforces the idea that the two languages are dynamic and fluid, not separate in the bilingual speaker's mind.

Blackledge and Creese (2012) speak about 'flexible bilingualism' which centralizes the speaker's role in an interaction, explaining that the speaker has no clear boundaries and uses both languages to convey information, using each one to convey a different message. They stress that it is through the bilingualism of the text that the full message is conveyed. The act of translanguaging then, according to Li Wei (2011) is "transformative in nature", creating a "social space" for the bilingual user to bring together different dimensions of this history, environment, attitude and cognitive capacity into one "coordinated and meaningful performance" (p.1223).

Canagarajah (2001) agrees with Garcia's ideology when expressing the belief that translanguaging is the ability of bilingual speakers to 'shuttle' between languages but treating both languages as "an integrated system" (p.401). Hornberger (2003) believes that a bilingual speaker can fulfill his role as a learner only when he is allowed to use the knowledge from all his existing language skills and is not constrained by a monolingual use.

2.3.2. The role of translanguaging in pedagogy

Üstünel and Seedhouse (2005) mention three roles that code-switching adopts in the bilingual classroom. The first major reason that code-switching is needed in the classroom, is for curriculum access. They express the need for code-switching to be present in the classroom in order to help those students who are not fluent in the language of instruction to grasp the content of the lesson without a language barrier. Moreover, they explain that code-switching can be beneficial for classroom management discourse, that is for instances that deviate from the context. They mention the example of disciplining students, attending to late-comers and gaining pupils' attention. Ferguson (2003) also notes this in his research in an English classroom in Turkey where the teacher code-switched between English and Turkish when introducing new topics in order to get the students' focus and attention (p.42). Üstünel and Seedhouse (2005) also explain how code-switching is used in certain classrooms in order to create a more relaxed atmosphere, making the teachers' relationship to the students more personal. In their study, teachers code-switched from English to Turkish in order to "express a Turkish idiom, comment on a social event in Turkey, and pass on personal information" (p.309).

Other researchers expressed similar beliefs; Kamwangamalu (2010) states that code-switching can have multiple advantages such as building classroom rapport, compensating for lack of comprehension with students who do not speak the language of instruction, and expressing solidarity with students (p.4).

A study by Mirhasani and Mamaghani (2009, as cited in Avery, 2013) which included experimental studies with adults in Iran learning English, concluded that when the group was allowed to code-switch in the classroom, they were more comfortable, took more risks and participated more (p.5). The use of their first language allowed their discourse to flow more naturally, breaking the language barrier in the classroom.

Meyer (2008, as cited in Avery, 2013) speaks about the idea of 'scaffolding', which can be defined as the modification of language by teachers to meet the ability of the students. Meyer insists that the presence of the first language of the students is important in "allowing a flow of communication and negotiation of language problems" (p.5) and admits that it can ultimately aid the learner in developing proficiency in the second language as well.

The presence of the first language in the classroom is always real, regardless of the teacher's decision to code-switch or not. He (2012) believes that the first language does not only hold value as a communication tool but she references Vygotsky when claiming that the first language is "the most powerful 'mediating tool' for thinking" (p.3). Even though students can be requested to speak in the language of instruction during a lesson, it can never be requested of them to 'think' in that language, and He claims that the student will use their first language to think about the content of the lesson and break it down to understand it better.

2.3.3. Opinions for and against translanguaging in the classroom.

In his study, Thomas S. Avery mentions two major views about the value and use of translanguaging or code-switching in the classroom – the monolingual and bilingual approach. The former speaks against the use of translanguaging in the classroom, deeming it as detrimental to students' education. The monolingual approach points to this phenomenon as "evidence of negative transfer and linguistic confusion" (2013, p.2). The bilingual person is seen as two monolinguals in one, having two different language systems, and using them in the same situation can only hinder language proficiency in the second language. Littlewood and YU (2009) have found that it is common in the USA and Asia to find that the first and second language are separated in the classroom. The bilingual approach looks at code-switching as the "natural result of languages in contact" and deems the presence of the first language as necessary to learn the second language (Kecskes and Papp, 2000 as cited in Avery, 2013, p.2). Research has also contradicted the ideology of the monolingual approach, stating that language transfer does not really hinder learning but leads to gains in language acquisition. Hoshino and Thierry (2011) have also followed recent developments in neuroscience, which claim that the first language is activated in the brain whenever the second language is used. Butzkann (2011) develops the argument even further when claiming that the first language of a speaker forms the "cognitive basis" (as cited in Avery, 2013, p.3) for all language learning and depriving speakers from using their first language is to deprive them of a very valuable tool.

An argument against the use of code-switching in the classroom is developed by Kim and Elder (2005), who found that teachers are not aware of the extent of their translanguaging practices in the classroom and when they were asked to report about this, it was found that they in fact

used the L1 seven times more then they reported. Researchers concluded that teachers made use of code-switching in order to avoid complex statements in the target language, hinting at the fact that a reliance on code-switching was needed since there was a lack of proficiency in the target language.

Garcia (2009) explains how a good balance can be found in the classroom, and that translanguaging practices can be used to benefit the students above any other reason. She mentions an example from an English as a foreign language classroom in New York where Spanish speaking students learnt English through a Biology class which was taught mainly in Spanish, however English was introduced gradually as the students became more proficient in it. Garcia highlights how introducing English to the classroom helped the students develop their bilingual ability whilst learning a content subject. She admits that this process was aided by textbooks which were available both in English and Spanish. Garcia explains how languages were used flexibly throughout all lessons, and even though students were required to write a final essay in English, they were allowed to write their drafts in Spanish.

Avery (2013) expresses the concern that extensively using both languages can seem similar to an extensive use of translation. However, he explains that translanguaging differs from translation as students are actively using both languages, in real contexts, without the time to think before they act (p. 15). This differs from translation which requires a certain amount of thought in order to be carried out effectively and is derived from intention. Williams (2002) explains that while translation separates two languages, translanguaging aims “to both utilize and strengthen both languages” (as cited in Avery, 2013, p.16).

2.4. Language Use in the Science Areas of Learning.

2.4.1. Why English?

The question may arise of why it is that English has dominated the world of science and not any other language. In 2001, Abram De Swaan designed a hierarchical model of the language systems in the world, portraying English as the 'hyper-central language' of the world with other languages like French and Chinese on a lower level as 'super-central' languages. The lowest level in his hierarchy consists of 98% of the world languages which are mother tongues of small ethnic groups and usually hold no official status where they are spoken (2001, p.1). In his research, Rainer Enrique Hamel (2007) claims that these languages are never included in the debate of science as they are considered "unfit to express scientific thought" (Hamel, p.54), however he insists that since there has been increased interest in the make-up of habitats and agriculture of indigenous places, there has been an increased interest in these languages.

Hamel explains how the rise of the USA as an economic and political world power helped English become a world dominant language. By the end of the 20th century, 75% of the publications in science and humanities were in English (p.60). This means that writers whose first language is not English have chosen to publish their work in this language. Hamel claims that even works with results of utmost importance to the scientific community and the world in general will probably go unnoticed if they are written in a language other than English, thus researchers choose to write in English in order "to be acknowledged by the top scientific community of their discipline" (p.61).

According to Crystal (1997), this empowerment that English has experienced in the scientific community and the world in general, has diminished the status of the USA as a dominant power. This is because English is being classified as a language which does not belong to a certain country, but to everyone. Durand (2001) is critical of this ideology and claims that this means that other languages are losing their international status and are being diminished in their own country. This does not only apply to small indigenous languages but also to international languages like French which is spoken in over fifty countries.

Hamel relates this thought to the Sapir-Whorf hypothesis when he claims that the notion of English being the only medium for scientific publications will affect the progress of science. He also explains how translating works to various languages cannot be the solution, since this will risk results being bent and twisted in the process.

A positive outcome of having one language representing the scientific community is that it will promote multilingualism in other countries, as communities will strive to learn English in order to be able to read and publish scientific documents (Ammon, 2006). On the other hand, this can be detrimental to English-speaking communities which will remain monolingual since they can already reach the rest of the world in their language and thus will not feel the need to become bilingual.

2.4.2. Language use in the science classroom.

Since language is central to any classroom, irrelevant of whether the lesson is content-based or language-based, a central issue of whether there should be a guideline followed for the use of one language or more arises. Garcia (1993) claims that although there is an attempt by teachers

to keep languages separate in the classroom, code-switching does in fact appear to help the students' learning.

One naturally has to make a difference between language-based classrooms and content-based classrooms. In the former, the language is the object and the medium of the lesson, while in a content-based classroom, the teaching of the content matter is the focus. Halliday (2004) conducted studies which indicate that one of the major obstacles that students face in the science classroom is a lack of proficiency in the language used as a medium of instruction. As a solution, the mother tongue of the students can be used to facilitate learning. While code-switching in a language classroom may be seen as detrimental to the progress of learning, research also shows that it can be an essential support for learning (Greggio & Gil, 2007).

Then and Ting's research (2011) about language use in the classroom is based in Malaysia, however provides a useful insight into multilingual societies and the language problems faced in the educational setting. In 2003, English was enforced as the medium of instruction for the science and mathematics classroom in Malaysia, with the reason being that there was a lack of proficiency in this language which was of importance to the country due to an increase in international trade. Since teachers were not proficient in English, code-switching between English and Bahasa Malaysia (the country's official language) was needed in order to cope. The results show that the teacher switched to the native language when she received no response from the students after asking a question in English. Other instances included code-switching to the native language to emphasize a point made or to correct misbehaviour (p.310).

Then and Ting (2011) highlight the main functions that code-switching was observed to fulfil in the Malaysian classroom. They explain that code-switching was present in the form of quotation, where the teachers quoted from documents and text-books which were only available in the native language. Code-switching also served the function of objectivisation; it was used for teacher empowerment as the teacher reinforced her authorative position when code-switching to the native language in order to give out orders (p.313). The most apparent function of code-switching was reiteration, the repetition of what the students said in their native language, in English. Most of the repetition involved academic concepts and instructions which the teacher felt were important to be repeated in the native language to make sure that the students understood the content completely.

Garcia (1993) claims that the extensive use of code-switching in the classroom serves a socio-political function and "reinforces the dominance of certain languages, particularly the standard national and official language" (as seen in Then and Ting, 2011 p.316). Thus, switching to the native language in this context reinforced it as the language of power in that context. Then and Ting (2011) express that they are in favour of code-switching in the science classroom since it is seen as a "communicative resource to facilitate learning" (p.317). They believe that effective communication between the teacher and the student outweighs any policies that exist in the school, as the student's educational progress should always be given the ultimate importance.

With communities becoming increasingly multicultural, the need to analyse language use in the classroom is inevitable. The Swedish National Agency for Education Examination (2010) reveals that teachers are frequently not proficient in the multiple languages present in the classroom and are also often not aware of the number of languages present, especially of newly arrived

students. Moreover, “multilingual and intercultural perspectives” are not often included in the curriculum (Karlsson, 2015, p.1).

Collier and Thomas (1999) stress the importance of allowing newly arrived students and those who do not speak the language of instruction to express themselves in their first language in content subjects, so that their performance will not be affected. This naturally could be possible in contexts where the students’ first language is known to the teacher and/or fellow students.

The scientific language used in the classroom and in school textbooks is “characterized by high lexical density, abstraction and technicality” (Martin and Veel, 1998 as seen in Karlsson, 2015, p.2), thus it is to be expected that students who are not proficient in the language of instruction, will find it hard to grasp the scientific concepts discussed, even though they may understand them in their native language. Hajer and Meestringa (2014, as seen in Hajer and Noren, 2017) further explain that teachers may lower their expectations for these students who do not speak the language of instruction, and over-simplify their teaching to accommodate them, meaning that they will not be challenged cognitively and will not progress academically.

This is harmful to a student’s education, especially in the science classroom where the goal is not language but the scientific content. Garcia and Wei (2014) discuss the importance of translanguaging, especially in such contexts, as it will be beneficial to the students’ learning and understanding. They claim that accepting translanguaging means validating all of the students’ linguistic repertoires, allowing them to develop their sociocultural identity. Moreover, they believe that creativity and criticality will be inhibited if the students are not allowed to express themselves freely.

According to Lewis, Jones and Baker (2012), when translanguaging is present in the classroom, "multilingual students use all of their languages in a dynamic and functionally integrated manner to organize and mediate processes in understanding, speaking, literacy, and learning" (as seen in Karlsson, 2015, p.3).

Students may try to overcome this barrier to scientific language by developing a 'hybrid language' (Bakhtin, 1981), a middle point between everyday language use and a scientific use of language. Higgins (2009) explains how bilinguals use their multiple voices and their various linguistic features selected strategically in order to communicate effectively. Thus students are not restricted to the use of one voice and one language, but in a flexible multilingual classroom, both students and teachers use all of their knowledge combined in order to understand the content better (Creese and Blackledge, 2010).

According to the study carried out by Karlsson (2015), which involved observing lessons in a Swedish multicultural primary classroom, when code-switching took place this was done to increase the students' understanding, and to relate the difficult subject matter to the students in a way more familiar to them (p.6). In one particular example, an Arabic-speaking student got angered when he tried to explain himself in English but no one could understand him. As a result, he switched to Arabic and explained himself to the teacher, who spoke Arabic herself. Karlsson still noted that most of the scientific terms in his speech were kept in English, and not translated into Arabic as well.

It is clear that in order for students to feel challenged and thus progress in their academic development, there must not be a language barrier hindering them from doing so. Lemke

(2003) questions whether it is more important to obey a monolingual policy knowing that it is detrimental to the students' success, or else to adopt a translanguaging method in order to accommodate the students (as seen in Karlsson, 2015, p.9).

Garcia and Wei (2014) believe that the solution is 'dynamic multilingualism' where students are able to access their whole linguistic repertoire, and classroom interaction can take part in multilingual communication. All students would benefit from such an approach, would feel challenged in the subject and could progress accordingly. They explain that it is only through adopting this pedagogy that all students can make meaning and sense of what is being taught in the classroom.

2.5. The Case of Malta

2.5.1. The local context

Camilleri Grima (2000) described Malta as a "mono-cultural community" (p.3) back in 2000, explaining that Malta is an interesting case since it functions in two languages (Maltese and English) despite being made up of a mono-cultural population. While since 2000 the Maltese population has grown and evolved to include the presence of different cultures and languages, the educational system still mainly revolves around these two languages.

Maltese has been spoken by the people inhabiting the island for many centuries while the presence of English is a more recent phenomenon, dating back to the 19th and 20th centuries when Malta was under British rule. Although English was first rejected by the Maltese population, it became increasingly important as the British ruled the island and even replaced Italian as the language of education (Camilleri Grima 2000, p.4).

Civil servants were to be knowledgeable in English as from the second half of the 19th century (Camilleri Grima, 1995, p.79) while Maltese Heads of primary schools were trained in the UK and teachers were trained by British personnel in Malta before the Faculty of Education was set up in the University of Malta in 1978 (Camilleri Grima, 2012). It is thus natural to expect a widespread presence of English in schools. In Independent schools, the use of English was enforced greatly to an extent that Navarro and Grech (1984) found that in some schools, students who were heard speaking a word in Maltese were punished and shamed. Even though some students admitted to speaking Maltese at home and with friends, they use English to address their teachers in the classroom. This reality was mostly predominant in the past, and nowadays research shows that there is a link between the language spoken at home and at school (Azzopardi, 2009). Camilleri Grima (1995) explains this elevated status given to the English language due to it being the language of the colonizers, and also because of "its vast and respected literature" (p.80). On the other hand, for a long time Maltese was deemed as being inferior, considered also as "the language of the kitchen" (p.80), since it was believed to be spoken by those who did not have an education or employment.

Nowadays, mainly because of the Internet and the world increasingly becoming globalized, the importance of English is indisputable. Maltese is the first language of the majority of the population, the official language of the Parliament and the Law Courts and the country's national language, while English holds the status of being an official language of the country and is the home language of a minority of the population as well (Camilleri Grima 2000, p.3). The mass media plays an important part in the influence of language use in Malta as local television and radio stations broadcast programs in both languages, and newspapers are

available in the two languages as well. Online social networks like *Facebook*, which are used by the majority of the Maltese population, are predominantly available in English, although a Maltese version is available.

Although attitudes to English are primarily positive, Maltese speakers of English are sometimes labelled as *snobs*, and those who do code-switch between English and Maltese in their conversations are perceived as uneducated or 'tal-pepé' (a negative term used to describe someone who code-switches between English and Maltese to assert their superiority) (Camilleri Grima, 1995, p.90). Vella (2013) documents that this term is still in use and explains that it is associated with people coming from a particular area of Malta and a particular background, "generally a white-collar and non-State school educated one" (Vella, 2013, p.546). This shows that English still has connotations of superiority and prestige associated with it; however, the attitudes that a part of the population has to this language and its speakers are sometimes negative.

Schooling in Malta is offered largely by the State and the Catholic Church, with the presence of a number of privately owned schools (Camilleri Grima, 2013, p.554). Scerri (2009) claims that while all schools adopt the use of both Maltese and English in their schools, some Church schools and Independent schools have a stricter English-only policy. Since Church schools have started to take in students according to a ballot system, the environment of the school altered to one that includes students of different backgrounds, thus resulting in an increase in the amount of Maltese-speaking students (Busuttil, 2001).

2.5.2. Bilingualism in education

The classroom is a mirror of society thus the languages that the students and teachers use in their everyday life will naturally be present in the classroom where consistent interaction takes place. The National Minimum Curriculum (Ministry of Education, 1999) states that Maltese should be the language used in teaching but "the school must ensure that the children are familiarising themselves with the second language" (p.23). The National Curriculum Framework for All (2012) discusses the issue of the language of instruction and states that it is necessary for students to become proficient in both Maltese and English for "their full social, cultural and economic integration" (p.41). The different needs of students in different schools in Malta are recognized and no language implementation policies are made; the document clearly recommends that schools should develop their own language policies according to what they deem fit to their student body. It is important to note that the document emphasizes that the secondary years' focus should be on the multi-lingual competency of the students, so it is taken for granted that students are proficient in Maltese and English, in order to be able to grasp a third and maybe a fourth language (2012, p.58).

The National Minimum Curriculum (1999) also stated that at a secondary level, Maltese, Social Studies, History, Religion and PSD are to be taught in Maltese while the rest of the subjects can be taught in English. The option of translanguaging was only mentioned in the case that these language policies pose "great pedagogical problems" (Ministry of Education, 1999, p.82). Policies thus remained attached to a monolingual reality and seek to separate the use of the two languages, restricting the use of code-switching only to extreme situations.

Farrugia (2009) documents research carried out in a primary Church school where an English-only policy was implemented. Farrugia observed a Grade 3 and Grade 6 classroom in a particular school where students were encouraged to speak English. The researcher observed that the students in the lower grade had little problems to express themselves in English, as the questions asked required a short answer. However, in the Grade 6 classroom where longer answers were required of the students, some students struggled to express themselves and often reverted to Maltese or more commonly used gestures, until the teacher finished off their sentences for them. The results of this research highlighted the reality that inhibiting students from expressing themselves in their native language was damaging to their education. Students were found to hold back from interacting in the classroom and asking questions "because they were afraid that they would make mistakes or because they were not sure how to ask the question in English" (Farrugia, 2009, p.21).

An important point to consider when discussing the bilingual reality in the classroom is that students rely heavily on written texts in a classroom, ranging from the teachers' notes to textbooks the students study from. These textbooks are usually available in English, except for those used in the Maltese lesson and in a few other subjects. Although national examinations in Maltese History, Religion and Social Studies can be answered in both English and Maltese, textbooks in some Church schools and Independent schools are offered in English, which naturally limits the students' choice in examinations (Busuttil, 2001). Even though the textbooks used are in English, Camilleri Grima (2013) notes that classroom interaction still involves Maltese, so code-switching is an inevitable reality in the classroom as teachers juggle the interaction with their students and the textbook in one lesson.

The extent of the presence of code-switching in the classroom depends on a number of factors including the school and the teacher's policies. The Head of School's attitude towards language use is an important factor to consider since the language choice in school assemblies, circulars given out and other school events, largely depend on the Head of School. In the classroom then, the teacher's own personal experience, background and training affects which languages are used and to what extent. A teacher may feel comfortable and proficient enough to conduct a lesson in English without code-switching to Maltese, but another teacher may feel more comfortable expressing herself and interacting with students in her native language. The learners themselves must also be considered as Camilleri Grima states that with higher ability students, teachers feel that the message can get across well, but with lower ability students "they find that Maltese is more appropriate because the learners can understand better" (1995, p.105).

Camilleri Grima comments on the extent of the use of English and Maltese in schools, explaining that there is the tendency to use English and not Maltese in content subjects. The use of English is also more likely to be used by older teachers, and in the environment of Independent schools (1995, p.215). When code-switching is present in the classroom this usually serves the purpose of accommodating to the learner's language through translation, elicitation and a way to build rapport with the students. These functions were ones already mentioned and discussed by other researchers such as Kamwangamalu (2010) and Avery (2013).

2.5.3. Language mixing in the science areas of learning.

Although a substantial part of the language mixing research done in the Maltese educational sector has been centered around language classes (Farrugia (2009), Camilleri Grima and Caruana (2016), Bezzina (2016), Bezzina (2017), Aquilina (2012), Gauci and Camilleri Grima (2013), Gauci (2011), Bezzina and Gauci (forthcoming) and other content subjects like Mathematics (Farrugia (2009), Farrugia (2015), Baldacchino (2008), Azzopardi (2016)), the limited research done in Science subjects has been helpful in starting to explain the reality of language use in these classrooms. In their research in integrated science classrooms, Mifsud and Farrugia (2016) found that code-switching was present in these classrooms and teachers mostly used it, while 60% of students resorted to the monolingual use of Maltese (pg.8). They believe that the reason for this could be that usually students used technical jargon related to science less than teachers did. Since the majority of the scientific terms are in English, if students did not use these terms they found that they had less reason to code-switch to English.

Mifsud and Farrugia also found that the presence of English varied according to the level of the students in the classroom. As the academic achievement of the students increased, the use of English became higher, and as the level of students' achievement decreased, the amount of code-switching present became higher (pg.9). This reality mirrors the fact mentioned previously by Kamwangamalu (2010) and other researchers, that code-switching is used as an aid for lack of understanding. One has to keep in mind that, most of the time, English is not the students' first language, thus using code-switching can help these students overcome any language barriers that they might face when tackling a difficult curriculum like that of science. When

there was a presence of non-Maltese students in a particular classroom, the use of English naturally increased in order to accommodate these students (Mifsud and Farrugia, 2016, p.10).

In a study conducted by Lucia Azzopardi (2009), which used questionnaires given out to 400 students and in depth interviews with a number of teachers, language mixing in the three areas of Science (Chemistry, Physics and Biology) was observed. Azzopardi tried to get information on the students' and the teachers' backgrounds in order to try to find a relationship between the language used by the students and teachers outside of the classroom or school and inside. The results showed that as a general result, from all the different sectors in Malta (State schools, Church schools and Independent schools), 60.5% of the students use Maltese outside of the classroom, while 25.2% admit to using both Maltese and English. 13.6% of the students in question use solely English in their speech (Azzopardi, 2009, p.35). It was interesting to note that students attending Church schools and State schools made use of language in similar ways - in both cases Maltese was the most common language spoken. In Independent schools, the situation changed drastically as only 9.9% of the students admitted to speaking solely Maltese and a staggering 40% of the students used only English in their speech (p.35).

When it came to lesson talk, the research showed that most of the students preferred to use code-switching, although in Independent schools the majority preferred to use solely English. Azzopardi's claim that "Maltese is never used alone as a medium of instruction" can be easily understood in this light as 0% of Independent school teachers believe that Maltese should be solely used in the classroom, and the majority of teachers in the three sectors believe that code-switching is the best option for teaching science (p.38).

As Mifsud and Farrugia mention in their research, Azzopardi (2009) found that explanations are an essential part of the science lesson due to the difficult curriculum demands. Teachers need to make sure that their students grasp the content knowledge well enough, and since the subject is an abstract one, this process is made more difficult. 53.8% of the students who participated in the study believe that they understand the subject better when explanations are in Maltese (p.60). This result was expected since Maltese is the native language of the majority of the students participating in the study. On the other hand, when taking only Independent schools into consideration, the results show a different side of the reality in Malta. 96.7% of Independent school students admit to preferring English as a medium for explanation (pg.60). When considering that the majority of these students had chosen English as a language of preference, this result is expected. Moreover, another reason for such a high percentage could be the strict language policies that these schools abide by, promoting the use of English and imposing English as a language of instruction in practically all subjects except Maltese itself.

Code-switching is present in the majority of the classrooms, whether a strict policy regarding language use is present in the school or not, so researchers try to find possible reasons why this remains such a common phenomenon, almost regardless of the students' backgrounds and the subjects' requirements. Azzopardi (2009) interviewed teachers regarding this phenomenon and most of the answers were common to all the teachers in question. Code-switching was used in the classroom to explain the difficult content to students and to accommodate foreign students in the classroom. Since the subject involves a number of scientific terms, code-switching was needed when teachers spoke in Maltese as they had to code-switch to English when using the right scientific terminology, which is only available in this language (p.67). Moreover, since

textbooks are solely available in English, and the research proves that the lessons in State and Church schools are never solely in English, code-switching was used when the teachers referred to such material in the classroom (p.67).

In his study, Jordan Mifsud (2012) finds similar code-switching tendencies to the studies mentioned above. When analyzing the use of code-switching in integrated science classrooms, he finds that 75% of the code-switching instances were when Maltese was being used as a language of instruction and English was used to express technical words. For example, '*waqt li jien ħraqt il-karta għamilt* **chemical reaction'** (as I burned the paper I made a chemical reaction) or *'meta għandek* **smooth surfaces**, **friction** *hija* **low**' (when you have smooth surfaces, friction is low) (Mifsud, 2012, p.37). Another common type of code-switching observed was that when the teacher used Maltese and the terms in English used were explained in Maltese immediately. For example, *'biex inpinġu il-***lamp**, *bozza ġifieri'* (to draw the lamp, meaning a lamp) or *'ħa jiġri dik li ngħidulha, kelma diffiċli,* **repulsion***, li tfisser jitbiegħdu minn xulxin'* (what is going to happen, a difficult word, repulsion, meaning getting further away from each other) (Mifsud, 2012, p.37). These examples clearly show that the teacher's preferred language of explanation is Maltese, but the teacher is aware that the scientific jargon is important to be included and that it is explained to the students in order to make sure that the content is grasped.

While teachers understand that the language of instruction is an important factor in achievement and students who lack proficiency in English "certainly encounter difficulties in comprehension" (Azzopardi, 2009, p.68), most of them still admit that the reality of having science examinations in Maltese is far-fetched. Since there is no scientific terminology available

in Maltese, it is unrealistic to teach science without the use of English. However, one teacher agreed with the possibility of introducing examinations where students have a choice of answering in English or Maltese (Azzopardi, 2009, p.69). In this way, she believes, students who lack proficiency in English will not underachieve in the subject due to the language barrier.

2.5.4. Code-switching in the area of Biology

The studies mentioned above shed light on language use in the science areas in general. There has not yet been detailed research that sheds light on language use specifically in Biology.

Azzopardi (2009) has shown that 37.9% of the students choosing a science subject opt to take Biology over the other two science subjects (p.47). Although this figure is relatively low, it is being compared to a subject like Physics, which was a compulsory subject in State schools at the time this study was conducted (Serpina, 2014). Only 14.2% of the students participating in the study expressed that they found it hard to understand the content of Biology (p.56). This figure is a positive one when compared to a staggering 25.6% claiming not to understand the Chemistry content at all (p.56). A reason for this could be that Chemistry is the most abstract subject of the three science subjects, while since Biology involves the study of life and living things, the subject becomes more relatable to the students' experiences.

The SEC syllabus of 2018 in Biology states that "the questions will be set in English and must be answered in English" (p.3). The students are reminded to answer in 'good English' and in an orderly way. The exam consists of two papers, the first one which is a general paper that all students around Malta taking this exam will complete. A choice for students is available in the second paper where two papers of a different difficulty level are available. It is important to

note that in both papers (1 and 2), students have to answer lengthy questions which can naturally be challenging to those who have not sufficiently mastered the English language.

2.6. Conclusion

The language-related reality presented in the final SEC examination, which students from all Maltese schools have to sit for, is far from the reality present in the classrooms themselves. The research showed that the percentage of lessons where Biology was taught exclusively in English was minimal, and in their final examination, students have to put aside their code-switching tendencies and answer exclusively in this language. However, is teaching exclusively in English the answer? The research showed that teachers believed this would be harmful to their students' progress in education (Azzopardi (2009), Mifsud and Farrugia (2016)), even though in reality they will be assessed only in this language.

Mifsud and Farrugia (2016) agree with Camilleri Grima's (2013) suggestion of using a hybrid language to teach science subjects. Teaching science through English exclusively "may not be beneficial for all students" (Mifsud and Farrugia, 2016, p.16) and the option to teach only through Maltese "should be excluded" (Mifsud and Farrugia, 2016, p.16). Since Maltese people usually use code-switching in their everyday life, they believe that this reality should be mirrored in the classroom. They state that with high achievers, there should be stricter implementation of English and code-switching should only be used to make the subject relatable. When dealing with low achievers, Mifsud and Farrugia (2016) believe that code-switching will ensure understanding, and if there is a strict implementation of English, the

students will have no way to grasp the content subject, even though they may have grasped it if it were taught in Maltese.

The language use in these subjects is clearly an issue that has not yet been resolved. Strict language policies may be detrimental to a number of the students' needs whose first language is being put aside. The importance of English is indisputable; however, language policies should reflect the reality present in Malta, not the ideal reality that all students in Malta are highly proficient bilinguals, able to communicate effectively in both Maltese and English, including in writing.

2.7. Final Conclusion

A number of researchers and theorists have dealt with the use of languages in a bilingual or multilingual reality. It is evident that the definition of being bilingual is not a straightforward one and researchers have argued about this concept greatly. Many nowadays believe that bilinguals enjoy advantages over monolinguals (Pollard, 2002) while others have expressed their concern over the possibility of linguistic confusion and developmental delay (Genesee, 2015).

The role that code-switching and translanguaging serve in the educational system is highlighted in different studies. The functions they serve in the classroom are widespread and range from making the students feel more comfortable (Avery, 2013), introducing a new topic, creating a relaxed atmosphere, removing any language barriers (Ustunel and Seedhouse, 2015) and building a rapport with the students (Kamwangamalu, 2010). Those against the use of code-switching in the classroom have pointed out that it hints at a lack of proficiency in the target

language (Kim and Elder, 2005). Garcia (2009) explained that a good balance needs to be found when using code-switching in the classroom. Both over using it and not using it at all can be harmful to the students' education.

When discussing the reality in the science classroom, it was pointed out that the presence of English is inevitable, partly because all major scientific works and textbooks are written in English, and also because the technical jargon that makes up the subject is available in this language. English has become a world dominant language that seemingly does not belong to one country (Crystal, 1997). Code-switching in the classroom is, thus, expected, and it is present in the form of quotations from textbooks, as a tool for teacher empowerment and as a mediator between the abstract scientific language and the ordinary language which the students are familiar with (Then and Ting, 2001).

Locally, the National Minimum Curriculum (1999) stated that Biology, amongst other subjects, is to be examined exclusively in English. Although English is an official language in Malta, it is not the first language of the majority of the population. The idea of code-switching is put aside by the curriculum and only reserved for extreme cases of difficulty (Ministry of Education, 1999). The National Curriculum Framework (2012) does not give specific guidance on code-switching in the classroom, only expressing that bilingualism is a complex issue and giving utmost importance to "linguistic fluency and competence (which) is expected in both the mother tongue (L1) and the second language (L2), which in the Maltese context generally refer to Maltese and English respectively" (p.34). Nevertheless, the presence of code-switching in the Biology classroom is evident and documented by researchers. Textbooks regarding Biology are available exclusively in English in Malta, however, Mifsud and Farrugia (2016) still found that

code-switching is used widely by teachers, and more than half of the students observed used Maltese exclusively in the classroom. Azzopardi (2009) claims that most students attending State and Church schools prefer using code-switching in the classroom, while those attending an Independent school have shown preference towards the exclusive use of English.

The figures discussed indicate that the SEC syllabus, which requires students to answer exclusively in English, is not reflecting the reality found in schools. Through my research, I aim to observe language use practices in different schools in Malta, across different sectors, and document the use of language in the Biology classroom. Where code-switching is present, I aim to reveal the functions it serves, and where there is a lack of it, I aim to understand why and the effects it has on students. By doing so, I will be able to understand if the requirements presented by the Biology SEC syllabus are truly representing the reality found in schools, or whether the strict language policies may in fact be detrimental to the students' success.

3. Methodology

3.1. Introduction

The aim of this study is to analyse the use of language in the Biology classroom in different school sectors in Malta. As previously mentioned, the subject of language use in classrooms has been researched and studied both locally and internationally. However, the research available is restricted to the teaching of languages, mathematics and science in general. Studies regarding the use of translanguaging in the Biology classroom in particular are limited. This research aims to analyse the use of the two main languages locally, Maltese and English, particularly how these languages are used in connection to each other. Although restrictions about language use are imposed on the curriculum and evaluation practices, the reality that Malta is a bilingual country cannot be disregarded in the classroom.

This dissertation aims to answer the following research questions:

- When and how does translanguaging occur in the Biology classroom?
- What is the reason for the presence of translanguaging, or lack of it, during Biology lessons?

This will be evaluated in the hope of understanding how this complex phenomenon is produced almost unconsciously by some bilingual speakers. This chapter outlines the research process carried out and the steps taken in order for the data to be collected.

3.2. Epistemology: An Interpretivist Approach

The methodology chosen solely depends on the type of research being carried out and the results that the researcher aims towards. Since the aim of this study is an in-depth analysis, then the path chosen cannot be a statistical one, as the aim is not to reduce the data to scientific facts. An interpretivist approach involves the observation of behaviour, always taking into account that people come from different backgrounds, and behave differently in everyday life. Therefore the knowledge that is pursued is subjective. It is an inductive approach, which differs from a positivist approach to research, as it does not start off from a theory and aim to test it, but builds a theory depending on the observation (Creswell, 2014). This means that the researcher remains open to different results and experiences throughout the research process. Naturalists describe and measure the behaviour of their participants as it occurs in their everyday lives.

This approach includes diverse methods of data collection, such as observation of behaviour and its recording, however taking into account that humans behave differently in everyday life. This method is more concerned with the meaning and understanding of why things happen. It rejects the view that meaning exists independently of consciousness (Collins, 2010). In order to collect data, the interpretivist researcher will adopt methods such as interviews, as through such methods, the culturally, socially and emotionally situated interpretations of the participants emerge. Smaller numbers of cases are chosen for this type of research since the researcher has to analyse more in depth rather than collect data. The main disadvantages associated with this approach relate to the study being subjective as there may be an amount

of bias involved, since the data is heavily impacted by a personal viewpoint. In spite of this, an interpretivist approach is still associated with a high level of validity since the data is considered honest and detailed (Dudovskiy, 2016).

This methodology is most suitable for this research as the use of language is not to be studied independent of the person speaking it. Language choice is highly subjective and is shaped through the experiences of people who come from different social and cultural backgrounds: this is exactly the aim of the study.

3.3. Research Methodology: A Qualitative Approach

One unique attribute of qualitative methodology is the absence of 'truth'. The research depends on human experiences who perceive the world in different ways. The researcher's role is crucial to the study and put in the centre, as it is through the researcher that the data is collected. Since the focus of this type of research is human experience, it is to be kept in mind that humans are different and perceive the world in multiple ways, thus it would be absurd to expect one single truth or put each person into one box. Therefore, the role of the researcher is to gain information about the participants in a context rather than a vacuum, and try to understand this information gathered. The qualitative researcher will not speak about the truth but rather the "plausibility" of the data collected (Roller and Lavrakas, 2015). This absence of truth stems from the fact mentioned that the data collected is context bound, thus it is expected that not one single idea is highlighted.

The closeness between the researcher and the participant means that trust will be developed which will be of benefit to the data collection. It is of utmost importance that the researcher

develops a connection with the participant in order to feel safe and comfortable, finally making the data more reliable and honest.

Contact between the researcher and the participants is evident through observations and interviews, and in the initial stages of the research in contact through e-mails and an explanatory meeting. In the case of the current research, all these types of contact took place. Following this, the contact was more secondary as when Biology lessons were recorded, no verbal contact took place between myself and the participants. On the other hand, there was more contact with the teachers involved since a feedback session was conducted after the lessons were observed. It was naturally important that a positive relationship between myself and the students was in place, so that the participants felt more comfortable expressing their thoughts and opinions.

3.4. Observations

A qualitative observation entails the researcher getting information of the behaviour or activities of the participants directly "at the research site" (Creswell, 2014, p.239). In this study, I had the role of a nonparticipant observer since there was no direct verbal contact between myself and the participants. In order to get a wide picture of the linguistic reality locally, it was decided that schools from the three schools sectors needed to be chosen for the study. It was decided that two schools from each sector were to be selected - two State schools, two Church schools and two Independent schools. The schools chosen can be found in different parts of Malta, which ensures that the results cover different parts of the island. Two lessons were observed in every school because it was expected that both teachers and students would feel

more tense with the researcher present in the classroom in a first session. Thus, the second observation was given more importance in the study as it was expected that both teachers and students would feel 'more relaxed' and their speech would tend to be more representative of the reality. This was done to ensure that the results were as accurate as possible. Each school observation was recorded using two technological devices, to ensure that the data was backed up. The technological devices chosen were a laptop and a mobile; both were placed close to the teacher's desk so that the recording would be as clear as possible. The second observation done in each school was transcribed using traditional transcription conventions (See Appendix I). Due to time and word limit restrictions for this dissertation, three of the five lessons were transcribed and analysed in full, while only samples from the remaining two lessons were transcribed. This was done so that one lesson from each school sector could be observed in depth.

Creswell (2014) highlights some advantages and disadvantages related to the use of observation in qualitative research. The use of observation ensures that the participants are recorded in their natural setting, ensuring that the results are not artificial or predetermined. Moreover, since language choice is usually an unconscious choice in an everyday setting, observation is an effective choice to prevent the participants from thinking about the unconscious linguistic decisions taken. On the other hand, the position of the researcher is sensitive as it may be viewed as intrusive into the privacy of individuals. Moreover, the role of the observer depends on having good observation skills. Creswell points out the reality that the participants hold back from behaving in a natural way when the researcher is present. This is a

setback in qualitative research and two observations in each school were done to minimize this possibility.

An observation protocol was followed when recording lessons. A sheet was created to be filled out before the start of every recording with demographic details such as the name of the school, the length of the lesson, the time of the lesson, the number of students in the classroom and so on. During the length of the recording, notes were constantly taken which consisted of comments about that which cannot be viewed through a recording (such as classroom setting, use of textbooks, PowerPoint presentations etc.) and also linguistic comments to aid the process of transcribing. Certain events taking place in class were also noted down as it was feared that these might be unclear during recording transcription. An example of this sheet can be found in Appendix G.

When the transcriptions were done, the linguistic repertoire was analysed in depth and every instance of code-switching was studied closely. This was followed by an exploration of the possible reasons why code-switching took place, and in the lack of it, an attempt to understand the reasoning and the effect that language choice has on students was made.

3.5. Feedback Sessions

Creating an effective interview or feedback session, where all the information needed is gathered in a short amount of time, can only be done by first asking a question to one-self, "What do I want to know in this study?" (Janesick, 2000, p.382). Asking broad questions to one-self can help to move the research in the right direction, even though the first questions drafted will probably not be included in the final draft as more focused ones will have replaced them. A

single general question allows the researcher to capture the goals of the study, and from this question diverse sub-questions can emerge which are more specific.

The development of questions occurs more frequently during the "inquiry process, sometimes during data collection and analysis" (Agee, 2009, p.436). This is because in the initial stages of the research, the researcher can only predict what the outcome will be, however when the actual data collection happens, the main focal points become clearer. Moreover, what is observed may lead to the addition of new questions that were never thought of before the actual data collection started.

Agee (2009) insists on creating 'answerable' questions for the participants. This means avoiding yes or no questions, but also avoiding asking questions which are too broad for the interviewee to answer. It is also important that questions are not leading, meaning that they do not contain "a presupposition about participants or events" (Agee, 2009, p.443). Even though the process of creating non-leading questions is difficult, it can be avoided if questions carefully planned before meeting the participant. Having clear, direct questions is an asset to the session, as the interviewer would not need to explain questions further or have questions which are too long for the interviewee to understand. In the questions used for this research, I made sure to use questions which are not leading, for example asking 'what is your opinion on the use of code-switching in the classroom?' instead of 'do you think code-switching is bad?' I asked questions related to the opinion of the teacher involved or else facts about the school or students (for example, which language students express themselves in). In this way, I got the information I needed for the purpose of the study without putting the teachers involved in any uncomfortable positions or arguing with them about using one language instead of the other.

A large part of the work related to a feedback session happens before the session ever actually starts. It is essential that each question has a purpose for being included, and does not deviate away from the subject or goal of the research.

In this research, after all the lessons were transcribed and analysed, a meeting was set up with the teachers involved. This was done for both the purposes of this research and to help the teachers. Teachers were able to observe the process leading to the use of the data collected in the dissertation, meaning that they could be made aware of what was actually observed in their lesson. On the other hand, the questions asked were aimed at both clarifying what was observed, as much as trying to find reasons for the choice of single language use or translanguaging during the lessons. The teacher's personal language preference and the school's language preference was also discussed in order to shed light on the results. The teachers were also allowed some time to share their opinion about the phenomenon of code-switching and how relevant or not it is to their experience as Biology teachers.

The feedback sessions were audio-recorded, only to allow repeated examination of the teachers' responses. This also meant that the conversation during the feedback session could be more natural, as it was not necessary to write down all that was said.

3.6. Ethical Considerations

The need to ensure that research studies are based on good ethical principles is not a bonus but a necessity. These principles are crucial in order to ensure valid results which can be published, and safeguard the integrity of the study. Ethics can be defined as

"The application of moral rules and professional codes of conduct to the collection, analysis, reporting, and publication of information about research subjects, in particular active acceptance of subjects' right to privacy, confidentiality and informed consent" (Marshall, 1998)

Christians (2000) points out four main guidelines one must take into consideration in order to be ethical while conducting research. He starts off by mentioning voluntary informed consent as subjects must be willing and agree to participate in the study after being given full information about it. This leads to his second guideline stating that the participants should not be deceived into participating in the study. He also highlights the importance of privacy and confidentiality, insisting that the information be kept confidential unless stated otherwise, as no one deserves harm as a result of insensitive research practices. Finally, Christians highlights the importance of accuracy in the research study.

Informed consent from the participant is crucial however is not enough when it comes to under-age participants. In such cases, the researcher must get consent from the parents and explain the research study in detail, including everything that is expected of the participant. Then, assent is required from the child, meaning that the child is informed of the basic aspects of the study without much detail which would confuse the child. The full detailed explanation is given to the parents. Obtaining consent is the first step but one should not forget that although consent is given, the participant still has the right to withdraw from the study at any time.

Govil (2013) explains that attempts should be made in order to minimize the effect that the study has on the normal working of the participant, so that the study is of burden in the least way possible. Moreover, as previously mentioned, it is of utmost importance that the

participant's identity is kept private so that the participant may feel comfortable disclosing to the researcher any sensitive information without the fear of being harmed or embarrassed.

Since the research involves contact with human subjects, particularly contact with students who are under the age of consent, signed consent was requested from different entities such as Heads of Schools, teachers and parents. Information letters were given together with consent forms, which explained the study better. Before entering the school, permission from the Directorate for Quality and Standards of Education and also from The Secretariat for Catholic Education was required, since the research included contact with different school sectors. Assent forms were given to the students together with information letters which explained the study in a manner relevant to the students. In the mentioned information letters and consent forms, the most basic ethical considerations were assured, such as the anonymity of participants, the confidentiality of the information gathered and the possibility of withdrawal from the study at any time (See Appendices B-E).

This process took place after the research was analysed and permission was given from both FREC and UREC committees, ensuring that the study is valid and grounded on an ethical basis.

3.7. Limitations

Since the study is dealing with human subjects and does not include statistics, there is bound to be some limitations. While the research aims to observe students and teachers in their natural setting, the presence of the researcher in the classroom is not a natural occurrence and so the students' and the teachers' speech is bound to be affected by the presence of an 'outsider'. This was moderated through the use of consent forms to ensure that the participants were

aware of what the research entails and what was expected of them. Moreover, two lessons were observed in the hopes that in the second observation, the participants would feel more comfortable with the presence of the researcher and act more naturally. Also, participants were given a general purpose for the study, namely that I would study classroom discourse dynamics, omitting at first the detail that I would be focusing on language choice. This was done so that the teacher would be as natural as possible in her speech. It is important to note that no foreign students were present in any of the classrooms across the three school sectors, thus the language chosen by the teacher was not a result of students not being capable of understanding Maltese.

The main means of collecting data was through a laptop and a mobile as recording devices. The natural setback to these means of collecting data is that the audio-recording may possibly not be clear or comprehendible. Moreover, background noises are inevitable when considering that the recording was done in a school setting. The use of both a laptop and a mobile as recording devices was done as a precautionary step to ensure that the data would still be collected if one device did not record clearly or malfunctioned. Both recordings were listened to repeatedly to ensure that the transcription was as accurate as possible. Moreover, during the observations, notes and comments were written to help in the transcription process. While background noises could not be eliminated completely, they were prevented by closing the door to the classroom to shut out any excess noises. The notes written down also helped to clarify some utterances there were made unintelligible due to background noises.

During the initial stages of the research, after all permissions were given by Heads of Schools, one particular teacher in a State school decided to opt out of the research. Since it was too late

in the research to try to find another eligible school to take part in the research, upon consultation with the research tutor, it was decided that the research would continue with five schools instead of six. This was naturally a great setback in the research as it meant that the results would be less representative of the particular school sector. However, the data collected in the other State school proved to be abundant and able to partially compensate for this setback.

Researchers stress the importance that the researcher be "prepared for unexpected events" (Postholm and Skrøvset, 2013, p.517) when conducting qualitative research. Contact with human subjects means that the researcher does not have complete control over the process or the outcome of the research but must "accept surprises" (Postholm and Skrøvset, 2013, p.517) and be responsive to them.

3.8. Conclusion

This chapter has outlined the methodology adopted for this study: a qualitative research including the observation and audio-recording of two Biology lessons in five different schools, and a feedback session with the teachers involved. This method was chosen as the study did not aim to obtain statistical data, but rather to analyse in depth the functions that would be fulfilled in the Biology classroom by the use of English and Maltese or through instances of translanguaging. Through this method, the reality present in schools could be observed in a natural setting, and the teachers' opinions could also be gathered through the feedback session.

4. Analysis

4.1. Introduction

This chapter presents the research findings of language use in the Biology classroom, with particular focus on the presence of translanguaging and the functions it serves. The aim of this analysis is to observe the presence of Maltese and English in the classroom, and examine the functions each language serves when used. A look towards the differences found between the three school sectors, if any, could also prove to be a point of reflection about the linguistic realities in local schools.

In order to have a balanced view of the results, three schools were chosen from the five schools involved in the study, one from each sector, and the results of these observations were analysed in depth. The remaining two observations were also considered and analysed in order to provide further insight.

4.2. Types of Code-switching Instances Observed

While the focus of this study is to analyse the functions served by the presence of translanguaging in the classroom, it is also important to note the types of translanguaging instances observed.

Multiple linguists categorize types of code-switching differently. Blom and Gumperz (1972) consider two types of code-switching – situational code-switching which refers to a change in language choice depending on the social situation the speaker is present in, and metaphorical

code-switching which stems from a change in the topic of the conversation. According to Chidambaram (2006) there are two types of code-switching; intra-sentential code-switching which happens within the sentence itself, for example a switch of a word or phrase, and inter-sentential code-switching where the switching occurs between the sentences. Poplack (1980) as seen in Al Abdely's (2016) work, proposes the third type of code-switching which he names as tag-switching. This involves inserting a short phrase in one language "into an utterance that is otherwise entirely in another language" (p.11). This occurs naturally in conversations as the phrase or tag inserted usually has little syntactic restrictions and does not affect the meaning of the utterance. Al Abdely mentions interjections and fillers as examples of this type of code-switching. A similar term that could be used for this category is 'discourse markers' which provide "no semantic content" and rather "signal a semantic relationship" between two utterances (Fraser, 2015, p.48).

For the sake of this study, the analysis will be focused on the three types of code-switching proposed by Poplack (1980) and mentioned in Al Abdely's (2016) study.

4.2.1. Intra-sentential switching

Among the three types of code-switching, this is probably the most complex since the switching occurs, on a syntactic level, within the sentence itself. Thus, for the switch to happen effectively, it must not be grammatically constrained. Intra-sentential switching was observed in the lesson observations, and was mostly present when the teacher or students spoke in Maltese and switched to English in order to express a scientific term. This can be observed in the following example:

Example 1: Church School 1	
T86: *jiddependi mill-* immune system *għalhekk għedtilkom eżempju din is-* small pox *minħabba li m'hawnx* small pox virus *ħadd m'għandu* immunity *għaliha*	T86: *it depends on the* immune system *that's why I told you, for example this* small pox *since there is no* small pox virus *no one has* immunity *against it*

This type of switching happens at word-level, as one word, or in this case, a scientific name is inserted into the sentence which is otherwise entirely in Maltese. This was a common finding in the observations. The functions served by this type of code-switching will be discussed in the next section. Below are another two examples of intra-sentential switching observed:

Example 2: Church School 1	
T92: *le l-* virus *l-unika ħaġa importanti hi l-* genetic strand*	T93: *no the only aspect important in the* virus *is the* genetic strand

Example 3: State School 1	
T33: *għedna l-moviment tal-ilma li tela' minn ġor-* roots *u tela' minn ġol-* xylem *għall ġol-* leaves *għal barra*	T33: *we said the movement of water which goes up from the* roots *and the* xylem *into the* leaves *and out*

Intra-sentential switching does not only occur at word level when scientific terms are involved. Below are a few examples where the teacher inserts a non-scientific word in English in an utterance which would have been otherwise entirely in Maltese:

Example 4: State School 1	
T1: *mela ilħqu oħorġu t-testijiet li kelli nippikkja s-* signature* tagħhom	T1: *so take out the tests which I had to collect the* signature *of*

Example 5: Church School 1	
Sd26: miss *jiena meta kont għamilt l-* operation *kienu* bacteria *sabuli*	Sd27: miss *when I had done an* operation *they had found* bacteria

In these examples, the English words inserted into the utterance are not scientific terms ('signature' and 'operation'). Although the equivalent in Maltese is quite straightforward, the words were inserted quite naturally into the utterance, as can be seen through the fact that the Maltese article was attached to them.

Intra-sentential switching was also present when whole phrases in one language were inserted into an utterance which would have been completely in the other language otherwise. Having a phrase inserted rather than simply a word is more complex as it has to be grammatically inserted in a manner which does not sound awkward or end up creating an incomprehensible message.

Example 6: Church School 1	
T14: *fil-fatt qalilna* they were too symmetrical to be alive *fil-fatt għalhekk ngħidilkom meta npinġu* living cells we also draw them freehand not with rulers	T14: *in fact we're told that* they were too symmetrical to be alive *and that's why I tell you that when we draw* living cells we also draw them freehand not with rulers

The teacher is speaking to her students about a particular comment made in the video about viruses which are too symmetrical in shape when compared to other cells. The teacher's comment 'they were too symmetrical to be alive' is taken directly out of the video, giving us a reason for the code-switching instance, however she also switches to English in the end of the utterance.

Example 7: Independent School 1	
T47: you can imagine a broad bean the *ful il-ful* they're in season right now we make *kosksu* from them	T47: you can imagine a broad bean *the broad bean* they're in season right now we make *kosksu* <traditional Maltese dish> from them

In this particular context, the teacher spoke entirely in English and only code-switched to Maltese with words of foods which are traditionally Maltese or part of the Maltese food culture.

Intra-sentential switching was a common type of code-switching observed in the Biology lessons recorded. The reasons why it was used and the functions that it served will be discussed in the next section of this analysis.

4.2.2. Inter-sentential switching

This type of switching occurs at a clause or sentence boundary and a greater fluency in both languages is expected from the speaker since the languages brought together must be juxtaposed correctly in order for the utterance to make sense (Zirker, 2007). Some examples of inter-sentential switching were observed in the Biology lessons recorded, however this type of switching was not as commonly found as other types:

Example 8: Church School 1	
T5: *paroli jieqaf:* // so they are not considered a kingdom ...	T5: *chattering stops:* // so they are not considered a kingdom ...

In the example above, the teacher uses Maltese for classroom management reasons, to tell the students to stop talking when they were disrupting the class. She switches back to English immediately to continue speaking about the lesson topic.

Example 9: State School 1	
T21: ... *apparti li tista' tkun fjura tista' jkun ukoll werqa li għad trid toħroġ minn fuq iz-zokk jew xi fergħa oħra mela*// it's a small swelling at the node which contains an undeveloped shoot ...	T22: ... *apart from being a flower it can also be a leaf which still has to form from the stem or another branch so* // it's a small swelling at the node which contains an undeveloped shoot ...

In this example the teacher begins her explanation in Maltese however then she switches to English in order to give the proper explanation in this language.

Example 10: Independent School 1	
T47: *ħa nibdew* use another pen let's continue	T47: *here we go again* use another pen let's continue

Putting this example into context, the teacher uttered the first phrase in Maltese as a side-comment unrelated to the lesson topic, when one student called another student's name in order for him to give him his pen back. The comment is commonly used amongst speakers of Maltese. The teacher switches back to English immediately to continue with lesson talk.

4.2.3. Discourse marker-switching

This type of switching occurs the most easily out of the three types of code-switching since the discourse markers inserted usually have little meaning and thus can be inserted into an

utterance in another language without constraints. When considering discourse marker instances, interjections, sentence fillers and tag-switching were all included in this category.

The Maltese language includes words like *mela* which has different meanings according to how it is used in the sentence. It can mean 'so', 'of course' or is just used as a sentence filler. This was used to a great extent in the lessons observed, as in the examples below:

Example 11: Independent School 1	
T3: *mela* good morning everyone	T3: *so* good morning everyone

Example 12: Independent School 1	
T54: *mela* give me a pendrive and I will save it there	T54: *so* give me a pendrive and I will save it there

Example 13: State School 1	
T51: *MELA* variation is not favoured	T51: *SO* variation is not favoured

Example 14: Church School 1	
T29: this would contain genetic instructions *mela* viruses are made of a genetic strand not a chromosome	T29: this would contain genetic instructions *so* viruses are made of a genetic strand not a chromosome

Discourse markers are also present in other instances, like the following examples:

Example 14: Church School 1	
T27: they must have come after other living organisms *issa* whether they have been *jien naf* formed from molecules or they were descended from other living organisms ...	T27: they must have come after other living organisms *now* whether they have been *I don't know* formed from molecules or they were descended from other living organisms ...

Since tags have no syntactic constraints they can be inserted almost everywhere without changing the meaning of the utterance. The presence of discourse markers in the recorded lessons shows that the speaker, sometimes unconsciously, reverts back to the native language, especially when it involves certain words which seem to be lacking in meaning but are greatly present in conversation.

The majority of the translanguaging instances observed were intra-sentential switching while the least observed type of switching was inter-sentential switching. Whether code-switching

was observed minimally or in greater amounts, it was present in all of the lessons observed in some way or another.

4.3. Functions served by Code-switching

Chapter 2.2 discusses multiple reasons why teachers may find the need to code-switch between two languages in the classroom. Linguists came up with different lists of functions that code-switching can serve. Üstünel and Seedhouse (2005) mention the function of curriculum access, classroom management discourse and disciplining students. Ferguson (2003) mentions the presence of code-switching when teachers are introducing new topics while Kamwangamalu (2010) states that code-switching helps build rapport with students.

For the sake of this study, these functions were grouped according to similarity in meaning and relevance to the research. Seven functions were listed. These are depicted in the table below:

Functions served by code-switching:	
1. *Curriculum Access* (+ Explanation)	Üstünel and Seedhouse (2005), Greggio and Gil (2007), Then and Ting (2011), Karlsson (2015)
2. *Scientific Terms*	Martin and Veel (1998)
3. *Classroom Management* (+ Disciplining + Objectivisation + giving out orders)	Then and Ting (2011), Üstünel and Seedhouse (2005)
4. *Introducing new topics*	Ferguson (2003)
5. *Creating an informal atmosphere* (+ joking + comment on local events)	Üstünel and Seedhouse (2005), Kamwangamalu (2010), Mirhasani and Mamaghani (2009)
6. *Quotation* (from books, or reading from PowerPoints)	Then and Ting (2011)
7. *Reiteration* (repeating what the student said in their native language in English)	Then and Ting (2011)

Table 1: Functions served by code-switching

When comparing the three main lessons (one from each sector) together, the amount of code-switching present in each lesson is considerably different. Thus, the main functions that code-switching served during the lesson are different as well. For the sake of the study, each lesson will be analysed separately. In this way, the results will be clarified and the differences found will be more explicit. The full transcriptions for the three full lessons analysed can be found in Appendices J-M, together with examples from the remaining two lessons.

4.3.1. Lesson 1: State school

The dominant language during this lesson was Maltese (76% of the word count). Most of the lesson talk, informal communication and explanations were in Maltese, both from the students

and the teacher. English was used mainly to express scientific terms, and to repeat explanations she had already said in Maltese, in English.

4.3.1.1. Functions related to classroom management and divergent talk.

Example 15: State School 1	
T1: *mela ilħqu oħorġu t-testijiet li kelli nippikkja / s-* signature *tagħhom / oħorġu n-* notes	T1: *so take out your tests that I had to collect / their* signature / *take out your* notes

In the beginning of the lesson, the teacher starts her speech in Maltese to express something which was not directly linked to the lesson or to Biology content. Mifsud (2012) labels this as *divergent talk*. During this utterance the teacher code-switched to English for words like *signature* and *notes* which have a straightforward equivalent in Maltese. This could have been because these words have become part of 'school talk' or they were an unconscious decision by the speaker. It could also be proof of the influence of English on discourse in Maltese.

In Example 16, the teacher uses her L1 in order to give out orders to a particular student (classroom management).

Example 16: State School 1

T5: *ejja Jacob ħa nibdew // ejja oħroġ it-test ħalli issa ndur u niċċekkjah*	T5: *come on Jacob let's start // come on take our your test so I'll come round and check it*

4.3.1.2. Functions related to scientific terms, curriculum access and reiteration.

The most common functions that code-switching served in this particular lesson was for scientific terms and curriculum access (explanation), as well as reiteration (repeating what she said in the L2, in L1). In one utterance, different functions were served so the examples cannot be separated from one another as they all have interconnected functions.

Example 17: State School 1	
T9: right *ejja ħa nibdew / l-ewwel kelma hija* node / what is the node↗ *min se jispjegali x'inhi l-kelma* node↗	T9: right *let's start / the first word is node* / what is the node ↗ *who is going to explain to me what the word* node *is*↗

In this example, the teacher's 'main' language is Maltese, and translanguaging serves the function of reiteration – the teacher repeats her question (what is the node?) in Maltese. If taken into context, one student answers back in Maltese (Sb2:*qisha dik li toħroġ mill-* istem↗ = like that which goes out of the stem ↗), which could serve as an explanation why the teacher repeats the question in Maltese. If the corpus is looked at closely, one can determine that

almost whenever the teacher asks a question, the students' answer is in Maltese, with minor code-switching to English for scientific terms:

Example 18: State School 1	
Sc3: *fejn kien hemm il-* bracket↗	Sc3: *where there was the* bracket↗
Sh1: *iġġorr l-ilma min-naħa għall-oħra↗*	Sh1: *it carries water from one side to another↗*
Si1: ee *li jġorr l-affarijiet minn fuq il-pjanta↗*	Si1: ee* the one that carries things from the plant↗*

In the following example, the teacher was explaining to the students the proper terminology for when the flower is a 'baby'. This word was expressed by a student and the teacher tried to get the students to think about the proper terminology:

Example 19: State School 1	
T19: *qed nuża l-kliem tiegħek stess / għadha se ssir fjura il-* bud * x'inhi*↗	T19: *i'm using your own words / is still has to become a flower the* bud *what is it*↗
Se3: *għadha ma kibritx*	Se3: *it hasn't grown*
T20: *għadha trid tiżviluppa*	T20: *it still has to develop*
Sd4: premature↗	Sd4: premature↗

The teacher did not simply tell the student that the correct terminology in science is 'premature' but waited until another student expressed it himself. Although the word is one which is also used in general English, it may not have been a word which all the students are familiar with. However, the teacher still gave them a chance to think about it and come up with it themselves rather than simply saying it and expecting the students to remember it.

Throughout the lesson, the teacher repeatedly had to explain a scientific term in Maltese. This can be easily understood through the following example:

Example 20: State School 1	
T21: ... it's a small swelling at the node which contains an undeveloped shoot *jew* a flower	T21: ... it's a small swelling at the node which contains an undeveloped shoot *or* a flower
Se4: undeveloped shoot *kelma oħra =ġifieri↗*	Se4: undeveloped shoot *is another word so↗*
T22: *eħe* yes ...	T22: *yes* yes ...

The teacher explained the term 'bud' to the students in English and even gave an equivalent to the scientific term 'undeveloped shoot' in simpler English, however the student still felt the need to use Maltese to clarify what the word meant.

Example 21: State School 1	
T33: okay *allura kellha x'taqsam mal-moviment tal-ilma li ġej mill-* xylem *għedna l-moviment li tela' minn ġor-* roots *u tela' minn ġol-* xylem *għall ġol-* leaves *għal barra* its' a cycle *għandna nirreferu għaliha bħala* transpiration / it's the movement of water through a plant from the roots to the leaves and out	T33: okay* so it had to do with the movement of water that's coming from the* xylem *we said the movement which came up from the* roots *and into the* xylem *into the* leaves *and out* it's a cycle *which we refer to as* transpiration / it's the movement of water through a plant from the roots to the leaves and out

In this example, the teacher explains what the term 'transpiration' is in Maltese to make sure that the students understand the term (curriculum access). As soon as she does so, she repeats the same explanation in English (reiteration), probably because that is the explanation that the students are obliged to give in an exam, and the definition they will need to understand when reading their notes to study. This was recurrently present throughout the lesson, and the teacher seemed to be concerned with the language used by the students during an exam. In one instance she expressed:

Example 22: State School 1	
T54: *u* diagram *tiskanta jnaqqaslek il-bżonn li tgħid ċertu paroli bil-miktub / ħa jiffrankalek il-ħin u inqas hemm ċans li tikkontradixxi lilek innifsek*	T55: *and* a diagram *reduces the need to say certain things in writing / it will save you time and you are less likely to contradict yourself*

The teacher advises her students to use more diagrams and less words where possible. This may be just an opinion, but could also stem from the fact that the students are used to expressing themselves in Maltese, thus she is concerned that when they are obliged to express themselves in English during an exam, they will end up contradicting themselves in their writing unconsciously and lose marks.

As already expressed, code-switching was used mostly to express scientific terms in English in an utterance which is otherwise entirely in Maltese. Below are some examples to depict this more clearly:

Example 23: State School 1	
T79: *għandna* coat seed coat *ngħidulu issa is-* seed coat *għandha dak it-* tough coat *li huwa* tough *biex jipproteġi l-* embryo *meta għaddiet mid-* digestive system *tal-għasfur*	T79: *we have a* coat seed coat *we call it now the* seed coat *has a* tough coat *which is* tough *to protect the* embryo *when it passed from the* digestive system *of the bird*

Example 24: State School 1	
T34: ... *aħna għedna li l-ilma li jidħol fir* roots *mhux bilfors kollu jintuża għal *photosynthesis* ikun tela' fil-* leaves *imbagħad minħabba li hemm is-* stomata *miftuħin biex jidħlu -* gases *bħall-* carbon dioxide *u* oxygen	T34: ...* we said that the water that goes into the* roots *isn't necessarily used for* photosynthesis *it would go into the* leaves *then because of the open* stomata *so that* gases *like* carbon dioxide *and* oxygen *can go in*

These examples are only a few but clearly depict 'a necessary' use of code-switching. Azzopardi (2009) explained how teachers who preferred to speak in Maltese throughout the lesson had to use English to express scientific terms since there was no practical equivalent in Maltese. Terms like 'carbon dioxide', 'seed coat' and 'embryo' might have an equivalent in Maltese however, this is not widely used, and the students are naturally more familiar with the English term since that is the term available in textbooks. Moreover, teaching the Maltese equivalent to students may seem useless to teachers since they know that this would never appear in an exam which is solely assessed in English.

4.3.1.3. Functions related to creating an informal atmosphere.

Throughout the lesson there were also instances where the L1 was used to create an informal atmosphere in the classroom through jokes or other comments.

Example 25: State School 1	
T26: ... the vessels that carry water through a plant *għadna naqra bis-sadid wara l-* Christmas holidays	T26: ... the vessels that carry water through a plant *you're still a bit slow after the* Christmas holidays

Example 26: State School 1	
T63: *illum qegħdin imċaqalqin waħda sew qiskom*	T64: *today you're really energetic it seems*

These examples show that the teacher creates an informal setting through joking and does so by using the student's native language. Üstünel and Seedhouse (2005) expressed the same function of code-switching and claimed that using the students' native language made the teacher-student relationship more personal.

4.3.1.4. The use of dialect and agricultural terminology.

It was interesting to note an example where a particular student said a word in dialect:

Example 27: State School 1	
Si2: miss *għax jekk ikellek dawn li qed ikabbru ftit u dawn li qed ikabbru ħafna*	Si2: miss *because you have these which are growing a bit and these which are growing a lot*

Language is a very subjective matter and language choice depends on multiple factors like the student's background, childhood and so on. The choice of words throughout this lesson suggested that the students' preferred choice of language is Maltese. The teacher showed that she is confident in speaking English, however spoke in Maltese as she knew the message passed on would be clearer. When speaking about terminology linked with nature and fields, the students asked more than once for the equivalent of a term in Maltese:

Example 28: State School 1	
Sm7: *x'tgħidilhom miss bil-Malti↗*	Sm7: *what do you call them in Maltese* miss↗
T100: *żerriegħa ta' dak it-tip↗*	T100: *that type of seed↗*
Sm8: *le:*	Sm8: *no*:
T101: *stenn inti tridni ngħidlek dik il-pjanta x'ngħidulha ↗ purament ma nafx ngħidlek bl-amment ma nafx ngħidlek / normalment hemm it-tendenza li nirreferu għalih bħala ħaxix ħażin aħna*	T101: *wait you want me to tell you what we call that plant↗ honestly I don't know what to tell you by heart / normally we have the tendency to refer to it as weeds*
Sm9: *in-nannu jgħidilhom xi ħaġa imma nsejt xiex*	Sm9: *my grandfather calls them something but I forgot what*

This example depicts the reality of some students who come from agricultural backgrounds and thus are familiar to particular terms in Maltese. These students will naturally feel the need to

have certain terms translated into Maltese in order for them to understand exactly what they are referring to. The teacher also used words like *miżwed* (a small pod) which is a scientific term in Maltese, and the students did not feel the need to ask what it meant. This further proves that the students are more familiar with certain terminology in Maltese.

4.3.2. Lesson 2: Church school

During this lesson the dominant language was English (82%). It is important to note that there was one particular student in class who participated substantially throughout the lesson and he only spoke in English (the teacher later expressed that he has a particular condition and only feels comfortable expressing himself in English). Apart from this student, the rest of the class spoke in Maltese when responding to or asking a question.

4.3.2.1. Classroom management and divergent talk.

As in the previous finding, the teacher starts off the lesson speaking in Maltese:

Example 29: Church School 1	
T1: *kulħadd ġie min kellu jiġi↗* okay *mela bdejna*	T1: *everyone who had to come came↗* okay *so let's start*

The teacher interacts with her students in speech, not relevant to the lesson topic, in Maltese however quickly switches to English when she starts the lesson:

Example 30: Church School 1	
T4: *imbagħad tihuli wara ejja ħa nibdew / mela* viruses, viruses are not considered a kingdom	T4: *give to me afterwards come on let's start / so* viruses, viruses are not considered a kingdom

This clearly depicts a sort of partition between lesson talk and divergent talk (as depicted in Mifsud, 2012). As soon as the teacher starts her lesson she consciously switches to English and 'separates' these two partitions with the discourse marker *mela*. This shows that the teacher is aware that she is expected to give out the lesson in English, this might even so have been more affected by my presence as a researcher in the classroom.

The teacher seemed to switch constantly to Maltese when correcting her students or managing the classroom:

Example 31: Church School 1	
T5: *paroli jieqaf:* /// so, they are not considered a kingdom ...	T5: *chattering stops:* /// so, they are not considered a kingdom ...

Example 32: Church School 1	
Sg28: and who's the king of the kingdom ↗	Sg28: and who's the king of the kingdom↗
T106: *ejja ejja* and these are the characteristics ...	T106: *come on come on* and these are the characteristics

In these examples, the teacher code-switches to Maltese in order to stop the students from disrupting the class. Üstünel and Seedhouse (2005) claim that the speaker switches to the L1 when deviating from the content so as to grab the students' attention. There are multiple instances when the teacher code-switches to Maltese when indulging in divergent talk and informing the students of what they will be doing. For example:

Example 33: Church School 1	
T10: ... they can only carry out the seven vital functions when inside other living things *tajjeb↗ issa / dal-vidjow ħa jurina ftit fuq* discovery of viruses okay↗	T10: ... they can only carry out the seven vital functions when inside other living things *good↗ now / this video will show us a bit about* discovery of viruses okay ↗

The teacher was explaining about viruses in English and switched to using Maltese to inform the students that they will be watching a video, that is, when announcing a new activity in the lesson. She quickly switched back to English to express a science-related term (discovery of viruses).

Example 34: Church School 1	
T99: ... the very first microscope that ever existed okay↗ *issa dan bażikament dan il-vidjow mhux se nurihulkom kollu ta*	T99: ... the very first microscope that ever existed okay ↗ *now basically i'm not going to show you all of this video*

Similarly in this example, the teacher code-switches to Maltese to explain that they will watch part of a video.

4.3.2.2. Curriculum access and scientific terms.

As in the previous lesson, the teacher uses Maltese to explain some terms that she feels need more explanation (curriculum access).

Example 35: Church School 1	
T19: they can adapt: to surroundings okay↗ and have some organisation *ġifieri speċi* viruses *bażikament huma magħmulin minn ċertu affarijiet dejjem l-istess* okay↗	T19: they can adapt: to surroundings okay↗ and have some organisation meaning sort of viruses are *basically made up of some things which are always common* okay↗

In this example, when the teacher expresses the term *organisation* she feels she needs to explain this term in Maltese so that the students grasp it better. This could be because the word is one which also has a non-scientific meaning in English which is surely familiar to the students, but she wanted to emphasize that in this case, the scientific meaning is different.

There are also some examples when the teacher chooses to use Maltese to explain abstract scientific terms and make them more tangible to students' reality.

Example 36: Church School 1	
T29: ... we will see later on, much later on, that chromosomes are really these strands okay↗ which are WOUND on / proteins *qatt rajtu rukkell ħajt pereżempju ↗ tista' taqbad rukkell ħajt inti u toħroġ il-ħajta kollha* allright↗ *u tiġi ħajta vera twila* kilometers	T29: ... we will see later on, much later on, that chromosomes are really these strands okay↗ which are WOUND on / proteins *you ever saw a reel of thread for example ↗ you can get a reel of thread and take out all the thread* allright↗ *and you will have one line of thread* kilometers long

The teacher explains something as abstract as DNA to students by making the example as concrete as possible by telling them to imagine having a reel of thread. Martin and Veel (1998) say that the terms used in the science classroom are characterized by abstraction and may be hard to grasp, even more so if they are not in their native language. In this way, the teacher diligently placed the abstract term in a very practical context through the example, and used the students' native language to make sure they understand. To know that she needs to make such a choice, the teacher probably has a close relationship with the students and knows that their preferred language is Maltese.

Nevertheless, in other examples the teacher shows that she is aware that the subject requires a good proficiency in English and tries to respond to students in the medium of instruction even when they ask a question in Maltese:

Example 37: Church School 1	
Sf3: miss *x'inhi d-differenza bejn* capsomeres *u* protein coat↗	Sf3: miss *what's the difference between* capsomeres *and* protein coat↗
T38: yes, because the whole thing is called a capsule made up of sections for the capsomeres allright↗ *tajjeb↗* the protein coat you can call the capsid ...	T38: yes, because the whole thing is called a capsule made up of sections for the capsomeres allright↗ *good↗* the protein coat you can call the capsid ...

The teacher's conscious decision to answer back in English probably stems from knowing that they will be assessed in English and so need to learn how to express themselves when explaining such terms. The possibility that the response in English was a result of my presence as a researcher in the classroom is not ruled out.

When the teacher explains something in Maltese, she still code-switches to English when mentioning some scientific terms which do not have a practical equivalent in Maltese:

Example 38: Church School 1	
T86: *jiddependi mill-* immune system *għalhekk għedtilkom eżempju din is-* small pox *minħabba li m'hawnx* small pox virus *ħadd m'għandu* immunity għaliha* okay↗	T86: *it depends on the* immune system *that's why I told you, for example this* small pox *since there is no* small pox virus *no one has* immunity *against it* okay↗

4.3.3. Lesson 3: Independent school

The language dominating this lesson was English with a majority of 98%. From a transcription containing over 6,000 words only 110 of them were in Maltese. As already discussed in Section 2.3, these instances of code-switching were almost all instances of discourse marker-switching and so did not serve a particular function in the lesson other than that of proving that the teacher's native language is Maltese, and that these sentence fillers and tags are naturally present in conversation. For example:

Example 39: Independent School 1	
T8: *MELA* guys i'm coming round collecting them	T8: *SO* guys i'm coming round collecting them
T32: ... we're going to have a closer look at each of those divisions *issa* first what you need to know is that ...	T32: ... we're going to have a closer look at each of those divisions *now* first what you need to know is that ...

4.3.3.1. Classroom management

In one particular instance the teacher code-switches to Maltese for the purpose of classroom management:

Example 40: Independent School 1	
T47: *ħa nibdew* use another pen let's continue	T48: *here we go again* use another pen let's continue

In this example the teacher notices that a student calls out another student for taking his pen. The teacher expresses this comment with a sigh and a remark to show them that she knows what is going on. This is a common term used sarcastically by speakers of Maltese.

Example 41: Independent School 1	
T66: *iva ieqaf naqra*	T66: *come on stop*

In this similar example, the teacher switches to Maltese to discipline a student who was disrupting the classroom.

4.3.3.2. Curriculum access

Contrasting with previous lessons, when a particular student feels that he did not understand something said during the lesson, the teacher gives a further explanation in English:

Example 42: Independent School 1	
Sa13: miss =cos for us it doesn't make a lot of sense	Sa13: miss =cos for us it doesn't make a lot of sense
T107: why↗	T107: why↗
Sa14: because we are not plants	Sa14: because we are not plants
T108: okay *mela* let me put it on par with us / we need oxygen and we need carbon dioxide / we have lungs: ...	T108: okay *so* let me put it on part with us / we need oxygen and we need carbon dioxide / we have lungs: ...

In this example, the student felt that he could not understand a particular term related to plants as it was unfamiliar to him. Instead of using Maltese as the previous teacher did when faced with such a situation, the teacher explained herself in simpler English and gave an example which is bound to be more familiar to the student.

4.3.3.3. Commenting on local aspects (food terminology)

The teacher used Maltese in a particular instance to mention the names of some Maltese food:

Example 43: Independent School 1	
T47: you can imagine a broad bean the *ful il-ful* they're in season right now we make *kosksu* from them	T47: you can imagine a broad bean *the broad bean* they're in season right now we make *kosksu* <traditional Maltese dish> from them

Similarly Üstünel and Seedhouse (2005) found that teachers code-switch to the native language to comment on something which is local, to create a more relaxed atmosphere or to build rapport with the students.

4.3.4. Lesson 4 and 5: Church school 2 and Independent school 2

Due to the constraints of this dissertation, not all of the five examples observed could be discussed in such depth as the previous examples. However, it is important to note that similar findings were found to the corresponding school sectors observed above.

4.3.4.1. Church school 2

In the Church school, English was the dominant language, however code-switching to Maltese was also very common throughout.

Example 44: Church School 2	
T1: In the Middle Ages it was a time *fejn kellna ħafna ħafna* plagues *il-* Black death it caused quite a drop in the population of the world	T1: In the Middle Ages it was a time *when we had a lot of* plagues *the* Black death it caused quite a drop in the population of the world
*Sa1:**hemm ċans li tiġi oħra bħal ma ġara↗*	Sa1: *is there any chance it could happen again↗*
T2: It is actually treatable now *imma dak iż-żmien ma kinitx* treatable Malta *kienu darba għamlu* series *il-pesta kienu semmewh għax il-* plague *il-pesta / l-isptar ta' Malta Manoel Island kien*	It is actually treatable now *but during those times it wasn't* treatable in Malta *there was a* series *the plague they had called it because that's the equivalent of it / the hospital in Malta was in Manoel Island*

As was observed in the other Church school, code-switching between Maltese and English was frequent. In this example, the teacher uses Maltese to speak about a local event (a TV series), and also uses code-switching to give a direct translation of the word *plague* in Maltese.

Example 45: Church School 2	
T3: Another part of population is the predator-prey cycle / it's a graph okay↗ *ħa nurikom il-* graph and then you will understand me	T3: Another part of population is the predator-prey cycle / it's a graph okay ↗* I will show you the* graph and then you'll understand me
Sb1: miss *di rridu nikkuppjawha jew↗*	Sb1: miss *we have to copy this or↗*
T4: *għandkom fin-* notes * ġifieri ħarsu 'l hawn* so you will understand it	T4: *you have this in your* notes *so look here* so you will understand it

In the example above, the teacher is explaining in English, however when the student asks a question in Maltese, which is not directly related to scientific knowledge but to instructions on practical issues, she answers in Maltese as well but still code-switching to English. This was depicted in Mifsud (2012) as he explained that teachers code-switch to the native language when in conversation with their students about something not directly related to lesson content. The teacher's language choice could also have been influenced by the student's choice to ask the question in Maltese.

4.3.4.2. Independent school 2

On the other hand, the lesson observed in the second Independent school was dominated by English. All explanations, classroom management instances and all divergent talk was done in English.

Example 46: Independent School 2
T1: all of my hyphae that are going to be involved in reproduction collectively we are going to call them the mycelium so mycelium can collectively be referred to as the vegetative part of the fungus okay↗ this is written all of it on page three highlighted there is also the definitions of mycelium and hyphae it's at the bottom of page three

As observed in this example, all of the lesson talk and divergent talk was done in English with no code-switching to Maltese at any moment. This was the case for all of the lesson.

Example 47: Independent School 2
T2: when we looked at our onion under the microscope what did we see ↗
Sa1: our onion epidermis
T3: yes our onion epidermis

Example 48: Independent School 2
T4: how does nutrition in a fungus differ from nutrition in a protozoa↗
Sb1: in a fungus the digestion takes place externally but in a protozoa it happens internally
T5: exactly

As observed in these examples, the teacher did not code-switch to Maltese in any of the cases, possibly because she did not feel the need to do so as the students seemed to be fluent in English and could explain themselves well in the language. Moreover, throughout the lesson, they appeared to be more familiar with scientific terminology, which could also result from the fact that speaking in English was very natural for them.

In the majority of the instances where code-switching was observed in all of the lessons, it served the functions of curriculum access where the teacher used the L1 for explanation and to express scientific terms. This also happened where the teacher was expressing herself in L1 but had to code-switch to English for particular terms which have no practical equivalent in Maltese. In instances of classroom management and in order to create an informal atmosphere, the teachers were also more likely to express themselves in their native language.

4.4. Complex Morphology

When I was in the process of transcribing the lessons I had heard, I came across some words which I had to reflect upon. In a particular lesson, the teacher used some English words which she inserted into Maltese speech and altered them to be inserted in Maltese morphology.

In one case a particular student used the word **jispredjaw** when referring to a virus that can spread around the world easily because there is no immunity for it. The student could have easily used the Maltese equivalent *jinfirxu* but opted to use an English verb and conjugate it with Maltese morphology.

In two another instances, one teacher used the words *nillejbiljalek* (I label for you) and the word *iħħajlajtjajtuhom* (highlighted them). When hearing these words during the lesson, I did not feel as though I was hearing something strange as they are words which have inserted themselves in one way or another in the Maltese language, probably because they are heard quite often or because there is not a clear equivalent in Maltese. The Maltese equivalent for *nillejbiljalek* could have been *nimmarkalek* (mark) or *nagħti isem* (give a name to), while a tentative equivalent for *iħħajlajtjajtuhom* could be *immarkaw b'kulur* (mark with a colour). While these words are natural to hear in conversation, they were striking when it came to write them down. This is because Maltese is written phonetically while English uses a system where groups of letters represent phonemes (Dixon et al., 2010). Due to this, while a word sounds quite natural in speech, it becomes problematic in writing.

In another example, the teacher did try to use the Maltese equivalent of a scientific word instead of introducing the English word in Maltese morphology. However, in this case, this was

not done well. The teacher opted to use the word *ċelel* to mean the word 'cells', but this does not refer to body cells but prison cells. The correct term to be used would have been *ċelloli*. While this could have only been a slight mistake in spontaneous speech, it could also serve to reveal that some teachers are trying to use a Maltese equivalent for some scientific terms, but in some cases need to be more careful to use the correct term.

4.5. Some Observations across the Three School Sectors.

In this section I will be focusing on three full lesson transcriptions, one from a State school, one from a Church school and the final one from an Independent school. I will be focusing on the language used, particularly which language (Maltese or English) was dominant by the teacher and the students during the lesson.

It is important to note that these results are not representative of any pattern across all the three school sectors in Malta, as the study was done on a minimal scale because of time restrictions. The results only portray what was observed in the schools chosen for the study, and depend on the teachers participating since this issue depends greatly on the linguistic identity of the teacher involved. It would be interesting to extend the research on a wider scale as it would be more conclusive on the reality present in the different local school sectors.

4.5.1. Speaking time

Figure 1 shows who used language more during the lessons analysed. As expected, teachers were the ones who had the most speaking time during the lessons observed, however, it was not expected that students would only have around 12% of the speaking time. This meant that for most of the time, students were sitting down listening to the teacher and not participating

in the lesson. While this is not the focus of the research, it is also important to note that it is difficult to precisely determine whether the students' preferred choice of language is English or Maltese, or whether they find it difficult to express themselves in the medium of instruction, when their speaking time is so minimal.

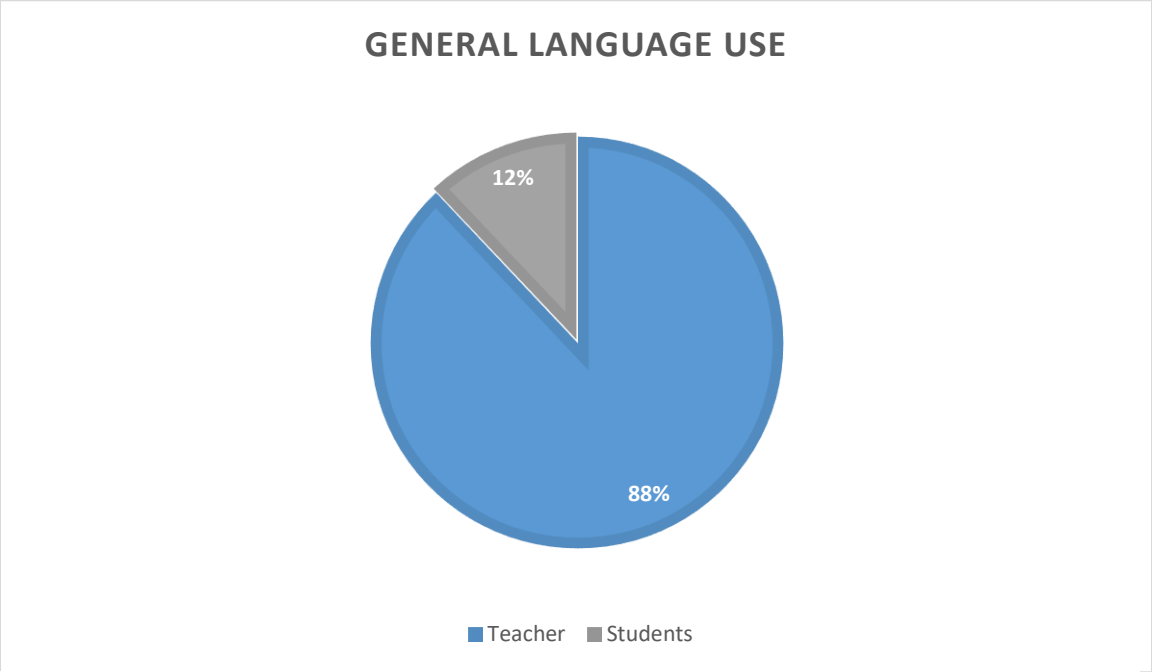

Figure 1: General language use

4.5.2. Overall frequency of language use

Figures 2 and 3 portray the frequency of Maltese and English in the lessons observed by both students and teachers. The figures clearly show that the dominant language in the lessons observed is English while Maltese was used during around 27% - 29% of the lesson.

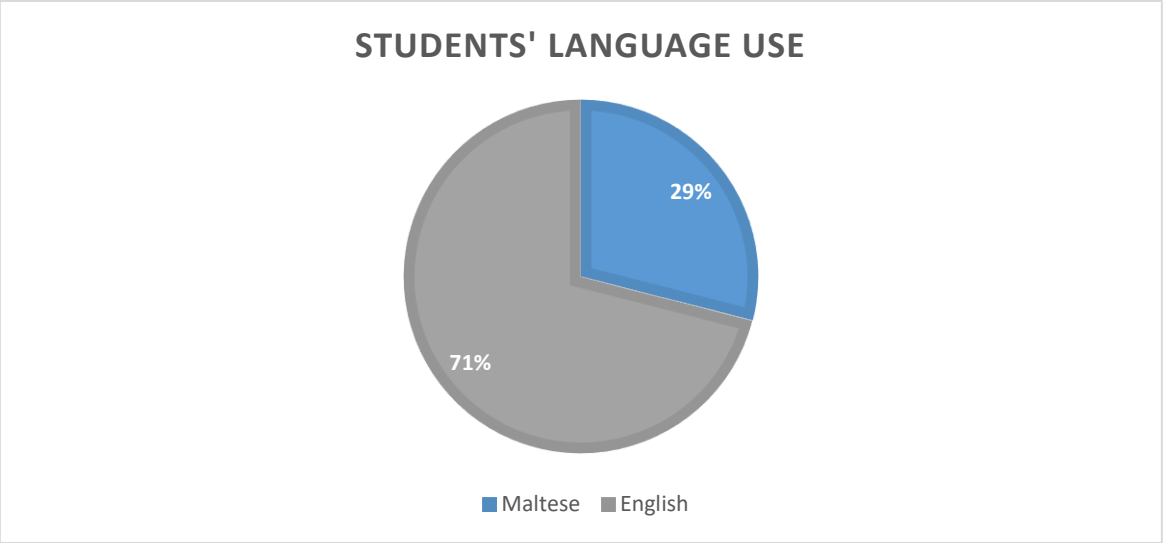

Figure 2: Students' language use

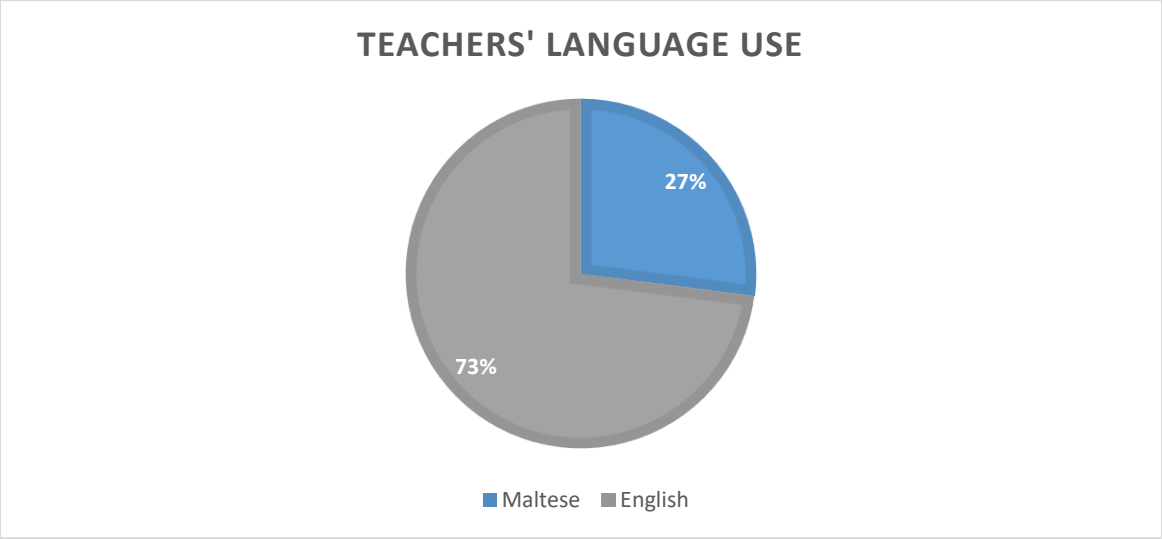

Figure 3: Teachers' language use

When considering each lesson separately, the results are different. In the Biology lessons observed in a Church school and an Independent school, English was the main language used while in the lesson observed in a State school, Maltese was used for the majority of the lesson (76%). These results may not be representative of the whole school sector in general, however

the difference in the amount of Maltese used in the Independent school (1.7%) lesson compared with the State school (76%) lesson is substantial.

Moreover, in the instances when Maltese was used in the Independent school, it consisted of tag-switching instances involving sentences fillers and interjections (*mela*, *issa, ejja)* and not whole phrases or utterances in Maltese. In fact, only 110 words from a total of 3,395 words transcribed were in Maltese. This differs extensively from the lesson observed in a State school where whole utterances were in Maltese and English was mainly used for scientific terms (see heading 3). Figure 4 compares the amount of English and Maltese used in each school sector.

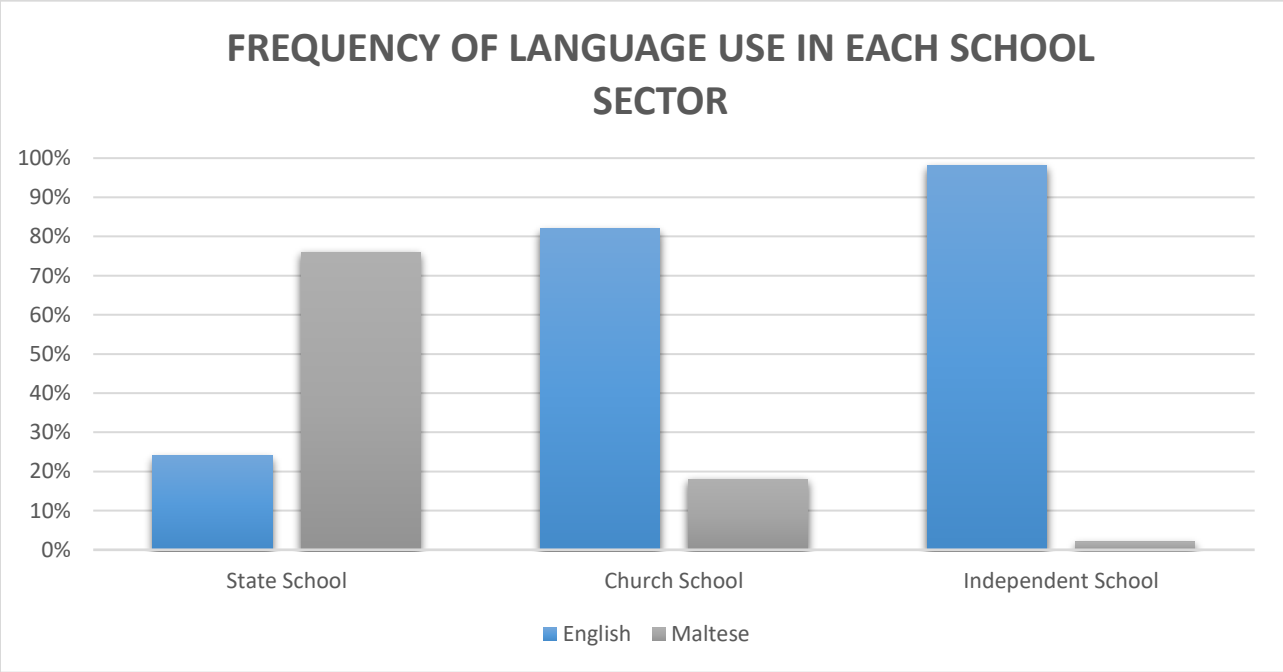

Figure 4: Frequency of language use in each school sector

While the results obtained in the Church and Independent schools vary slightly, the reality of language use in the State school is considerably different. When analysing the transcript of the

lesson observed in the State school, it can be noted that of the total of 412 words uttered by the students during the lesson only 92 of them were in English and they consisted entirely of scientific terms or words related to the topic of the lesson in some way or another. This shows that whenever the students expressed themselves during the lesson, they did so in Maltese and used English only to express scientific terms, which had no practical equivalent in Maltese (for example *stem*, *node* and *cross-pollination*) or are linked to education in some way (*topic* and *homework)*. Words like 'handout' were considered as Maltese since the word has entered the language and is commonly used amongst Maltese speakers (*ħendawt).*

When considering English and Maltese words, the word *Miss* (used to call a teacher) was eliminated from the word count for the reason that it is used widely in all classrooms and does not imply that a student expresses himself in English. The equivalent in Maltese *Sinjura*/*Sinjorina*/*Sinjur* is not usually used and was not observed in any of the classrooms during conversation.

4.6. Teacher Feedback Sessions

As a follow-up to the findings of the recordings, a feedback session was arranged with the teachers involved in the study so as to get more insight on the teachers' viewpoint on language use in the classroom and their personal preferred choice of language. The teachers were asked brief questions about their opinion on code-switching and their view on Biology examinations being solely in English.

Since language is a very personal dynamic, the teachers were asked which language they preferred to speak in their daily life. It is important to note that all teachers were of Maltese

nationality. Only 2 of the 5 teachers expressed that they usually speak in English in their daily life (these teachers happened to be teachers in an Independent school). One teacher answered that she had no problem with speaking both in Maltese or English and automatically switched according to whom she was with. Moreover, she admitted that she does use English words when speaking in Maltese to help her express her feelings better.

When asked about the predominant language in their school, 2 of 5 teachers said that Maltese was predominant in their school, while in the Independent schools and one Church school, the teachers said that English was the predominant language in their school environment (this meant that English was the medium of instruction in assemblies and other school activities).

The teachers were asked to express their opinion on code-switching in the classroom, particularly in subjects which are examined in English. The majority of the teachers regard code-switching as 'normal' and a 'natural product of bilingual and multilingual language use', feeling that not code-switching during lessons may result in students not participating if they're not fluent in English. Another teacher felt that there is an increase in low-ability students choosing Biology because it is required to further their studies in Physical Education. She felt that these students are not as proficient in English, thus code-switching is a necessity.

One particular teacher admits she is against the use of code-switching and says that it is not much of an option due to the large number of foreigners present in her school (Independent School).

All the teachers except the ones teaching in an Independent school claim that the majority of their students prefer speaking in Maltese, however even in these contexts there are some

students who prefer expressing themselves in English. One teacher explained how she prefers that the students express themselves in whichever language they please rather than avoid talking at all.

When the teachers were asked if they think that Biology being assessed solely in English proves to be a hindrance to some students, two teachers explained that lower-ability students are definitely less likely to do well in such an exam as some do not even understand the question being asked. They also admitted that some students are not capable to formulate their answers to an extent that they sometimes end up contradicting themselves. One teacher does not limit this to lower-ability students only, saying that this could happen to all students, however lower-ability students have a 'further hurdle' as they do not understand what is being asked of them. One particular teacher argued against Biology being assessed in Maltese as she feels that trying to teach or examine Biology in Maltese would be even harder, especially since some scientific terms and keywords will be even less familiar to students (since Maltese individuals are used to them being in English).

All of the teachers agreed that their language choice will depend on the students they teach, however one particular teacher (Independent school) never felt the need to use code-switching or Maltese as the students understood English well. One particular teacher (State school) explained how with lower-ability students she automatically translated a question to Maltese before expecting an answer but did not feel the need to do so with higher ability students.

The results of the feedback session show the different realities in schools. It is also interesting to note that some teachers have associated students who are not proficient in English to low

ability in Biology. This further proves that being proficient in English is required to do well in Biology. This notion will be discussed in more detail in the next section.

4.7. Conclusion

While these results are in no way conclusive or representative of schools in Malta, they are an indication of the varying linguistic reality present in the classrooms of a subject that students will be examined for in the same way.

The linguistic realities in these schools appeared as varied from one another, however these students are all expected to sit for the same exam at the end of their studies (SEC). English was generally the dominant language, but was not so in the State school observed. Although Garcia and Wei (2014) promote the use of translanguaging in the classroom as it is beneficial for the students' understanding, it is legitimate to ask whether having a lesson which is predominantly in Maltese is harmful for the students' chances of doing well in their exam which is assessed solely in English. At the same time, would students who cannot understand if explanations are solely in English, be able to access the content in any way?

In the next section, the results obtained will be discussed and interpreted. There is naturally no answer to what the 'best option' would be, thus it is important to note that the interpretations are subjective and could vary from one researcher to another.

5. Discussion of Results

5.1. Introduction

This section will reflect upon and question the reasons that may explain the findings of the study. The results will be compared with what linguists have expressed and what other researchers have found. While these results are in no way representative of the reality in all local schools, they offer points for reflection on the linguistic reality present in schools and the effect this reality may or may not have on students' success in Biology examinations, especially SEC examinations which are common for all students in Malta.

5.2. Amount of Code-switching and Academic Ability

Linguists like Kamwangamalu (2010) and researchers like Mifsud and Farrugia (2016) found that the amount of code-switching in the classroom was higher when the students in the classroom were of lower ability. They explained that code-switching helped overcome any language barriers that the students might face when tackling complex content like that of science. This is difficult to comment on in this study as the classrooms consisted of mixed-ability students, thus there was not one classroom which was labelled as 'lower-ability'. However, the teachers did express their opinion about this and claimed that they use Maltese more with lower-ability students as they believe that they have a harder time understanding Biological concepts. A particular teacher teaching in an Independent school did not feel the need to use Maltese as her students were fluent in English and understood her well. This was also evident in the

lessons observed in the Independent schools as the teacher used simpler English to explain difficult concepts instead of switching to Maltese like other teachers did.

Hajer and Meestringa (2014 as seen in Karlsson, 2015) argued about this reality, saying that teachers lower their expectations of students who do not speak the language of instruction and often over-simplify their teaching to accommodate them, which results in them not doing well because of this. Being proficient and able to express oneself fluently in English is essential in Biology as Biological concepts are not easy to grasp and the exam involves writing in detail about particular concepts. Students who are not proficient in English are regarded as low-ability in Biology, which is a testament to how these two subjects go hand-in-hand. Azzopardi (2009) stated that teachers understood that the language of instruction is an important factor in achievement and thus students who lack proficiency in English find it difficult to understand the subject and do well. Nevertheless, the teachers in her study still believed that the exam being in Maltese is still far-fetched since no scientific terminology is available in Maltese. This was also expressed by a teacher in this study who claimed that examining Biology in Maltese would be even harder since the key words would be even less familiar to students.

5.3. Language Frequency

This study showed that the linguistic reality of students who will be sitting for the same exam (SEC) is quite different. In the Independent schools the dominant language was English, with the presence of Maltese being close to zero. On the other hand, in the Church schools the presence of Maltese was definitely stronger, while in the State school Maltese was the dominant language.

Azzopardi's (2009) research in Science classrooms showed that most of the students in State and Church schools prefer to use code-switching in the classroom while the majority of those attending Independent schools prefer to use solely English. This mirrors the reality that was observed in this study, as the presence of English on its own was only observed in the Independent schools. She also found that Maltese was never used on its own in the classroom and this comment also stands as true in my research, as even in the State school where the presence of Maltese was the highest, Maltese was still not used on its own.

The students in the State and Church schools both used Maltese to express themselves and switched to English when it came to scientific terms and expressions, while in the Independent schools students expressed themselves solely in English. The teachers' explanations in the State and Church schools had a mixture of Maltese and English, but mostly the use of English was to express scientific terms. This differs in the Independent school where explanations were solely in English. This is also what Azzopardi (2009) observed in her study, explaining that 53.8% of students in general preferred when explanations in the classroom where in Maltese, however 96.7% of Independent school students preferred explanations to be in English. This was similar to the findings in this research, as one of the most common reasons of code-switching was for curriculum access (explanation).

Mifsud (2012) experienced a similar reality when he found that 75% of the code-switching instances recorded where when the teacher was expressing herself in Maltese and used English to express technical jargon. This finding is similar to what was observed in the State and Church schools as the most common reason for code-switching was to express scientific terms, which there is no practical equivalent to in Maltese, or this is not commonly used.

These works were written approximately 6-9 years ago, and they express very similar results to what was found in this research, showing that the linguistic reality in different school sectors has not changed much.

5.4. A Sociolinguistic Trend?

When code-switching was not present (in Independent schools), the teachers claimed that this was because they never felt the need to code-switch since their students were fluent enough in English to understand the lesson.

Is there a reason that in both Independent schools all students were fluent in English while in other schools, the teachers felt the need to code-switch to Maltese in order for them to be understood well?

Is this because of the teacher's personal linguistic preference or is code-switching a necessity for comprehension?

Brincat (2007) found that generally, in her study conducted in Form Three secondary school classes, students have a positive attitude towards English, however found that English was most commonly used among the highest socioeconomic groups. Moreover, some participants were "quite indifferent" when faced with the statement that English is the language of the more educated (p.55). In Amaira's (2009) study a particular fifth-former expressed the opinion that Maltese people who speak in English are 'snobs', while most males in the study believed that if Maltese people spoke in English they are considered of high class. Similar findings were found in Brincat's (2007) study. It is clear that English enjoys a high degree of prestige, possibly at least partly stemming from the fact that English was the language of colonizers in the 20th

century (Fenech, 2014). Whatever the reason, it is an undeniable fact that English is essential in students' education in order for them to succeed academically.

The teachers teaching in an Independent school both claimed that the predominant language in their school is English, and assemblies, school notices and all school-related activities are in English. As one teacher explained, this could be stemming from the growing presence of foreigners in Independent schools. Could it also be the case that the dominance of English in Independent schools is because the students attending these schools are part of the higher socioeconomic groups in Malta? It is a common fact that the school fees for attending such schools are not feasible for everyone, so these schools become 'naturally selective' of some social classes in Malta.

On the other hand, Church schools represent a mixture of social groups since entrance depends on a ballot system, thus everyone has the chance to enter such schools. Therefore is it expected that these schools have students coming from different social backgrounds, and so different linguistic backgrounds. In the case of State schools, students in one school have similar geographical backgrounds as each school has its own catchment area. Thus restrictions for entrance only depend on the locality that the student lives in.

Although regarding Maltese as the "the language of the kitchen" (Camilleri Grima, 1995) is now far-fetched and unrealistic, the reality of English being spoken by the higher classes seems to still be a reality in Malta.

5.5. The Future of Biology Examinations

The presence of English in the scientific world is indisputable, as has already been discussed in previous chapters of this research. Textbooks are generally available solely in English, and students are examined only in this language. Thus, it is only natural to suggest that this subject be taught in English, if students wish to further their career in such a field. However, students who speak solely English are a minority in Malta, and so, one can wonder whether it is realistic or fair to assess them only in English?

In Azzopardi's (2009) study, one particular teacher claimed that it would help if there was a possibility for students to have a choice in answering in English or Maltese, so students who lack proficiency in English could still have a chance at succeeding. However, this idea could still be far-fetched if students would not be allowed to code-switch as this would mean that all scientific terms have to be translated to Maltese. This could pose a further difficulty to students who are used to hearing technical jargon in English, and if creating a completely Maltese technical jargon proves to be impossible, students could be allowed to code-switch in the exam.

Mifsud and Farrugia's (2016) suggestion of a 'hybrid language' could prove to be ideal to teach science subjects, as code-switching will help those students who are not as proficient in English. However, if the presence of a hybrid language is not an option in the exam then is it useless to have it present in the classroom? If the students need Maltese to grasp a concept or to explain themselves well, is it a positive thing that they are allowed to have a fair chance at expressing themselves in the classroom, knowing that they will not have the same chance in their SEC exam? Is this 'fair chance' in the classroom deceiving?

5.6. Conclusion

There is clearly no correct answer or solution to such an issue. However, it would be interesting if this research were to be more widespread and could include a representative sample of the schools in Malta. It could also be interesting to analyse the SEC results of students coming from different school sectors so as to come to a conclusion whether English is really a barrier for success in the Biology examination.

Then, the results would be a clear indication of the reality present in all local schools and this would pave the way for possible decisions to be taken to create a clear and fair chance for all students to do well.

6. Conclusion

6.1. Main Findings

The aim of this research was to reveal linguistic trends in some local schools, particularly language use in the Biology classroom. The presence of translanguaging in these classrooms was observed, and the possible functions it served were discussed.

The observations conducted in five schools from the three different school sectors in Malta (State, Church and Independent schools), portrayed a different linguistic reality in the classroom. In the Independent schools, English was the dominant language and the use of Maltese was close to none. Contrasting this was the State school, where the use of Maltese was quite dominant and code-switching to English was frequent. In the lessons observed in the Church schools, both Maltese and English were used, and code-switching had a dominant presence.

Translanguaging served a number of functions, ranging from classroom management to explaining scientific content. During the feedback sessions held, the majority of the teachers expressed that code-switching was a natural product of bilingualism, and they had no problem with using it in the classroom if it was of benefit to the students' progress in the subject. On the other hand, one particular teacher, expressed negative attitudes towards the use of code-switching in her classroom and admits that it is not an option in her school due to the increasing presence of foreigners.

All of the teachers expressed that their language choice largely depended on the students in their classroom; if their students prefer expressing themselves in Maltese or find it hard to express themselves in English, then translanguaging is not only of help but a necessity.

Some teachers also pointed out a pressing problem: the level of proficiency in English is directly linked to the ability to do well in Biology. This issue is one of the reasons why this study was conducted in the first place. While bilingualism is encouraged and the NCF stresses the importance of bilingual language proficiency, the reality in some schools is that students are not proficient enough in English, or do not feel comfortable expressing themselves in English, and revert to code-switching to the native language. While, in my opinion, code-switching is not at all a negative mechanism in itself, the requirements of the subject in question do not allow students to express themselves in their native language in their assessment.

6.2. Limitations and Further Studies

As previously stated, the study was limited to a small number of local schools due to the time restrictions presented by the course. Thus the results, apart from being context-dependent are also not representative of the local linguistic reality, they only present a possible linguistic trend.

A significant limitation to this study was having one school drop out from the study at a crucial stage. This resulted in having one school from a State school context and two schools from the other two school contexts. This imbalance naturally meant that the results are less conclusive of the reality present in Maltese schools.

Having said this, it would be interesting if the study were to be conducted in greater depth, possibly including a larger number of schools around Malta and Gozo, so that the results could be more accurate and representative of reality.

6.3. Conclusion

The reality in Malta is that English and Maltese are both official languages, however Maltese is the native language of the majority of the population, and some students clearly cannot grasp the content material without the use of this language. In my opinion, decisions need to be taken regarding pedagogy and assessment in the Biology field and Science in general.

The importance of English in the scientific field is unquestionable, as it is the language students must be proficient in if they want to progress in this field. However, should students who are not as proficient in English not have a chance to further their studies in this subject? Is there a problem of a lack of proficiency in English in some schools or parts of the population? Or is it a matter of changing the assessment tradition, and include Maltese in the examinations of such subjects?

When analysing the lesson transcriptions, it is clear to see that the presence of scientific jargon in Maltese is close to none. Even when the teacher is expressing herself in Maltese, she code-switches to English to express a scientific term. In one instance, when the equivalent of 'body cells' was expressed in Maltese, the wrong term was used (*ċelel* instead of *ċelloli*). In other cases, when Maltese was used it expressed terms which are familiar to the students, for example the equivalent of 'leaves', 'plants' and 'seed'. Even when certain verbs to express scientific processes were used, these were used in English and in some cases expressed through

applying Maltese morphology to a clearly English lexical item, for example using *jittravilja* (to travel). If technical jargon in Maltese is almost absent or is unnatural to Maltese speakers, is it realistic to envisage using Maltese during Biology lessons?

This issue is a complex one, but I believe it should not be taken lightly. It is not only up to policy makers, but teachers and schools should share this responsibility and reflect on their teaching methods and practices, in order to improve the present conditions and provide students with fair chances at progressing in such fields.

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Appendices

Appendix A: Acceptance by FREC

UNIVERSITY OF MALTA

UNIVERSITY RESEARCH ETHICS COMMITTEE

		YES	NOT APP.
1a.	Recruitment letter/ information sheet for subjects, in English	☒	☐
1b.	Recruitment letter/ information sheet for subjects , in Maltese	☒	☐
2a.	Consent form, in English, signed by supervisor, and including your contact details	☒	☐
2b.	Consent form, in Maltese, signed by supervisor and including your contact details	☒	☐
3a.	In the case of children or other vulnerable groups, consent forms for parents/ guardians, in English	☒	☐
3b.	In the case of children or other vulnerable groups, consent forms for parents/ guardians, in Maltese	☒	☐
4a.	Tests, questionnaires, interview or focus group questions, etc in English	☒	☐
4b.	Tests, questionnaires, interview or focus group questions, etc in Maltese	☐	☐
5a.	Other institutional approval for access to subjects: Health Division, Directorate for Quality and Standards in Education, Department of Public Health, Curia…	☒	☐
5d.	Other institutional approval for access of data: Registrar, Data Protection Officer Health Division/ Hospital, Directorate for Quality and Standards in Education, Department of Public Health…	☒	☐
5c.	Approval from Person Directly responsible for subjects: Medical Consultants, Nursing Officers, Head of School	☒	☐

Received by Faculty Office on	
Discussed by Faculty Research Ethics Committee on	
Discussed by University Research Ethics Committee on	

UNIVERSITY OF MALTA

Request for Approval of Human Subjects Research

FROM: (*name, address for correspondence)* Leanne Cauchi	PROJECT TITLE: Functions of translanguaging instances in Biology lessons held in the Maltese educational context.
TELEPHONE: 79473961	
EMAIL: leanne.cauchi.13@um.edu.mt	
COURSE AND YEAR: Masters in Teaching and Learning (Maltese) 1st Year	
DURATION OF ENTIRE PROJECT: From April 2017 To May 2018	FACULTY SUPERVISOR'S NAME AND EMAIL: Dr. Anne-Marie Bezzina anne-marie.bezzina@um.edu.mt

ANTICIPATED FUNDING SOURCE:
N/A

1. Please give a brief summary of the purpose of the research, in non-technical language.

The study will analyse the bilingual reality in the Maltese classroom during Biology lessons. It will review literature on the effects of codeswitching in science education. At SEC level, Biology examination papers in Malta are written in English and students are expected to answer in good English. Textbooks and homework are in English. It is thus expected that students have grasped the English language well enough to be able to explain themselves at length. This study will investigate whether this may hinder the education of those students who identify Maltese as their first language. This study will investigate the linguistic reality present in schools during Biology lessons.

2. Give details of procedures that relate to subjects' participation
(a) How are subjects recruited? What inducement is offered? (*Append copy of letter or advertisement or poster, if any.)*

In order to carry out this research, I will seek permission from the Directorate for Quality and Standards in Education, the Secretariat for Catholic Education and the Heads of Independent Schools and kindly ask them to distribute information letters and consent forms to Biology teachers in their schools. When the Heads of Schools hand back any signed consent forms, I will kindly ask them to distribute information letters and consent forms to parents and information letters and assent forms to students. The information letters and consent forms given to parents and students will be written both in English and Maltese. For the purpose of this study, I will accept the first six teachers willing to participate, the first two from state schools, the first two from the church schools contacted and the first two from Independent schools.

(b) Salient characteristics of subjects – number who will participate, age range, sex, institutional affiliation, other special criteria:

For the purpose of this research, I will observe twelve Biology lessons in six schools. I will observe each teacher twice. Six teachers will be part of the research, two of whom teach in a state school, two who teach in a church school and a final two who teach in an Independent school. There will be no restrictions of age, gender or teaching experience.

(c) Describe how permission has been obtained from cooperating institution(s) – school, hospital, organization, prison, or other relevant organization (*append letters).* Is the approval of another Research Ethics Committee required?

I will send in a form to the Directorate for Quality and Standards in Education, a letter requesting permission to the Secretariat for Catholic Education and to the College Principals and Heads of Schools of Independent Schools. The letters to be sent are all attached to this application form.

(d) What do subjects do, or what is done to them, or what information is gathered? (*Append copies of instructions or tests or questionnaires)* How many times will observations, test, etc., be conducted? How long will their participation take?

The teachers and students' spoken interaction during the Biology lesson will be audio-recorded, transcribed and linguistically analysed to observe the functions of code-switching. Feedback sessions with the teachers involved will also be held during which instances of codeswitching will be discussed in order to see which why they took place. I want to see which acts of speech are usually carried out in which language or languages, and who triggers codeswitching.

(e) Which of the following data categories are collected? Please tick where appropriate.

Data that reveals:
N/A

Race and ethnic origin	☐
Political opinions	☐
Religious and philosophical beliefs	☐
Trade union memberships	☐
Health	☐
Sex life	☐
Genetic information	☐

3. How do you explain the research to subjects and obtain their informed consent to participate? *(If in writing, append a copy of consent form.)* If subjects are minors, mentally infirm, or otherwise not legally competent to consent to participation, how is their assent obtained and from whom is proxy consent obtained? How is it made clear to subjects that they can quit the study at any time?

In order to explain well the research to subjects and obtain their informed consent to participate I will distribute to them detailed information letters and consent forms which require their signed consent. I will be informing them that I am researching classroom discourse, so as not to bias language distribution during the lessons. It will be made clear in the information letters and consent forms that participants can quit the study at any time without suffering consequences.

4. Do subjects risk *any* harm – physical/ psychological/ legal/ social – by participating in the research? Are the risks necessary? What safeguards do you take to minimize the risks?

I will not be dealing with vulnerable groups, no sensitive or personal information about the subjects will be required and participation in the study will be of no detriment to participants.

5. Are subjects deliberately deceived in *any* way? If so, what is the nature of the deception? Is it likely to be significant to subjects? Is there any other way to conduct the research that would not involve deception, and, if so, why have you not chosen that alternative? What explanation for the deception do you give to subjects following their participation?

No, subjects participating in this research will be informed that there will be an audio-recording of the spoken interaction during the lesson. Moreover, the fact that the research is on spoken interaction will be made clear to the participants beforehand.

6. How will participation in this research benefit subjects? If subjects will be 'debriefed' or receive information about the research project following its conclusion, how do you ensure the educational value of the process? (*Include copies of any debriefing or educational materials)*

The research will not benefit the participants directly but will be of benefit to the teaching of science subjects in Malta through the analysis of spoken interaction in the Biology classroom.

TERMS AND CONDITIONS FOR APPROVAL IN TERMS OF THE DATA PROTECTION ACT

- Personal data shall only be collected and processed for the specific research purpose.
- The data shall be adequate, relevant and not excessive in relation to the processing purpose.
- All reasonable measures shall be taken to ensure the correctness of personal data
- Personal data shall not be disclosed to third parties and may only be required by the University or the Supervisor for verification purposes. All necessary measures shall be implemented to ensure confidentiality and where possible, data shall be anonymized.
- Unless otherwise authorized by the University Research Ethics Committee, the researcher shall obtain the consent from the data subject (respondent) and provide him with the following information: The researcher's identity and habitual residence, the purpose of processing and the recipients to whom personal data may be disclosed. The data subject shall also be informed about his rights to access, rectify, and where applicable erase the data concerning him.

I, the undersigned hereby undertake to abide by the terms and conditions for approval as attached to this application.

I, the undersigned, also give my consent to the University of Malta's Research Ethics Committee to process my personal data for the purpose of evaluating my request and other matters related to this application. I also understand that, I can request in writing a copy of my personal information. I shall also request rectification, blocking or erasure of such personal data that has not been processed in accordance with the Act.

Signature:

APPLICANT'S SIGNATURE: *I hereby declare that I will not start my research on human subjects before UREC approval* DATE	FACULTY SUPERVISOR'S SIGNATURE *I have reviewed this completed application and I am satisfied with the adequacy of the proposed research design and the measures proposed for the protection of human subjects.* DATE

Applicant's email: Index No:

To be completed by Faculty Research Ethics Committee

We have examined the above proposal and advise

Acceptance **Refusal** **Conditional Acceptance**

For the following reason/s:

Signature: Date: 5th June 2017

To be completed by University Research Ethics Committee

We have examined the above proposal and advise

Acceptance **Refusal** **Conditional Acceptance**

For the following reason/s:

Signature: Date: 24/10/2017

Appendix B: Information Letter to the Principal and Heads of Schools

Letter to School Principal requesting permission to carry out research in the school.

Dear School Principal,

I am a student currently reading for a Master's degree in Teaching and Learning Maltese. As part of my course requirements I will be conducting a study on language use in the science classroom with emphasis on the Biology lesson, under the supervision of Dr. Anne-Marie Bezzina.

I would like to and would appreciate if you kindly agree to grant me permission to contact the Secondary School's Head of School of your College so I could ask permission to carry out my research in the school. This research requires that I observe two Biology lessons in your school. The observations will focus on the spoken interaction between the teacher and the student throughout the lesson. With your permission, I would like to audio-record these lessons so as to be able to analyse the language used further. Upon completion of the study these audio-recordings will be destroyed. The participation of teachers and students would be voluntary and school and teachers'/students' names will not be disclosed at any time. I would also like to kindly ask permission to ask the participating teachers for a feedback session on the results observed.

If you have any queries do not hesitate to contact me on 79473961 or by e-mail on leanne.cauchi.13@um.edu.mt, or my supervisor on anne-marie.bezzina@um.edu.mt.

Thank you for your cooperation.

Kind regards,

Leanne Cauchi

_____

Dr. Anne-Marie Bezzina

_____

Letter to Head of School requesting permission to carry out research in the school.

Dear Head of School,

I am a student currently reading for a Master's degree in Teaching and Learning Maltese. As part of my course requirements I will be conducting a study on language use in the science classroom with emphasis on the Biology lesson, under the supervision of Dr. Anne-Marie Bezzina.

I would like to and would appreciate if you kindly agree to grant me permission to conduct my research in your school. This research requires that I observe two Biology lessons in your school. The observations will focus on the spoken interaction between the teacher and the student throughout the lesson. With your permission, I would like to audio-record these lessons so as to be able to analyse the language used further. Upon completion of the study these audio-recordings will be destroyed. The participation of teachers and students would be voluntary and school and teachers'/students' names will not be disclosed at any time. I would also like to kindly ask permission to ask the participating teachers for a feedback session on the results observed. Kindly note that for the purpose of this research I will be accepting the first six teachers who are willing to participate, the first two from State schools, the first two from Church schools and the first two from Independent schools.

If you have any queries do not hesitate to contact me on 79473961 or by e-mail on leanne.cauchi.13@um.edu.mt, or my supervisor on anne-marie.bezzina@um.edu.mt.

Thank you for your cooperation.

Kind regards,

Leanne Cauchi

_____

Dr. Anne-Marie Bezzina

_____

I, _____ give permission to the above mentioned to carry out research in my school.

_____

Appendix C: Information Letter and Consent Form for Teachers

Letter requesting permission to carry out research in a Biology lesson.

Dear participant,

I am a student currently reading for a Master's degree in Teaching and Learning Maltese. As part of my course requirements I will be conducting a study on language use in the science classroom with emphasis on the Biology lesson, under the supervision of Dr. Anne-Marie Bezzina. I would like to and would appreciate if you kindly agree to grant me permission to observe two Biology lessons as part of this research. The observations will focus on the spoken interaction between you and the students throughout the lesson. With your permission, I would like to audio-record these lessons so as to be able to further analyse the language used. Upon completion of the study these audio-recordings will be destroyed. I would also like to kindly ask permission to have a feedback session with you where some general questions about language use in the classroom will be asked. Kindly note that for the purpose of this research I will be accepting the first six teachers who are willing to participate, the first two from State schools, the first two from Church schools and the first two from Independent schools. Please note that your participation in this study is entirely voluntary and you are free to decline participation:

1. All the collected information will be held anonymously and your identity will not be disclosed at any point.
2. You have the right not to answer any questions you would not like to answer.
3. You may withdraw from the study at any time without having to provide an explanation for your withdrawal. Your data would then not be used.

Please sign the attached consent form if you agree to participate in this research project. If you have any queries do not hesitate to contact me on 79473961 or by e-mail on leanne.cauchi.13@um.edu.mt, or my supervisor on anne-marie.bezzina@um.edu.mt. I will be happy to answer any questions that you may have. Thank you for your cooperation.

Leanne Cauchi — Dr. Anne-Marie Bezzina

_____ _____

Consent Form for Teachers

I, the undersigned, confirm and declare that Leanne Cauchi has informed me of her research study, and of the need of audio-recording the lessons observed. I have had the opportunity to ask any questions to the researcher and her supervisor. I understand that:

1. The researcher will audio-record my lessons.
2. The data collected will be saved on a password protected hardrive.
3. Any data collected will be kept anonymous.
4. The researcher will not disrupt my lesson in any way.
5. I can withdraw from the study at any time.
6. I have the right not to answer any questions that I would not like to answer.

I declare that I agree to the above statements with the understanding that such observations will be used for research purposes and all audio data will be destroyed upon completion of the study.

_____ _____

Teacher's name and surname Teacher's signature

_____

Date

_____ _____

Researcher's signature Supervisor's signature

Appendix D: Information Letter and Consent Form for Parents

Letter requesting permission to carry out research in a Biology lesson.

Dear Parents/Guardians,

I am a student currently reading for a Master's degree in Teaching and Learning Maltese. As part of my course requirements I will be conducting a study on language use in the science classroom with emphasis on the Biology lesson, under the supervision of Dr. Anne-Marie Bezzina. I would like to and would appreciate if you kindly grant me permission to observe two Biology lessons where your son/daughter will be present, as part of this research. The observations will focus on the spoken interaction between the teacher and the student throughout the lesson. With your permission, I would like to audio-record these lessons so as to be able to further analyse the language used. Upon completion of the study these audio-recordings will be destroyed. Kindly note that the teacher will be present at all times and I will have no individual contact with the student and will not disrupt the normal proceeding of the lessons in any way.

Please note that participation in this study is entirely voluntary:

4. All the collected information will be held anonymously and your child's identity and school will not be disclosed at any point.
5. You may choose to withdraw consent at any time without having to provide an explanation for it.
6. Your child also has the right to give his/her assent and may terminate their participation at any time without consequences. No data related to your child will be collected without their assent.
7. If your child refuses to take part, she/he will not be used in the study in any way.

If you have any queries do not hesitate to contact me on 79473961 or by e-mail on leanne.cauchi.13@um.edu.mt, or my supervisor on anne-marie.bezzina@um.edu.mt. I will be happy to answer any questions that you may have. Thank you for your cooperation.

Leanne Cauchi Dr. Anne-Marie Bezzina

Ittra ta' permess għad-dħul fil-lezzjonijiet tal-Bijoloġija

Għeżież Ġenituri/Tuturi,

Jien studenta u bħalissa qiegħda nagħmel il-kors tal-*Masters in Teaching and Learning (Maltese)* fl-Università ta' Malta. Bħala parti mix-xogħol meħtieġ għall-kors qiegħda nagħmel studju dwar l-użu tal-lingwa waqt il-lezzjonijiet tax-xjenza b'enfasi fuq il-lezzjonijiet tal-Bijoloġija, taħt is-superviżjoni ta' Dr. Anne-Marie Bezzina.

Jiena nixtieq u napprezza jekk tagħtini l-permess li nosserva żewġ lezzjonijet tal-Bijoloġija fejn ibnek/bintek ikun/tkun preżenti, bħala parti mir-riċerka tiegħi. L-osservazzjonijiet se jiffokaw fuq it-taħdit bejn l-għalliema u l-istudent matul il-lezzjoni. Bil-permess tiegħek, nixtieq li nirrekordja dawn il-lezzjonijiet sabiex inkun nista' nanalizza l-lingwa użata aktar fid-dettall. Meta nlesti din ir-riċerka ir-reġistrazzjoni se tinqered. Waqt l-istudju l-għalliem tal-klassi se jkun dejjem preżenti u mhux se jkun hemm kuntatt bejni u bejn l-istudenti peress li bl-ebda mod ma jien se nintervjeni fil-lezzjoni li se ssir b'mod normali.

Jekk jogħġbok innota li l-parteċipazzjoni f'dan l-istudju hija kompletament volontarja:

1. L-informazzjoni miġbura se' tibqa' anonima u l-identità ta' ibnek/bintek u l-iskola qatt mhi se tinkixef.
2. Tista' tagħżel li tieħu lura l-kunsens f'kull ħin mingħajr ma tipprovdi spjegazzjoni għal dan.
3. Ibnek/bintek għandu/għandha d-dritt li jagħti/tagħti l-permess u jwaqqaf/twaqqaf il-parteċipazzjoni mingħajr ebda konsegwenza. F'dan il-każ, ebda informazzjoni li jkollha x'taqsam ma' ibnek/bintek ma tiġi użata.
4. Jekk ibnek/bintek jirrifjuta/tirrifjuta li jieħu/tieħu sehem, mhuwiex/mhijiex se jintuża/tintuża għall-istudju bl-ebda mod.

Jekk għandek xi mistoqsijiet tiddejjaqx tikkuntattja lili fuq 79473961 jew permess ta' ittre fuq' leanne.cauchi.13@um.edu.mt, jew lit-tutur tiegħi fuq anne-marie.bezzina@um.edu.mt. Jien lesta li nirrispondi kull mistoqsija li jkollok. Grazzi tal-kooperazzjoni tiegħek.

Leanne Cauchi

Dr. Anne-Marie Bezzina

_____

_____

Consent Form for Parents

I, the undersigned, confirm and declare that Leanne Cauchi has informed me of her research study, and of the need of audio-recording two of my son/daughter's lessons observed. I have had the opportunity to ask any questions to the researcher and her supervisor. I understand that:

1. The lessons observed by the researcher will be audio-recorded.
2. The data collected will be saved on a password protected hardrive.
3. Any data collected will be kept anonymous.
4. My child can withdraw from the study at any time.
5. Any data collected during the study will be destroyed after the study is completed.
6. If my child refuses to take part, he/she will not be used in the study in any way.

I declare that I agree to allow the researcher to be present and audio-record lessons in which my child is present within the understanding that such observations will be used for research purposes and all audio data will be destroyed upon completion of the study.

_____ _____

Child's name and surname Child's class

_____ _____

Parents'/Guardians' name and surname Parents'/Guardians' signature

_____

Date

_____ _____

Researcher's signature Supervisor's signature

Ittra ta' kunsens għall-ġenituri/gwardjani

Jien, hawn taħt iffirmat/a, nikkonferma u niddikjara li Leanne Cauchi informatni bir-riċerka tagħha, u l-bżonn li tirrekordja żewġ lezzjonijiet tal-Bijoloġija tal-klassi ta' ibni/binti li tosserva. Kelli l-opportunità li nistaqsi l-mistoqsijiet meħtieġa lir-riċerkatriċi u t-tutur tagħha. Nifhem li:

1. Il-lezzjonijiet li tosserva r-riċerkatriċi se jiġu rrekordjati.
2. L-informazzjoni se tkun miġbura f'*hardrive* protetta minn kodiċi sigrieta.
3. Kull informazzjoni miġbura se tibqa' anonima.
4. It-tifel/tifla tiegħi jista'/tista' jieqaf/tieqaf mill-istudju f'kull ħin.
5. Kull informazzjoni miġbura matul l-istudju se tinqered ma' tmiem l-istudju.
6. Jekk ibni/binti jirrifjuta/tirrifjuta li jieħu/tieħu sehem fl-istudju, mhuwiex/mhijiex/se jintuża/tintuża għall-istudju, bl-ebda mod.

Jiena niddikjara li nagħti permess lir-riċerkattriċi biex tkun preżenti u tirrekordja l-lezzjonijiet fejn it-tifel/tifla tiegħi se jkun/tkun preżenti bil-fehma li din l-informazzjoni se tintuża biss għal skopijiet ta' riċerka, u se tinqered ma' tmiem l-istudju.

_____ _____

Isem u kunjom l-istudent/a Il-klassi

_____ _____

L-isem tal-ġenitur/gwardjan Il-firma tal-ġenitur/gwardjan

_____

Id-data

_____ _____

Firma tar-riċerkatriċi Firma tat-tutur

Appendix E: Information Letter and Assent Form for Students

Information letter for students.

Hello!

My name is Leanne and I am currently studying to become a teacher. As part of my study journey, I would need to enter two of your Biology lessons and observe the way you and the teacher use language in your class. I also have to audio-record the lesson so that I can listen to what was said during the lesson afterwards.

I will be sitting at the back of the class and will not be taking part in your lessons in any way. I will only be listening to what is being said.

You can stop taking part whenever you want. I will not be speaking to you or taking any photos of you. I will not disturb the normal running of the lesson. I will at no point mention your name or your school in my report. If you refuse to take part, you will not be used in the study in any way. If you have any questions, you can contact me on 79473961 or leanne.cauchi.13@um.edu.mt or my supervisor Dr. Anne-Marie Bezzina on her email address anne-marie.bezzina@um.edu.mt.

If you agree to this, please sign the assent form.

Thank you,

Leanne

Leanne Cauchi

_____

Dr. Anne-Marie Bezzina

_____

Ittra ta' informazzjoni għall-istudenti

Bonġu!

Jien jisimni Leanne u qiegħda nistudja biex insir għalliema. Bħala parti minn l-esperjenza tat-tagħlim tiegħi, se jkolli bżonn nidħol f'żewġ lezzjonijiet tal-Bijoloġija tiegħek u nosserva kif intom l-istudenti u l-għalliema titkellmu bejnietkom waqt il-lezzjoni. Se jkolli bżonn nirrekordja dawn il-lezzjonijiet sabiex inkun nista' nismagħhom sew wara.

Se nkun qed inpoġġi fuq wara tal-klassi u mhux se nkun qed nieħu sehem fil-lezzjonijiet b'ebda mod. Se nkun qed nisma' biss x'intom tgħidu.

Inti tista' tieqaf tieħu sehem f'dan l-istudju meta trid. Jiena mhux se nkun qed nikkomunika miegħek jew nieħu xi ritratti tiegħek. Mhux se nkun qiegħda niddisturba l-lezzjoni b'ebda mod. Mhux se nsemmi ismek jew isem l-iskola fir-rapport tiegħi. Jekk tirrifjuta li tieħu sehem, m'intix se tintuża għall-istudju bl-ebda mod. Jekk għandek xi mistoqsijiet, tista' tikkuntattjani fuq 79473961 jew leanne.cauchi.13@um.edu.mt jew it-tutur tiegħi fuq anne-marie.bezzina@um.edu.mt.

Jekk taqbel ma' dan, jekk jogħġbok iffirma l-formola ta' parteċipazzjoni.

Grazzi,

Leanne

Leanne Cauchi

_____

Dr. Anne-Marie Bezzina

_____

Assent form for students

I, the undersigned, confirm that Leanne Cauchi has spoke to me about her study and the need to audio-record two of my Biology lessons. I had the opportunity to ask any questions about the study to Ms. Leanne and her supervisor. I understand that:

1. The lessons observed will be audio-recorded.
2. She will be sitting at the back of the class and will not be taking part in my lessons in any way.
3. I can stop taking part whenever I want.
4. I will not be spoken to and no photos will be taken of me.
5. My name or the school's name will not be mentioned in her report.
6. If I refuse to take part, I will not be used for the study in any way.

I agree to the above statements and with the understanding that the data collected will be used only for research purposes and will be destroyed when the study is completed.

Thank you,

Leanne

_____ _____

Your name and surname Your class

_____

Date

_____ _____

Researcher's signature Supervisor's signature

Ittra ta’ permess għall-istudenti

Jien, li ffirmajt hawn taħt, nikkonferma li Leanne Cauchi kelmitni dwar ir-riċerka tagħha, u l-bżonn li tirrekordja żewġ lezzjonijiet tal-Bijoloġija tal-klassi tiegħi. Jien kelli l-opportunità li nistaqsi l-mistoqsijiet lilha jew lit-tutur tagħha. Nifhem li:

7. Il-lezzjonijiet li tosserva r-riċerkatriċi se jiġu rrekordjati.
8. Hi se tkun bilqiegħda fuq wara tal-klassi mingħajr ma tipparteċipa fil-lezzjoni.
9. Jiena nista’ nieqaf nieħu sehem meta rrid.
10. Ir-riċerkatriċi mhux se tkellimni jew tieħu ritratti tiegħi.
11. Ismi jew isem l-iskola qatt mhux se jinkixef.
12. Jekk nirrifjuti li nieħu sehem, jien m’iniex se nintuża għall-istudju bl-ebda mod.

Jien niddikjara li naqbel mal-punti ta’ hawn fuq bil-fehma li l-informazzjoni miġbura se tintuża għall-iskopijiet tar-riċerka u se tinqered ma’ tmiem l-istudju.

Grazzi,

Leanne

_____ _____

Ismek u kunjomok Il-klassi tiegħek

_____

Id-data

_____ _____

Firma tar-riċerkatriċi Firma tat-tutur

Appendix F: Feedback Session Questions

Feedback Session: Questions for Teachers

1. Do you feel more comfortable speaking in English or Maltese in your daily life?
2. Which language is predominant in your school?
3. What is your opinion about the use of code-switching/translanguaging in the classroom, especially in those subjects which are examined in English not Maltese?
4. If code-switching was present in your lessons, state the reasons why you felt the need to make use of it.
5. Do you think that your students feel more comfortable expressing themselves in English or Maltese?
6. What is your opinion about Biology examinations being solely in English? Do you think this hinders particular students in some way?
7. Do your use of language and code-switching practices change according to which students or classes you are teaching?

Appendix G: Field Notes Sheet

School:

School Sector:

Date of Recording:

Time of Recording:

Length of Lesson:

Language used most:

Code-switching uses	
For understanding	
To explain scientific terms	
To discipline students	
Classroom management	
Introduction of new topics	
To create a relaxed atmosphere	
In informal situations	
To build a rapport with students	

Other code-switching uses:

_____
_____

Code-switching used mostly by teachers or students?

_____

_____

What resources were used during the lesson?

_____

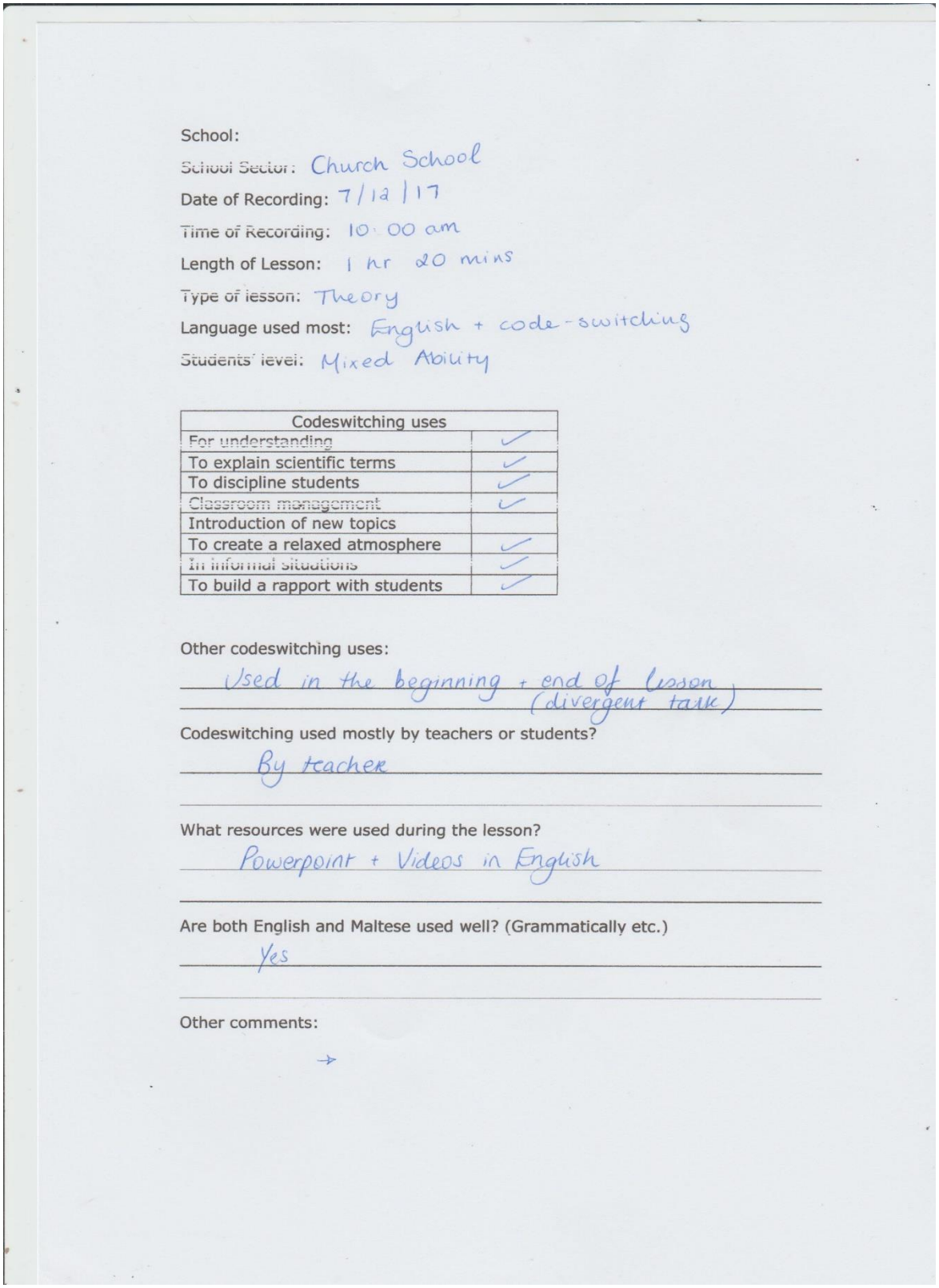
Are both English and Maltese used well? (Grammatically etc.)

_____

_____

Other comments:

Appendix H: Field Notes Sheet – Example



School:

School Sector: Church School

Date of Recording: 7/12/17

Time of Recording: 10:00 am

Length of Lesson: 1 hr 20 mins

Type of lesson: Theory

Language used most: English + code-switching

Students' level: Mixed Ability

Codeswitching uses	
For understanding	✓
To explain scientific terms	✓
To discipline students	✓
Classroom management	✓
Introduction of new topics	
To create a relaxed atmosphere	✓
In informal situations	✓
To build a rapport with students	✓

Other codeswitching uses:

Used in the beginning + end of lesson (divergent task)

Codeswitching used mostly by teachers or students?

By teacher

What resources were used during the lesson?

Powerpoint + Videos in English

Are both English and Maltese used well? (Grammatically etc.)

Yes

Other comments:

→

7/12/17.

[redacted] 2nd Recording.

Start of lesson - before theory starts - Maltese.

When theory starts she switches to English.

'Notes Miftuhin!' - Switches to Maltese during her English speech.

'Dal-video ha jurina fiit fuq discovery of learning' - 3:00.

Student - Meta skopruha..? - Teacher answers in MLT - accomodation.

Some brief explanation during video - English.

Explanation in Eng. but 'Ejja ha nakaw' - 7:00.

8:10 - Have organisation.. gifieki bazikament ... (Explain in MLT).

9:00 - Mijach .. hijacu gatt mhi xi haga sabiha. Comments in Maltese.

Student asks about exam & other student 'kif bdiew il-virwes?' - In Maltese - teacher did not answer.

English .. xi nadd jiftakar .. (11:45). Eng → MLT.

Exp of scientific term - Qatt rajtu rukkell hajt? 13:00 - Making abstract terms familiar to students + explanation to students in MLT but biological terms in English. organisms, instructions.

Issa I see it with the rest of the class - 15:30

~~Si Student~~ Student speaking in recording - with LSA

Students between themselves - 16:25 - Int in kartta?

18:20 - Jemm jista' jkun inissu ma' xulxin mhux awtoppig.

Teacher - Explaining to students by going round class (to draw a diagram) - Maltese mostly.

19:50 - Student asks in Maltese, teacher answer in Eng, when she sees that it is still not clear she switches to Maltese.

Appendix I: Transcription Conventions

/,//,///	Pause: brief, average, long
:, ::, :::	Length of syllable: lightweight, average, very affected
Underlining	Overlapping of speech
↗	Interrogative intonation
-	Abandoning of word
=	Removal of a sound or syllable, normally due to a typical oral pronunciation
< >	Comments <laughs, inaudible, attitudes (ironic, mocking), gests, tonal indications ...>
(?)	Uncertainty as to the interpretation of the recording
XXX	Every X represents an inaudible syllable
…	Beginning and end of sequences belonging to a language other than the dominant language of the interaction
CAPITAL	Syllables or words with an accent of intensity and insistence

Key

T1 – Teacher + number of utterance

Sa1 – Student + differentation between students + number of utterance

R - Researcher

Appendix J: Transcription – State School 1

T1:	*mela ilħqu oħorġu t-testijiet li kelli nippikkja / s-* signature *tagħhom / oħorġu n-* notes *hawn ħi <directed towards student who is showing the teacher a paper> le ma lħaqtx ikkoreġejtu bdejt nikkoreġi l- *pastpapers *u kważi kkoreġejt ta' kulħadd // issa // mela //
Sa1:	Miss * il-* homework *għal-lum kien↗
T2:	*le le le għal *next lesson // *il-basktijiet poġġuhom fir-* rack
Sb1:	Miss *il-* homework *dak li kellna npinġu (?)
T3:	*ara l-importanti li tagħmlu l-* labelling *mhux jiġri bħal* homework *ta' qabel tiftakar qabżitilkom u ma ndunajtux biha // sibu wkoll il-karta tal-* glossary *ħa nibdew biha*
Sc1:	*Għadna m'għamilna xejn imma*
T4:	*le le le ta' dat-* topic *għadna m'għamilna xejn*
Sd1:	Topic 7↗
T5:	*iva* topic 7 *dan // ejja Jacob ħa nibdew <directed towards student who walks in late> ejja oħroġ it-test ħalli issa ndur u niċċekkjah / mela sakemm // dawn itellfukom l-affarijiet hawn fuq il-* bench <teacher leaves some personal items on desk and asks students if it bothers them> //
Sd2:	Miss *il-* pastpapers allright *kollox sew↗*
T6:	Ee *kważi lesti kollox baqagħli l-aħħar ftit ħa nżommhom ħalli ngħaddi il-* comments *kollox f'daqqa // mela // il-karta tal-* glossary *ijsa u ħa nduru wkoll it-test <teacher goes round the classroom checking that everyone got their work> mela tiegħek kollox sew Maya↗ tiegħek ukoll↗ *allright* tajjeb↗ eħe tagħkom *allright↗*
Sa2:	Miss *tiegħi mhux iffirmat*
T7:	*hemm xi raġuni għala mhux iffirmat↗*
Sa3:	*għax* miss (?)
T8:	Allright allright *mela rrid narah* Monday // issa
S:	<students' interactions while the teacher is going round the class are in Maltese>
T9:	Right *ejja ħa nibdew / l-ewwel kelma hija* node / what is the node↗ *min se jispjegali x'inhi l-kelma* node↗
Sb2:	*qisha dik li toħroġ mill-* istem↗
T10:	Okay *mela huwa l-post minn fejn se jkolli l-* leaf *jew inkella l- *bud *se tkun imqabbda magħha
Sa4:	Miss *dawn qegħdin fin- *notes↗
T11:	*iva mela ħi mhux dejjem kliem min-* notes *inkunu qed nirrevedu↗ / mela* the next one / the next one *hija* internode *rajna x'inhi n-*node *issa* internode Maya↗
Sa5:	Ee l-* angle *ta' bejn il-X u in- *node*↗
T12:	Not exactly no it's not an angle / Thomas↗
Sd1:	Miss the point between the node and the stem↗

T13:	Not exactly / the internode / what does the word inter mean↗
Sd2:	in↗
T14:	Inside *jew inkella↗ spjegali*
Sd3:	*biċċa mill-i *stem* qisha n-* node *qiegħda fiha↗
T15:	No no it's much simpler than that
Sc2:	The inside of the leaf↗
T16:	It's the distance between one node and ANOTHER // *bejn* node *u oħra ġifieri bejn werqa u oħra / tafu li fiz-zokk il-weraq ma jkunux imwaħħlin kollha fl-istess post tajjeb↗ / mela d-distanza bejn werqa u ta' fuqha jew ta' taħta ngħidula l- *internode*
Sc3:	*fejn kien hemm il-* bracket↗
T17:	*eħe* it's not exactly an angle it's not exactly a point it's a distance between two sucessive nodes / so / the next one is the bud / what is a BUD ↗ Cassie↗
Se1:	*meta il-pjanta tkun għadha ma kinitx fjura tkun għadha *baby*
T18:	*mela jekk qed tgħidli għadha ma kibritx fjura mela l-* bud *x'inhi↗
Se2:	*ee ikollha dawk insejt x'inhuma*
T19:	*qed nuża l-kliem tiegħek stess / għadha se ssir fjura il- *bud* x'inhi↗
Se3:	*għadha ma kibritx*
T20:	*għadha trid tiżviluppa
Sd4:	Premature↗
T21:	It's a PREMATURE flower *għadha* protected *mill-istrutturi / issa nsemmihom ukoll* so the bud is a small swelling *tibda qisha b'nefħa żgħira* at the node *li jista' jkun fiha biex inkunu aktar eżatti apparti li tista' tkun fjuri tista' tkun ukoll werqa li għad trid toħroġ minn fuq iz-zokk jew xi fergħa oħra mela* it's a small swelling at the node which contains *an undeveloped shoot * jew *a flower*
Se4:	Undeveloped shoot *kelma oħra ġifieri*↗
T22:	*eħe* yes *mela il-* xylem *x'kien↗ fejn jinsab il-* xylem *x'inhu xogħlu↗ nixtieq nisma' lin-naħa ta' wara wkoll
Sf1:	*in-naħa tal-* female↗
T23:	*il-* xylem *in-naħa tal-* feminine ee no not really *m'għandhiex x'taqsam mal-* male *jew mal-*female* // x'inhi↗ <asks student who said something which was not recognisable>
Sg1:	*qiegħda fin-naħa t'isfel↗*
T24:	*in-naħa t'isfel ta' xiex↗ tal-fjura↗* nono it's totally not
Sh1:	*iġġorr l-ilma min-naħa għall-oħra↗*
T25:	*il-* xylem *prosit huma dawk il-* vessels *li minnhom se jgħaddi L-ILMA / minn liema direzzjoni għal-liema direzzjoni↗
S:	Minn isfel għal fuq

T26:	MINN ISFEL GĦAL FUQ ġifieri mir-* roots* biex jitla' lejn il-*leaves* u l-bqija tal-pjanta mela *the vessels that carry water through a plant* għadna naqra bis-sadid wara l-* Christmas holidays <students laugh>
Sg2:	Miss *il-* xylems *dawk li hemm hemm fuq↗*
T27:	*pinġejthom fuq il-bord jekk tiftakru l-aħħar darba qishom żewġ pajpijiet tajjeb↗ għedna li d-direzzjoni tal-moviment ġo fihom ikun 'il fuq
Sg3:	Ee *għedna tal- *phloem* imbagħad
T28:	*issa tini sekonda għax dik hija *the next step* // mela il-* phloem *xi ħadd li għadni ma smajtx xi ħadd minn hemm wara ejja*
Si1:	Ee *li jġorr l-affarijiet minn fuq il-pjanta↗*
T29:	*minn fuq il-pjanta minn liema parti speċifikament↗ min jagħmel l-ikel fuq il-pjanta↗
Si2:	*il-weraq*
T30:	*IL-WERAQ mela l-* phloem *huma dawk it- *tubes *li jġorru l-ikel madwar il-pjanta issa jista' jkunu partijiet oħra tal-pjanta pereżempju l-fjuri / issa l-ikel biex inkunu aktar eżatti jkun *in the form of glucose* biex norbot ma' diffikultà li rajt fil- *pastpapers* ma niftakarx ta' min eżatt / L-IKEL meta jkun qed jittravilja fil-pjanta ma jistax jittravilja *in the form of starch *bilfors* in the form of glucose* għax huwa *insoluble* għax huwa *insoluble it cannot travel it has to be in solution
Si3:	Miss *irid ikun* glucose *biex XX↗
T31:	*biex ikun* soluble *ħalli jinħall fl-ilma* imbagħad meta jiġi storjat jinbidel bħala ee *structure* mela* the next step *hija* transpiration *x'kienet tfisser din↗ ma dħalnix fid-dettal fiha din għax għedna s-sena d-dieħla u iktar tard din is-sena se nitkellmu aktar dwarha*
Sg4:	Exchange of gases↗q
T32:	No *kun aktar speċifiku* it's not the exchange of gases *x'kienet* transpiration↗
Si4:	Ee the evaporation of water from the roots
T33:	Okay *allura kellha x'taqsam mal-moviment tal-ilma li ġej mill-* xylem *għedna l-moviment tal-ilma li tela' minn ġor-*roots* u tela' minn ġol-* xylem* għall ġol-* leaves *għal barra *it's a cycle *għandna nirreferu għaliha bħala* transpiration / it's the movement of water through a plant from the roots to the leaves and out // *mela l-aħħar żewġ kelmiet* // pollination↗
Sg5:	miss *ġifieri* transpiration↗
T34:	Transpiration *huwa l-moviment tal-ilma għax aħna għedna li l-ilma li jidħol fir-* roots *mhux bilfors kollu jintuża għal *photosynthesis* ikun tela' fil-*leaves* imbagħad minħabba li hemm is-* stomata *miftuħin biex jidħlu l-* gases *bħall-* carbon dioxide *u* oxygen / *inti għandek qisu bieb miftuħ li awtomatikament bla ma trid qed jaħrablek l-ilma minnu tajjeb↗ / mela* pollination↗ għidli James
Sj1:	*meta l-insetti jibdew imorru minn fjura għal oħra↗*

T35:	*sewwa* is it something that is necessarily carried out by insects pollination↗ // no *mela l-importanti allura mhix il-kelma* insects
Sj2:	*allura* is it sexual reproduction↗
T36:	It's not sexual reproduction *għax għad baqa' xi jsir hija neċessarja biex issir / huwa *the transfer of pollen* issa jekk hux bl-insetti jew bir-riħ dak huwa dettall *extra allright↗* / mela *it's the transfer of pollen by means of wind or insects to fertilise the ovules* tinsewx ee x'għedna li mhux imbilli ġie trasferit il-* pollen *jekk il-* pollen *tal-* hibiscus *waqa' max-xitel tar-* roses *ma ġara xejn b'daqsekk* fertilisation *mhux se ssir għax inti l-* pollen *il-* male sex cells *iridu jiltaqgħu ma' *female sex cells* tal-istess tip ta' pjanta tajjeb↗ / issa l-aħħar terminu / ktibtuh għax irrid indawwar l-islajd↗ / mela* the next term is nectar what is nectar↗
Sj3:	*l-* insects *imorru għalih↗*
T37:	*l-* insects *imorru jiġbruh tajjeb u x'jagħmlu bih għal xiex imorru għalih↗
Sj4:	*biex jikluh*
T38:	*biex jikluh għax huwa* a sugary solution yes *li huma għandhom bżonnu biex jikluh biex jagħmlu l-għasel tajjeb↗ però li bis-saħħa tiegħu l-insetti jkunu attirati lejn↗ il-fjura / ġifieri l-fjura m'għandha l-ebda skop li tipproduċih in-* nectar *sempliċiment qed tipproduċih biex ikollha *an added attraction *għall-insetti tajjeb↗ mela għandna* the sugary solution found at the base of petals of insect pollinated flowers e *dawk li jiġu* pollinated *mir-riħ mhux* worth it *għalihom li jinvestu l-enerġija u jipproduċu n-* nectar *daqs kemm mhux* worth it *għalihom li jipproduċu *brightly coloured flowers* però b'*insect pollinated flowers* bis-saħħa tiegħu jiġu l-insetti u allura* pollination *tkun tista' sseħħ // mela issa ma' dawn il-kelmiet ma qgħadtx inżid fil-lista l- *petals and so on* partijiet differenti tal-fjura / ir-raġuni hija kienet se tkun eżatt eżatt *repetition* ta' dak li għamilna fin-* notes* però enfasizzajniha li tridu tkunu tafu d-* diagram* tpenġuh tillejbiljawh u tagħmlu *annotations* fuqu ġiferi nispera li kien parti mir- *revision* tagħkom
Sj5:	Miss *imma jekk ikun hemm* pollinated flower *jista' jkun ikun hemm ir-riħ u jmexxi kollox↗*
T39:	*JISTA' jkun li r-riħ imexxi l-* pollen *però l-fatt li għedna pereżempju li s-*stamens *is-* stigma* jkunu qegħdin 'l isfel fil-fjura BIEX xħin tiġi n-naħla jkollha tħokk miegħu tajjeb↗ *its' very unlikely* li se jirnexxielu jinġarr*
Sj6:	*li qed ngħidlek jien li jitfa' kollox fuq fjura oħra*
T40:	*jittrasferixxi l-* pollen* ta' fjura oħra jista' jkun imma ma nafx kemm se jkun *accurate* / mela ħa nsib is-slajd li wasalna fiha sibu n-* notes please// mela din lestejtuha kollha suppost/*
Sa7:	Miss *il-kompjuter irid jagħmillek* restart
T41:	*ijja ijja ndunajt issa jagħmel *restart* meta jrid / mela iċċekkjaw *please* jekk din l-islajd kulħadd għandu kompluta // ħalli nagħmel li jmiss mela fl-islajd li jmiss insertajna li għandi vidjow / mela isimgħu attenti hawn *please <students watch video> <during video> endosperm *huwa l-ikel merfugħ fiż-żerriegħa* <video ends> okay *mela vidjow li nisperaw li għenna *number one revision* ħafif ta' dak li konna għamilna fil-* lessons *li għaddew anki fil-bidu tal-* lesson *u t-

	tieni jgħinna nimmaġinaw x'se nkunu qed nitkellmu dwaru minn hawn u ftit ieħor tajjeb↗ id-differenzi bejn *pollination *it-tipi differenti ta'* pollination *x'jiġri meta jseħħ *pollination *biex isir *fertilisation *eċċetra mela* any difficulties *f'dak li rajna jew li ma fimniex↗ kien hemm xi *extra details pereżempju li hemm *nuclei *differenti fil-* pollen*
Sa8:	*u l-* endosperm↗
T42:	*le l-* endosperm *insemmuha fi kliem ieħor imma nsemmuha / imma hemm xi dettal *extra* li ma nsemmuhx fl-* explanation *imma issa *you'll see as we go along* li *it was not that important* // MELA *pollination *għenda li tfisser jew tirreferi għat-* transfer of pollen* u rajna li għandna żewġ tipi *Cross-pollination *u* self-pollination *għandna l-istampa* allright↗ *jekk il-fjuri għandha iż-żewġ tipi ta' *organs *il-* male *u l-* female organs *u l-* pollen *ta' dik il-fjura jiġi *transferred *għal fuq l-i *stigma* ta' dik l-istess fjura tajjeb↗ u tirriżulta f'* fertilisation *għax hemm pjanti li ma jippermettux ee li l-fjura ddakkar lilha nnifisha JEKK *fertilisation* issir hemmhekk ngħidu li għandna *self-pollination* JEKK il-* pollen *mill-banda l-oħra ta' fjura jiġi* transferred *għal fuq fjura oħra tista' tkun fl-istess xitla allura għandna il-* Cross pollination tajjeb↗
Sj7:	Miss *allura l-fjuri li jagħmlu* Cross-pollination *mhux se jagħmlu* self-pollination
T43:	*JISTA' JKUN li jippermettu imma tgħidli la għandek l-istrutturi kollha kif ma jippermettux↗ jista' jkun li biex iżżid il-* variation *dan bħal meta ngħidu jekk għandek ġuvni u tfajla ngħidu ma nħallux il-kuġini jekk jista' jkun joħorġu flimkien għax id-difetti tal-familja ħa jibqgħu fl-istess familja* and it's the same thing with nature *jekk jista' jkun inħalltu ma' fjuri minn pjanti oħra*
Sa9:	*għax jekk ikun hemm xi* virus *pereżempju*
T44:	*mhux* virus *iktar milli* virus *iktar *genetic problems genetic defects* fimt↗ għidli Jake
Sk1:	*allura l-* filament *għala qiegħed↗*
T45:	*mela sekonda l-* filament *hija DIN il-parti <points at diagram on board> *just* is-sapport issa l-iskop tagħha hu li tgħolli din il-parti daqsxejn 'il barra għax inkella ara x'se jiġri jekk din kienet qasira s'hawn isfel mhux se tħokklu ma żaqqu lill-insett u aħna rridu jekk jista' jkun li l-insett jidħol 'l hawn isfel biex imbagħad il-* pollen grains *jeħlu ma' ġismu tajjeb↗ xi diffikultà oħra↗ / mela dak kien id-* diagram *li għandkom ukoll fin-* notes *mela* pollen is transferred from the anther to the stigma of another plant *jew inkella* another flower of the same species għandna *Cross-pollination* jekk għandna *the pollen is transferred to the stigma of the same plant *għandna* self-pollination *bħalma diġà għedna l-vantaġġ ta'* Cross-pollination *huwa li* it favours variation allright↗
Sk2:	*tvarja bħala liema* species XX↗
T46:	*le ma jfissirx żomm naqa ma rridx ninftiehem ħażin li* one species *tista' ddakkar pjanta ta' speċi oħra da= qisni qed ngħid kelb u żiemel ma jistax ikolli t-tfal ta' kelb u żiemel għax mhux possibbli imma fjura pereżempju l-* hibiscus *ħamra eżempju ddakkarlek *hibiscus* li hija pereżempju safra nistgħu noħorġu fjura li hija kulur ieħor jew eżempju toħroġ* orange *jew inkella ħamra bl-isfar tkun qed toħloq *variation / *xi ħadd minnkom kellu diffikultà↗ għidli

Si5:	*nista’ mmur it-tojlit↗*
T47:	*mur malajr ijsa / mela xi ħaġa li tellajtha qabel ma lhaqt staqsejta kienet x’* disadvantage *xi żvantaġġ taħsbu li hemm meta inti għandek *Cross-pollination* ġifieri qed tgħid li l-pjanta biex ikun hemm *fertilisation *u jirnexxielha jkollha t-tfal bilfors li l-* pollen irid imur minn pjanta għall-oħra jew minn fuq fjura għall-oħra / u bħalma qed taraw hemm <points to picture on board> *it is very risky *għax inti biex il-* pollen *qed imurlek minn fuq fjura għal fuq oħra qed tiddependi minn insett jew mir-riħ * / BY THE WAY pollination Cross-pollination jew self-pollination *għalkemm il-fjura qed turi* insect pollinated *tista’ wkoll tapplika għal* wind *ġifieri nkunu ċari fil-biċċa ee* that is very risky *għax inti m’għandekx garanzija li il-* pollen *se jirnexxielu jmur // il-pjanta għandha *pollen *regolari imma ara kemm trid tipproduċi aktar biex inti sserraħ moħħok li l-* fertilisation *se ssir u din id-differenza ħarġet id-darba l-oħra xħin konna qed nitkellmu fuq *wind pollinated *u* insect pollinated *għedna fil-* wind *għax jiddependi iktar miċ-ċans iridu jipproduċu aktar* pollen *MELA fir-rigward ta’ *self-pollination *l-* advantage *huwa effiċjenti l-* pollen* m’għandux distanzi twal x’jittravilja*
Sk3:	*l-eżami (?)*
T48:	*x’inhu↗ ma fhimtekx ta’*
Sk4:	*l-eżami kemm se jkun twil↗*
T49:	*bħala ħin↗*
Sk5:	*Eħe*
T50:	*sagħtejn // mela* it’s very efficient *għax il-* pollen *m’għandux distanzi twal x’jitravilja però d-* disadvantage *tiegħu huwa li *variation is not favoured <bell rings> *di= l-ewwel waħda imma hux↗*
S:	Mhm
T51:	*MELA* variation is not favoured *mela jekk hemm xi difett fil-pjanta pereżempju ma tiflaħx ħafna għas-sħana jew in-nuqqas ta’ ilma / meta jiġilek staġun li m’għamlitx ħafna xita jew it-temperaturi telgħu ħafna / attenti hawn* please <directed towards students who are speaking to each other> *ikunu* likely *li jmutu* any difficulty↗ *nista’ nkompli↗ mela għandna* handout two *nagħmluha għal *Thursday *bħal-lum ġimgħa mela għandna *handout one* għal *Monday *u* handout two *għal* Thursday //*mela ejja nassumu li saret* pollination *permezz tal-insetti permezz tar-riħ* whatever *il-* pollen *ġie* transferred *fuq fjura adattata / illandja fuq l-i* stigma *u* what’s the next step issa↗ *u ħa naraw xi ħaġa li l-vidjow introduċiena għaliha
Sk6	*tat-* tube *haw= it-* tube
T52:	*x’ngħidulu dak it-* tube ↗
Sk7:	*ee dak tat-* tube cell
T53:	*il-* pollen tube *ħa nirreferu għalih hekk għax* that is a bit of an extra detail *se jibda jiżviluppa l-* pollen tube *mill-* pollen *u għalfejn għandu jiżviluppa l-* pollen tube↗ / *biex il-* male sex cell *minn fuq tkun tista’ tinżel isfel u tiltaqa’ ma’ xiex↗

S:	*mal-* ovule
T54:	*eżatt mal-* ovule / *issa dak id-* diagram *hemmhekk u li intkom għandkom in-* notes *tiegħu* I suggest you learn how to draw it / it's NOT A MUST *però fl-eżami jew f'xi* tests *jew fl-eżami ġieli tiltaqgħu mal-* question *pereżempju SPJEGALI x'jiġri wara li ssir* pollination using a diagram or otherwise *mela hu qed jgħidli spjegali bl-aħjar mod possibbli għalik x'jiġri wara li ssir* pollination *u* diagram *tiskanta jnaqqaslek il-bżonn li tgħid ċertu paroli bil-miktub / ħa jiffrankalek il-ħin u inqas hemm ċans li tikkontradixxi lilek innifsek / mela int qed iħallik* free *jew ħaġa jew b'oħra issa *it's up to you but I suggest you learn it okay↗* MELA* so when pollen falls on the stigma of a flower of the same species a pollen tube grows down the style *imbagħad kif għedtuli intom ukoll dan il-* pollen tube *se jservi ta'* channel *biex il-* male gamete *tinżel u tiltaqa' mal-* ovule *issa hemmhekk fl-istampa għamilna* for simplicity's sake ovule *waħda*
Sk8:	*kemm ikun hemm issoltu ġifieri↗*
T55:	*tvarja tvarja iktar m'għandek* ovules *pereżempju jekk taqsam tuffieħa minn nofs ma jkollkomx dik il-biċċa tan-nofs qisha* plastic *ngħidilha jiena / nispiċċaw narmuha jew hekk / dik il-biċċa tan-nofs jekk toqgħod tosserva ħa tara xi ħaġa hekk qisha forma ta' <notices she has no marker> ma ġibthomx miegħi hawn xi ħadd għandu* marker *inti xħin qsamt it-tuffieħa ġietek xi ħaġa hekk <draws on board> u tara din il-parti tan-nofs ĠO fiha jkun hemm is-* seeds *issa ġieli jkun hemm tlieta ġieli jkun hemm erbgħa hemm ċertu frott bħan-naspli jkollhom waħda biss dawk qishom lanġas żgħir in-naspli / SKONT / ejja ngħidu li jiena sibt tlieta żerriegħat dak ifisser li bilfors hemm tlieta* ovules↗ *ir-risposta hija LE għax inti jista jkun għall-argument kellek sitt* ovules *u ġew* fertilised *biss ERBGĦA / tnejn minnhom ma ġewx* fertilised *u dawk it-tnejn li ma ġewx* fertilised *mhux se jifformaw żerriegħa mela* we're only seeing *hemmhekk dawk l-* ovules *li ġew* fertilised *qed niftiehmu↗ u dak in-numru jista' jvarja anki mill-fjuri tal-istess pjanta ISSA * so once fertilised the ovule becomes the seed *is* seed *li għadna li hija l-istruttura li jkollha l-* baby *tal-pjanta IL-* CARPEL *il-* female structure *se ssir il-frotta
Sk9:	*kollha ġifieri*
T56:	*eħe* allright↗ *din il-parti iva se tiżviluppa u ssir frotta / infatti ma nafx qatt tajtux kas meta jkollok il-fjuri jkunu <u>xi jkunu*</u>
Sk10:	*<u>Imma mhux kollha jagħmlu le*</u>
T60:	No no it's not a must but in certain species
Sk11:	*x'inhu l-iskop li jkollok il-frotta↗*
T61:	*mela li saqsieni Thomas huwa x'inhu l-iskop li jkollok il-frotta / minn hawn u ftit ieħor se naraw* the petals the sepals the stigma and style will X away* mela għandek JEKK se tiżviluppa l-frotta l-* carpel *kollha se ssir il-frotta JEKK le f'każ li ma ssirx il-frotta l-kumplament tal-* carpel *il-petali u l-affarijiet l-oħra tal-fjura se jaqgħu* any difficulties↗
Sa10:	Miss *inti għedt jista' jkun hemm erbgħa* fertilised↗ ee hu fih il-* gametes *uu ee il-* pollen

T62:	*ee meta kien hemm il-* pollen *dak kien dettal *extra* injorah inti fil-* pollen *għandek in-* nucleus *li se jinżel biex jiltaqa' mal-* female gamete *tidħolx fiha għax dik* beyond O-level* issa mela l-aħħar parti / l-frotta l-iskop tagħha huwa li se tgħin fid-* dispersal tas-* seed // *l-iskop tal-frotta hu li tgħin fis-* seed dispersal
Sl1:	Miss *nista' nixrob↗*
T63:	*illum qegħdin imċaqalqin waħda sew qiskom* <students laugh> // mela l-frotta l-iskop tagħha hu li se tgħin fid-* dispersal *għax issa mhux imbilli pproduċejna ż-żerriegħa ż-żerriegħa ħa tibqa' fil-post tal-ġenituri x'taħsbu↗ għalfejn għandu jkolli *dispersal↗
Sa11:	*ħalli qatt ma tiġi* extinct
T64:	*le le l-fatt li pproduċejt iż-żerriegħa diġà pproduċejt iktar minnha issa l-kwistjoni hi / għalfejn għandek tferrixha ż-żerriegħa↗ jaqbillek tkabbarha taħt l-istess post↗
Sl2:	Miss *għax jekk ikellek dawn li qed ikabbru ftit u dawn li qed ikabbru ħafna*
Sa12:	*għax jekk ikollok is-* soil *li ma jkunx tajjeb hekk ħa jibqa'*
T65:	*mela x'hu importanti li jkollok bejn il-pjanti li qed jikbru fl-istess post↗*
Sa13:	*ir-* roots *ma jkollhomx ħafna ilma hekk imma hux↗*
T66:	*ilma biss↗*
Sa14:	*u* nutrients:
T67:	*se jkollok mela* COMPETITION *araw ftit* please *HEMM WARA HEMM WARA <directed towards students speaking to each other> mela għandna in-nutrijenti, ix-xemx, l-ilma li jridu jixxerjaw bejniethom mela allura se jkollok il-kwistjoni tal-* competition *il-* parent *se tispiċċa tikkompeti mat-tfal tagħha stess u f'din il-* competition who's likely to win↗
S:	*il-* parent
T68:	*għax hi ikbar mela jekk niġu fil-kwistjoni li nikkompetu għad-dawl għall-* photosynthesis *din qiegħda iktar 'il fuq allura min qiegħed taħt ma tantx ħa jkun* exposed *għad-dawl / jekk se niġu għan-nutrijenti biex nassorbu mill-ħamrija l-* parent *għandha iktar għeruq aktar* extensive *mela* the parent is mostly likely to win / *U JEKK tgħixlek il-* parent *u jmutu t-tfal x'se jiġri↗*
Sa15:	*qisek qed tuża l-enerġija għalxejn*
T69:	*mela qed teħli l-enerġija ta' xejn u t-tieni* the parent is the older *fis-sens waħda hemm mela allura *you're beating the whole purpose of it all if you're not dispersing the seed *mela xi ħadd jixtieq iżid xi kumment fuq din↗ // mela allura hawn għandha d-* diagram *sempliċi li qed jgħaqqdilna s-* cycle *kollha flimkien
Sa16:	Miss *tadama dik↗* <referring to diagram>
T70:	*iva tadama dik* the tomato is not *ħafna jsibuha diffiċli biex jaċċettawha din it-* tomato *mhijiex ħaxixa imma frotta*
Sk12:	Miss *ġifieri s-* seple *ma jaqax↗*
T71:	*is-* seple *jista' jkun li TINŻAMM bħala parti miz-zokk imma m'għandhiex funzjoni aktar fl-i* structure as such *mela kellna l-fjura / saret* fertilisation *għandna l-i* structures *li qegħdin

	jinxfu l-* filamen *il-petali tajjeb↗ / l-* ovary *fejn kelli l-* fertilised ovules *bdiet tikber u tiżviluppa tajjeb↗ u żviluppat il-frotta tajjeb↗ ISSA x'se jiġri minn hemm↗ ħa naraw il-ħendawt
Sk13:	*il-ħendawt kollha↗*
T72:	*u ejja qatt ma jkunu twal il-ħendawts ejja għal* next lesson // *mela* now we're going to talk about dispersal *tinsewx issa qed nitkellmu fuq* dispersal *tas-* seed *mela* after fertilisation the seeds need to be dispersed away from the parent plant otherwise the young and underdeveloped plant will have to compete for resources against the well-developed parent *xi ħaġa li kontu qed issemuhieli intom stess importanti dawn it-* terms please dispersal, competition okay↗ *biex jgħinukom tispjegaw lilkom infuskom
Sg4:	Dispersal eee *biex jitbiegħdu↗*
T73:	Dispersal *tferrex =ġifieri / ISSA* so who is going to help the plant in this dispersal↗
Sk14:	The wind↗
T74:	*jista' jkollok ħafna fatturi l-* wind *pereżempju*
Sk15:	*l-* insects
T75:	*għandkom l-istampa minjaf kemm il-darba għamiltuha*
Sk16:	Birds:
T76:	Birds how do they help↗
Sk17:	Eee because they eat the seeds↗
T77:	*allura isimgħu din qalli s-* seeds *jieklu l-frotta bażikament dak hu l-iskop tal-frotta / huma jieħdu pjaċir jieklu l-frotta hija* sweet *qatt ma rajtu eżempju tmur taqta' l-frott fil-ġnien u jkun qisu mtaqqab ↗ l-għasfur jew l-annimal ikun diġà prova jiekol minn dik il-frotta / kieku kielha kollha l-għasfur mhux se joqgħod jagħżel iż-żerriegħa mill-frotta mhux hekk↗ bela' kollox / iż-żerriegħa se jiġrilha xi ħaġa ↗ iż-żerriegħa mhu ha jiġrilha xejn qisu aħna kilna tuffieħa u blajna ż-żerriegħa mhu ha jiġrilha xejn SEMPLIĊIMENT però aħna wara li nieklu wara ċertu ħin morna t-tojlit u battalna fl-istess post imma l-għasfur mhux fejn kiel ħa joqgħod jistenna / se jkompli jtir u jagħmel x'imkien ieħor / U DIK IŻ-ŻERRIEGĦA tkun għaddiet mid-* digestive system *tiegħu* and that is a beneficial process
Sf2:	*għax ikollu xi nutrijenti jista' jmexxihom↗*
T78:	*mhux* nutrients *le ż-żerriegħa x'għandha fuq in-naħa ta' barra tagħha↗*
Sf3:	coating↗
T79:	*għandha* coat seed coat *ngħidulu issa is-* seed coat *għandha dak it-* tough coat *li huwa* tough *biex jipproteġi l-* embryo *meta għaddiet mid-* digestive system *tal-għasfur għaddiet mill-istonku kien hemm l-aċtu DAK se jgħinu biex meta appena taqa' fil-ħamrija ż-żerriegħa tkun tista' tibda tinbet mela* that's a beneficial process
Sf4:	Miss *imma kullimkien tista' tinbet↗
T80:	*OVVJAMENT din ma tistax tikber kullimkien ejja ngħidu għall-argument għamillek fuq iċ-ċint le imma jekk waqgħet fil-ħamrija u hemm in-nutrijenti li għandha bżonn dik iż-żerriegħa se tibqa'

	tikber issa jiddependi waqgħetx f'ħafna xemx u m'hemmx ilma / *so can you mention others methods of dispersal *semmejtuli r-riħ u l-għasafar
Sj8:	*l-ilma*
T81:	*l-ilma kif jgħin↗ fix-xita jġorr is-* seeds *mal-kurrent fix-xita jġorr* seeds *kbar bħal* coconuts *eżempju li tinġarr mal-ilma tax-xmajjar jew tal-baħar / ISSA* any others you can think of↗
Sf5:	insects↗
T82:	*l-* insects *kif pereżempju↗
Sf6:	pollination↗
T83:	*stenna stenna ssemilix* pollination *għala le↗ għax issa qed nitkellmu fuq is-* seed // *ejja x'iktar↗*
Sf7:	*Aħna forsi↗*
T84:	*aħna stess kif↗*
Sf8:	*għax niżirgħu*
T85:	*qatt mortu* hike *intom u ħadtu l-kelb magħkom↗ qatt ma provajtu tibrushjaw il-kelb tagħkom↗ jew intom ↗
Sf9:	*e: minn dawk hemm:*
T86:	*e:: mela ejja ċċaqalqu / ikollna dawk il-boċċi jew intom qatt m'għamiltu↗ aħna konna nagħmluha ħafna meta konna żgħar biex nittantaw lil sħabna konna naqbdu dawk qishom hekk u nwaddbuhom lil xulxin dawk huma kollha metodu ta' kif il-pjanta tiffavorixxi* dispersal *għax ejja *let's face it *jekk inti kelb jew inti mort timxi u weħlitlek boċċa tagħmel sens li toqgħod tieqaf u taqlagħha dak il-ħin↗ mela x'nagħmel↗ xħin imxejt 'il bogħod minn hemm noqgħod inneħħihom mela allura jien qed ngħin biex is-* seeds *tbiegħdu mill-* parent plant
Sf10:	*ee u hekk imbagħad tikber siġra ġifieri↗*
T87:	*issa jew waqgħet fil-ħamrija pereżempju l-* acorns *qishom boċċi manafx x'jgħidulhom bil-Malti*
Sj9:	*tal-i* squirrels
T88:	*eħe għal dawk qed nirreferi jiena l-i* squirrel *x'jagħmel l-i* squirrel mhux annimal Malti fis-sens li naraw / JIEĦU s-* seed *imma x'għandu tendenza li jagħmel↗
Sj10:	*jiġri biha↗*
T89:	*qatt ma rajtu għandu t-tendenza li jmur jaħbihom u x'jagħmel meta jmur jaħbihom jagħmel il-ħofor fl-art imbagħad jinsihom // mela Maya kont semmejtli eżempju bl-ilma tad-dranaġġ
Sm1:	*le mhux hekk*
T90:	*mela xiex↗*
Sm2:	*din bħalma qed tgħid inti*
T91:	*ee qed tgħid li jista' jkun jinġarru* seeds *mal-ilma tad-dranaġġ bħalma jinġarru mal-ilma normali eħe jista' jkun / mela ħa naraw daqsxejn x'żidtuli aktar mela għidtuli r-riħ semmejna l-ilma / din ħadd ma semmihieli / l-* explosive mechanism *tixpakka l-frotta*

Sm3:	*tipo l-* cactus↗
T92:	*jista' jkun: ma kellix f'moħħi l-* cactus *imma jista' jkun issa nurikom stampa tagħha bil-Malti ma nafx x'jgħidulha eżatt se nurikom stampa però haw siġar minnhom / jista' jkun għandek l-annimal bħal ma semmejna qabel il-kelb li jinqabdu miegħu is-* seeds *jew inkella l-għasfur il-frott // mela ħa nurikom eżempju speċifiċi attenti 'l hawn qed nara daqsxejn* distractions *mela għandna l-istampa tad-* dandelion *li nagħmlu l-* wishes *biha meta jkun ir-riħ minjaf kemm naraw minnhom itiru / issa innutaw din hija importanti ħafna issa / kemm il-forma: taż-żerriegħa hija addattata għal* mechanism *li se jiġi utilizzat biex din iż-żerriegħa tinfirex / ma nistax ngħid li l-pjanta se tiddependi mir-riħ biex iġġorrilha ż-żerriegħa jekk din iż-żerriegħa tkun tqila bħal tal-* coconuts *araw x'qed ngħidu nies: għax dawn huma* questions *tipiċi fil-karta tal-eżami *you have to apply what you know* fl-eżami jista' jagħtik stampa bħal dik li inti qatt ma rajtha ma jgħidlek xejn fuqha u jgħidlek isma din il-pjanta b'liema mod taħseb li qed tinfirex iż-żerriegħa / għalfejn↗ spjega ruħek / mela allura trid tara li l-* method *li tagħżel ikun relatat mal-istruttura taż-żerriegħa / mela* these lightweight seeds are dispersed long distances by means of winds BECAUSE they are light *għandhom dik l-istruttura li tinqabad mar-riħ ikunu jistgħu jinġarru qishom forma ta'* parachute / *trid tistaqsi xi ħaġa Kyle↗*
Sn1:	*di= qisha bħal ma jagħmlu l-i* spores *meta jkunu* ripe↗
T93:	Yes ofcourse *imma żomm naqra ħa ngħidha wkoll l-i* spores *għandha wkoll *explosive mechanism / *mela din hija żerriegħa KBIRA din id-darba mela bir-riħ* definitely *ma tistax tinġarr il-* coconut these seeds are carried over very long distances *imma mhux bir-riħ permezz tal-ilma // issa din hija tal-* explosive mechanism *simili tal-fulu pereżempju l-* pod *tal-fulu tafu l-fulu kif inhu*
Sn2:	*bħall-piżelli↗*
T94:	*eħe anki l-piżelli l-istess proprjament biex inkun eżatta l-miżbet tal-fulu l-istruttura l-ħadra mbagħad ġo fiha għandek il-ful / issa AĦNA l-bidwi l-fulu jaqtgħu meta jkun għadu aħdar ejja nimmaġinaw il-fulu baqa' mwaħħal max-xitla ġifieri l-pjanta qed tikber* in the wild *il-pjanta pproduċiet is-* seed *allura s-* seed *tagħha tinfirex / x'se jiġri↗ kieku l-fulu jispiċċa jinxef il-* cover *tiegħu jitqarqaċ u jinxef aktar ma jgħaddi żmien imbagħad meta jinserta t-temp addattat ma jridx ikun umdità għax l-umdità żżommu mimli bl-ilma*
Sm4:	*ġifieri hawn Malta ma tantx taħdem din*
T95:	*le le taħdem taħdem imma m'iniex se nuża l-eżempju tal-ful WAĦDA hawn siġar u pjanti jaħdmu hekk*
S:	*tal-ħarrub tal-ħarrub*
T96:	*il-ħarrub ukoll simili* yes *ee fejn il-miżbet jibda jinxef imbagħad meta jkun riħ fuq u jekk ikun ir-riħ aktar u aktar jitqarqaċ jickrackja għax jimbaram u jickrackja l-miżbet u ż-żerriegħa li jkun hemm ġewwa ttir* okay↗ so *hemmhekk qed nuża l-kelma* carpel *għax il-miżbet huwa parti mill-* carpel // it is an explosive *għax tant tkun* brittle *li kif tixpakka liż-żerriegħa tferrixha 'l barra mhux taqa' taħtha / dik il-forza li tagħmel biex int tixpakka* it disperses the seeds *però

	mhux se jkunu* dispersed over long distances *bħal ma kienu tad-* dandelions e: *aktar ma tkun kbira u tqila is-* seed *inqas hemm ċans li titbiegħed*
Sm5:	Miss *imma jekk eżempju għandek pjanta li ddum ħafna (?) imbagħad jispiċċaw in-* nutrients *imbagħad x'jiġri↗*
T97:	*imma inti għalhekk għandek il-* compost *u ssaqqi s-sustanzi mhux l-ilma biss hekk qed tirriplejsjah m'għandekx annimal li XXX // hawnhekk għandna miskin ġibna eżempju bil-kelb li ħadnih jimxi jew mar idur dawra u mtela' b'dawk iż-żerriegħa / x'għandhom dawk iż-żerriegħa li jgħinhom ikun adattati↗*
S:	Spikes
T98:	*eħe għandhom qishom* spikes
Sm6:	*qisu* velcro
T99:	*qisu bħal* velcro yes *il-* velcro żviluppat minn fuq dawn bħala idea / dawk l-i* spikes *jgħinu u vera antipatki biex tneħħihom // issa // *the hooked seeds attach themselves to the fur of animals*
Sm7:	*x'tgħidilhom miss bil-Malti↗*
T100:	*żerriegħa ta' dak it-tip↗*
Sm8:	*le:*
T101:	*stenn inti tridni ngħidlek dik il-pjanta x'ngħidulha↗ purament ma nafx ngħidlek bl-amment ma nafx ngħidlek / normalment hemm it-tendenza li nirreferu għalih bħala ħaxix ħażin aħna*
Sm9:	*in-nannu jgħidilhom xi ħaġa <u>imma nsejt xiex*</u>
T102:	<u>Però jekk trid</u> fil-* library *jidhirli li hemm jien għandi d-dar filkas inġibu miegħi / hemm ktieb il-flora u l-fawna ta' Malta u jkollu l-isem bil-Malti wkoll u tarah għax ma nafx bl-amment x'kien l-isem // issa hawnhekk għandna l-eżempju tal-għasfur li qiegħed jiekol il-frott u se jgħinha mmexxu ż-żerriegħa / OVJAMENT iż-żerriegħa l-għasfur x'se jippreferi jiekol bħal din jew din↗* <shows them two different plants>
S:	*bħal din bħal din*
T103:	*għala↗
Sn3:	*għax ikkulurita*
T104:	*GĦAX IKKULURITA hija iżgħar allura jista' jiħħandilja / issa l-fatt li għandek frotta li hija tajba se tgħinu biex jiekol il-frotta u l-frotta jkun qed jikolha mhux biex jagħmel pjaċir lill-pjanta għax hu qed jiekol però mbagħad meta jagħmel tojlit mal-* faeces *tiegħu jkun qed jarmi ż-żerriegħa ta' dawn il-pjanti // u l-aħħar eżempju hawnhekk għandna* seeds *li huma* edible *bl-iskop li jistorja ż-żerriegħa ħalli meta ma jkunx hemm* available *ikollu l-ikel merfugħ imma miskin għandu memorja qasira u għandu t-tendenza li jkun nesa u ma jsibux u jispiċċaw jinbtu* any difficulty↗ *nerġa' nirrepeti / jiena tajtkom ĦAFNA eżempji ma jfissirx li fl-eżami huwa obbligat li joħroġ waħda minn dawk jista' jippreżentalkom stampi li qatt ma rajtu *you have to apply them* imbagħad / <bell rings> issa mbagħad inkomplu:

Appendix K: Transcription – Church School 1

T1:	*kulħadd ġie min kellu jiġi↗*
	<students settling in class>
T2:	okay, *mela bdejna* /// *Emm .. Jiena tajtkom iktar żmien ħa niġbru l-ġimgħa d-dieħla / imma jekk hu lest u trid tagħtih tista' tagħtihuli* <referring to homework>// all right↗ // *xi ħadd ieħor↗*
Sa1:	*jien* miss *tista' toħoduli tiegħi*
T3:	<speaking to another student> All right↗? *Nista' niġbru l-ġimgħa d-dieħla* // all right↗
Sb1:	miss↗ <student shows the teacher that his work is done>
T4:	*imbagħad tihuli wara ejja ha nibdew*/ *mela* viruses, viruses are not considered a kingdom / notes *miftuħin* NOTES *MIFTUĦIN*
Sb2:	*fejn qiegħda X↗*
T5:	*paroli jieqaf:* /// So, they are not considered a kingdom they are bordeline between living and non-living things okay↗ and we said last time that this is because they have no metabolism of their own: / what do we mean by metabolism↗
Sc1:	chemical processes↗
T6:	yes, chemical processes occurring where↗
Sb2:	in the cytoplasm
T7:	mitochondria and also in the: ↗
Sc2:	cytoplasm
T8:	cytoplasm, yes, most of the reactions of the cell occur in the cytoplasm / basically what occurs in the mitochondria – which chemical processes↗
Sb3:	glucose and oxygen
T9:	which CHEMICAL process
Sd1:	respiration↗
T10:	respiration respiration all right↗ *imma* cytoplasm is basically where chemical reactions of metabolism occur / so this tells us that the viruses they have no chemical reactions okay ↗ so they are not considered as living things, they can only be considered as living: if they enter: other living organisms okay↗ they can only carry out the seven vital functions when inside other living things *tajjeb↗ issa/ dal-* video *ħa jurina ftit fuq* discovery of viruses okay↗ / do you think that it happened *erm jien naf* long, long ago even before bacteria where discovered↗
Sb4:	no definitely not
T11:	why not↗
Sb5:	because viruses are harder to be seen by the -
T12:	yes viruses are very very small they cannot be seen by the light microscope, <u>they can only be seen -</u>

Sb6:	it takes (?) of the electron microscope given that they are even smaller than our cell
T13:	yes they can only be seen by the electron microscope and the electron microscope is quite a RECENT emm development
Sd2:	like mitochondria /// miss *illum nistgħu mmorru nagħmlu* fieldwork electron microscope ↗
T14:	*mhux bħalissa mhux bħalissa* so let's watch this video <video playing and teacher comments> some viruses attack bacteria <video ends> all right? *fil-fatt qalilna* they were too symmetrical to be alive *fil-fatt għalhekk ngħidilkom meta npinġu* living cells we also draw them freehand not with rulers
Sd3:	miss but then how do viruses move from place to place ↗
T15:	they don't move
Sd4:	but then how do (?)
T16:	because they are carried by wind currents / and when we sneeze for example we are pushing air out
Sd5	okay
T17:	okay ↗ and that carries viruses from one place to another okay↗ so are viruses alive ↗ these are XX that say viruses are not alive / these might: make us think they are living organisms all right ↗ *mela ħa naraw* why are they not alive / they are not made of cells or organelles *ħa nibdew b'din* NOT MADE OF CELLS remember the seven vital functions ↗
Sd6:	yes
T18:	but then we mentioned eight characteristics ↗ and the eight characteristics are the seven vital functions and last one that all living organisms are made up of cells
Sd7:	Miss XXX cells
T19:	yes, yes so the fact that viruses are not made of cells is against their being alive okay ↗ they cannot reproduce on their own, they don't metabolise energy, they don't produce energy in the process of respiration all right ↗ they don't perform any cellular processes *m'għandhomx* enzymes *dawn m'għandhom xejn* okay↗ so all these tell us that viruses are not living organisms, but then they reproduce *imma anka hawnhekk għandna* not on their own, they need to ENTER living organisms for them to reproduce. They have nucleic acid:, nucleic acid is another term for genetic material okay ↗ genetic material which is DNA or RNA okay ↗ where we have instructions to what is going to happen to the living organisms. They can adapt: to surroundings okay ↗ and have some organisation *ġifieri speċi* viruses *bażikament huma magħmulin minn ċertu affarijiet dejjem l-istess* okay ↗ and viruses can only function and multiply inside a living organism so the conclusion is: are viruses living organisms ↗
Sd8:	yes and no
T20:	no, they are not living organisms on their own okay ↗ they can only HIJACK living organisms to carry out their processes especially reproduction *dawn bażikament dak li jagħmlu l-* viruses

	they reproduce *jidħlu jsibu xi* living cell, they hijack it to produce millions of copies of their own cell, that's all they do okay ↗ they just reproduce.
Sd9:	but they are – they harm
T21:	ofcourse they do, anything that is going to hijack a cell, hijack *qatt mhi xi ħaġa sabiħa* all right ↗ when cells are hijacked yes they are being harmed. In fact they are always considered as PARASITES / they are all parasites there are NO NO beneficial viruses:
Sd10:	there are beneficial bacteria and <u>fungi but not viruses</u>
T22:	<u>yes but we are talking about viruses</u> there are NO BENEFICIAL viruses they are – they all harm, <u>they are all parasites</u>
Sd11:	<u>so we must get rid of them all ↗</u>
T23:	yes all of them
Sd12:	in fact, so far emm so far emm, this is what we need to know about viruses emm viruses, so far, it is shown that what we need to do/ in order to get rid of the viruses is that we need to try severe the links on where they can <u>reproduce ↗</u>
T23:	<u>yes</u>
Sd12:	take the small pox virus for example, the so far only success eee the small pox virus ee it has been stopped: because we were able to cut it off from all humans
T24:	yes that's why vaccines are so important
Sd13:	and this is why other diseases like polio, measles and XXX might be next
T25:	yes we will be talking about this soon
Se1:	(?) *irridu nistudjaw xi* viruses (?)
T26:	no just the basic stuff *issa XX li għandkom XX* all right ↗ // *mela ħa nibdew minn din* could viruses, could they have been the first living organisms on earth what do you think ↗
Se2:	no because for them to be living they have to be inside a living organism and
T27:	yes the fact that we said that viruses have to ENTER living organisms for them to reproduce, they can't have been the first organisms on earth all right↗ they must have come after other living organisms *issa* whether they have been *jien naf* formed from molecules or they were descended from other living organisms we don't really know allright ↗ but definitely they have not been the first organisms on earth / now this is what you need to know, the structure of viruses allright ↗ It's a very simple structure. Obviously there are MANY different viruses and the structures ARE going to be different but they will all consist of: a piece of genetic material okay ↗ which can either be RNA or DNA *xi ħadd jiftakar <u>x'għedna* DNA is↗</u>
Sd14:	<u>What's the difference↗</u>
Se3:	de deox <trying to pronounce the word>
T28:	deoxyribonucleic acid allright↗/ *issa* deoxyribonucleic: acid contains part of it shh <teacher quiets down class> a sugar called deoxyribo and then there is a similar nucleic acid okay↗ which is called ribonucleic acid where the SUGAR is different, it's ribo not deoxyribo okay ↗ *xejn kbir

	m'għandkomx għalfejn tkunu tafu* just know that RNA and DNA are called nucleic acids allright↗ and they form genetic instructions of cells.
Sd15:	<u>essentially viruses are are</u>
T29:	<u>simple, simple organisms like</u> viruses and bacteria may have RNA not DNA okay↗ because it's, it's a bit simpler that's all but this would contain genetic instructions *mela* viruses are made of a genetic strand not a chromosome, not a chromosome, =cos we will see later on, much later on, that chromosomes are really these strands okay↗ which are WOUND on / on proteins *qatt rajtu rukkell ħajt pereżempju↗ tista' taqbad rukkell ħajt inti u toħroġ il-ħajta kollha* allright↗ *u tiġi ħajta vera twila* kilometers *imbagħad* that kilometer of thread you can wind on one piece of spoon okay↗ *daqshekk inti jkollok* kilometers and that is a chromosome okay↗ chromosome is the genetic material WOUND on itself XXXX that is a chromosome *imma fil-* viruses it's so small and simple that it doesn't need to be wound so it's just the thread, the DNA or the RNA okay↗
Se4:	*qisu* muscle *tas-sieq* XXXXXX↗
T30:	le le le le le le just *ħajta li altru jiena nħalli ħajta hekk twila u altru naqbadha u ngebbibha tajjeb↗ l-ewwel nett hemm inqas ċans li titħabbel u ħa toħodli inqas spazju / dik ir-raġuni għalfejn aħna eee f'* organisms *li għandhom ħafna* instructions *u allura* DNA *twila ħafna ma nħalluhomx* just a very long molecule but it's wound on these strands and that will form the chromosomes okay ↗ *mela* viruses have a genetic strand not a chromosome okay is that clear ↗ AND this genetic strand is just ENCAPSULATED okay ↗ CLOSED in a protein coat/ and then on the outside you will have emm // a different cover depending on the virus. But the two most important things are the genetic strand and the protein coat and we are going to draw them now together.
Sd16:	so: really: viruses are just pieces of genetic material covered in a coat
T31:	yes in a <u>protein coat that's all</u>
Sd17:	<u>protein coat jacket</u>
T32:	and protein coat is not just one whole thing it's in sections and the sections of the protein coat are called capsules
Sd18:	what is the coat made of ↗ / protein ↗
T32:	yes protein / different viruses are made of different proteins that is why they attack different organisms *mela* let's draw this
Sf1:	ee I already drew it
T33:	*issa* I see it with the rest of the class
Sd19:	but why do viruses require ee hijacking other organisms in order to -
T34:	because they have no metabolism of their own, they need the chemical processes in living cells so that they can replicate they can't do it on their own they need a living cell // okay *mela* //

	foolscap, foolscap REMEMBER diagrams should take you about six, seven lines, remember to leave space for labelling and
	<one student to another student> *nagħtik karta ↗*
T35	okay↗ so <while drawing a diagram on the board> an outer coat, an outer layer, then capsomeres ///
Sf2:	*qisa ta' XXX qiegħda dik* miss *qisa ta' XXX*
Sd20:	do we use our rulers↗
T36	yes you can, you can
Sd21:	considering that viruses are not living organisms we can
T37:	you can // but I think it will be even more difficult using a ruler so - // allright↗ this is just to show that the protein coat is made of bits: called capsules and inside is the genetic strand // okay↗ labelling /// <teacher continues drawing> *jekk jista' jkun nagħmluhom ma' xulxin* not overlapping <referring to capsules> // *mhemmx għalfejn tkunu artisti biex inpinġuhom imma oqogħdu attenti li d-* diagram *jagħmel naqra sens* //
Sf3:	miss *x'inhi d-differenza bejn* capsomeres *u* protein coat↗
T38:	yes, because the whole thing is called a capsule made up of sections for the capsomeres allright↗ *tajjeb↗*. The protein coat you can call the capsid, it capsules the whole thing, is made up of sections called capsomeres, this is the outer layer of the virus okay↗ and we will see it will take many different forms and made up of different proteins, each virus is made up of different proteins okay↗ encapsulating a genetic material. Allright *lesti, nimxu↗* so
Sg1:	miss *x'inhi l-bidla↗ għax hemm waħda fuq il-da= haw= wieħed fuq il-* protein coat *imbagħad it-tnejn li huma XX
T39:	yes yes yes this is the WHOLE protein coat and another name for the protein coat is the capsule and the protein coat or capsid is made up of sections: called the capsomeres *allura din hija* capsomere *u ħdejha* capsomere
Sg2:	*Għedtlek hekk għax hu tnejn minnhom huma* capsomeres *u mbagħad l-oħra* protein coat
T40:	*ijja ijja, dak li qed ngħidlek, il-* capsomeres *kollha flimkien jagħmlu l-* protein coat allright↗
Sf4:	miss *imma għax qed jaħseb li dawn it-tnejn huma* capsomeres *u l-oħrajn huma*
T41:	*le le le le le ma jistax ikun "nillejbiljalek" kull* capsomere *li hawn fid-* diagram allright↗ *dawn KOLLHA huma* capsomeres, all round the genetic coat okay↗ *mela* let's see <continues video and while video is playing> NOW look at the shapes, geometric shapes *avolja qed jidhru qishom* rod shape /// whatever the shape it's always genetic material and protein coat /// these are bacteriophages <stops video to explain> *daw= vera interessanti* this is a bacteriophage so these are viruses that attack bacteria okay↗ *issa jekk tindunaw di= tiġi qisha* injection allright↗

Sg3:	*dik qisha brimba*
T42:	*tinżel fuq il-* bacteria *allura dawn huma s-saqajn, qisu, immaġinaw* UFO *jinżel*
Sg3:	Miss *iktar brimba*
T43:	and this will counteract and inject the genetic strand strand into the bacteria okay↗ =cos it's only the genetic strand that is important to enter the living cell // but this is ee the shape of a bacteria allright↗
Sd22:	ee what type of bacteria does the bacteriophage attack↗
T44:	there are different bacteriophages that attack different bacteria
Sd23:	but which bacteria does it EXACTLY attack↗
T45:	do you want the exact name of the bacteriophage attacking the specific bacteria↗ because I don't know
Sd24:	but does it attack the sole cell of a: beneficial bacteria or does it compete with harmful bacteria for the cell↗
T46:	they attack specific bacteria according to species okay↗ for example the influwenza virus will attack humans, it will not attack dogs or cats, there are different viruses which attack dogs and cats allright↗ so these bacteria are also – specific bacteriophages will attack specific bacteria, we're just seeing
Sd25:	Also HIV, that will attack humans
T47:	we're just seeing different shapes and in all these different shapes you have to notice that in ALL viruses whatever their complicated shape will look like will consist of a simple genetic strand and a protein coat *daqshekk* that's all you need to know.
Sg4:	miss are those legs or↗
T48:	not legs no they're XXX
Sf5:	miss *dik qisha brimba*
	<video continues>
T49:	okay↗ so those are just some different shapes of viruses all made of the same base layer. Now this will give us some examples of viruses, we have already mentioned influwenza allright↗ and some of you even mentioned small pox, which does not occur anymore, there is no more small pox in the world except in some virals in some labs kept under tight security because if someone releases those viruses what do you think will happen↗
Sg5:	it will come back
T50:	it will not only come back, it will kill lots and lots of people because now we don't have immunity against small pox virus so it will *jien naf, tagħmel ħerba kieku u għalhekk qiegħda* under tight security.
Sg6:	miss and we wait for it to just die out↗
T51:	*ħeq* yes // so tell me of viruses that you know of or DISEASES that you know of↗
Sf6:	*affarijiet* dangerous *dejjem sbieħ ikunu*

T52:	<laughs> *sbieħ bħala* structure↗ *ijja vera* other examples↗
Sg7:	HIV or AIDS and miss miss what does HIV affect↗
T53:	HIV is the human immunodeficiency virus causing the AIDS disease allright↗ acquired immunodeficiency syndrome.
Sg8:	miss what does AIDS do to you actually what happens ↗
T54:	because the virus attacks the immune system and you are no longer able to cope with any other infectious disease, we will talk about these later on *bħalissa rrid* examples of viruses
Sf7:	emm fever?
T55:	fever is just a SYMPTOM of an infection, I want names of viruses
Sf8:	Influwenza
T56:	Influwenza *semmejniha, xi ħaġa oħra↗*
Sf9:	Chicken pox↗
T57:	Chicken pox yes
Sf10:	Cancer virus↗
T58:	*le*
Sg9:	Cancer is a non-infectious disease
T59:	*le* a cancer is just a change in the genetic material that makes the cell first and then a number of cells behave differently
Sf11:	sore throat↗
T60:	it can be caused by specific viruses but it can be caused by bacteria. I want, I want the viruses name, you don't know the name of viruses↗ *pereżempju* chicken pox *x'haw= iktar↗*
Sg10:	ee measles
T61:	MEASLES thank you very good
Sg11:	and mumps and rubella
T62:	yes German measles // Okay so let's see some examples of viruses
	<students watching video>
T63:	okay↗, so those are some examples of viruses
Sg11	isn't herpes harmless mostly ↗
T64::	there are many different types of herpes
Sg12:	most of them are harmless
T65:	harmless harmless:
Sg13:	*u iva* it's not really that dangerous
T66:	you can get herpes symptoms like a cold sore on your lips and that's relatively harmless yes
Sd26:	why are we worried about herpes then↗
T67:	but herpes you can: get the latent virus it remains there, and then if you're *jien naf* stressed or something and you get the immune system a bit lower the virus can attack other cells and it will become a complication / viruses are always harmful: our immune system will try to keep them

	intact but they are very wiley creatures and they know how to: *kif tgħid speċi: jistaħbew huma u allura malli tkun naqra 'l isfel l-* immune system they rise up // nothing nice about viruses definitely
Sh1:	*skont haw= rajt filmat meta taqbdek l-* AIDS *emm l-* AIDS *għall-ewwel tkun qisha* virus you catch *imma mbagħad jasal f'punt li l-* white blood cells *jisplodu*
T68:	*għax fil-bidu jkun għandek l-* immune system *jiġġildilha imma mbagħad* it completely destroys it *imma ejja ma nitkellmux fuq l-* AIDS *għax* it's just one virus / we're just talking about the general characteristics of viruses
Sg14:	but hold on miss back up a bit / what about those last small pox viruses ↗
T69:	eh what about them ↗
Sg15:	eh: / it's making me wonder: if eh if: viruses never hijack a body they would live forever ↗
T70:	yes they would live forever yes that's why when they opened Tutankhamun <u>tomb</u>
Sg16:	what ↗
T71:	you know Tutankamen↗ the egyptian pharoah ↗ and when they found his tomb the persons who went into the tomb *jien naf* terrible things happened to them and they died and now: before they thought it was a curse of the egyptian gods but now they know that probably there were viruses in that tomb and they got a virus and it lived for centuries.
Sg17:	but those small pox viruses isn't there something that kills viruses↗
T72:	yes // what↗
Sg18:	those viruses isn't there something to kill those last guys ↗
T73:	yes yes but they are keeping them for research purposes in the lab // you're talking about those in the lab ↗
Sg19:	*eħe*
T74:	they are keeping them for research purposes they don't want to get rid of them
Sg20:	and then when they're done they can just get rid of them
T75:	when they're ready they will get rid of them somehow / okay so how viruses live and replicate / actually they don't really live okay↗ they just replicate. Look at this word <points to word on powerpoint presentation> we're not using the word reproduce like living organisms but we use the word replicate because viruses they just make photocopies of their own *għalhekk qed nużaw kelma differenti* it's not reproduction it's replication okay↗ and this is basically what happens okay↗
Sg21:	miss so where is this lab ↗
T76:	I have no idea *ejja* let's continue // this is a different cell and this is a virus which is going to attack the cell so obviously the virus has to enter the cell that is the first thing okay↗ so we will see a video where we will see that the cells will actually welcome the viruses *għalhekk għedtilkom* these are really EVIL creatures okay↗ because our cells do not recognise these viruses as foreign things but they will actually – when the virus attaches to the cell membrane,

	the cell membrane thinks that it's a good thing and it will let it enter okay↗ and when the virus enters the protein coat just disintegrates and the pieces of it just remain inside the cytoplasm, the GENETIC CODE will take over the nucleus and it will use the chemical process of the cell to make lots and lots and lots of photocopies and uses the chemical processes of the cell to form protein coats – there will be SO MUCH viruses that basically the cell will burst releasing all the millions of viruses produced from just one virus okay↗ and you have to KNOW this process / this is the most important thing about viruses you have to know the structure and how they replicate okay ↗ this is what you need to know *issa*
Sh2:	*il-* white blood cells *ma jagħmlu xejn↗*
T77:	*il-* white blood cells *iva issa imma aħna qed nitkellmu fuq *the cells of the body the normal cells, the white blood cells are part of the defense mechanism so the white blood cells sometimes: if they are not hidden the viruses can find them and eat them up but with normal cells they can <u>just</u>
Si1:	<u>Miss</u> *kont qed ngħid* cooties* teżisti↗
T78:	eh↗
Si2:	Cooties, *il-* cooties *jeżistu↗*
T79:	*stenna naħseb xiħa wisq għaliha din x'inhi↗*
Si3:	*għax haw=* myth *li n-nisa għandhom* cooties għalhekk u ma nafx min għamilha u għalxiex imma haw=* theory *li n-nisa għandhom* cooties
T80:	*in-nies jew in-nisa↗*
Si4:	*in-nisa*
Sh3:	*tista' tinqabad faċli*
T81:	<directed towards me> *taf biha din int↗*
R:	*le*
T82:	*imma* someone needs to explain to me *x'inhuma daw= il-* cooties↗
Sh4:	*tal-Amerikani din naħseb/ jaħsbu li jekk tifla tbusek taqbdek din*
Si5:	*tigirfek – jaħsbu li jekk tifla tigirfek u tkun infettata jista' jkun li jekk tibqa' ma tagħmel xejn taqbdek*
T83:	*in-nisa biss↗*
Si6:	*in-nisa imma tista' tgħaddiha lill-* boys *ukoll
Sh5:	*u mhux vera dik naħseb*
T84:	DEFINITELY NOT // no
Sg22:	Miss tapeworm is a virus↗
T85:	no tapeworm is an: it's like an animal
Si7:	*għala jirriskjaw iżommu affarijiet eh li jispredjaw malajr u f'kas ta' inċident jinxered mad-dinja kollha eżempju* small pox↗

T86:	*jiddependi mill-* immune system *għalhekk għedtilkom eżempju din is-* small pox *minħabba li m'hawnx *small pox virus *ħadd m'għandu* immunity *għaliha okay↗ *għax inti meta taqbdek marda il-* white blood cells *jiġġieldu u nżommu speċi ta'* reserve white blood cells *illi jkunu għarfuh lil dak il-* virus *meta kien daħal biex meta jerġa' jidħol fihom jerġgħu jattakkawh malajr* okay↗ and that is our immunity *issa jekk* virus *għandu – ma jkunx qatt iltaqa' miegħu ma jkollniex dak l-* immunity, that defense *u għalhekk imbagħad meta jiġi xi* virus *ġdid – għalhekk eżempju dak l-i* swine flu *u l-* bird flu *ġieli smajtu bihom le↗* it's just a normal influwenza virus which CHANGES a bit so that no one in the world has immunity to it *u allura da= jidħol u s-* cells *jgħidulu idħol idħol agħmel ħerba agħmel ħerba u jibdew joħorġu miljuni minnhom daw= mis-* cells *u jinfirex ħafna malajr / imbagħad bil-mod il-mod wara* certain number of years it will die down because then people will get immunity against it okay↗ *għalhekk joħorġu waħda waħda* swine flu, bird flu
Sg23:	miss it goes in because of the hole↗ the protein coat ↗
T87:	yes *fil-vidjow li ġej ħa nurihulkom *because it acts like a lock and a key okay↗ and the viruses have keys to our cells so if you have a key to a dar you can open it, even if the person inside doesn't want you to enter allright↗ *qishom daw= qishom ħallelin illi jkollhom iċ-ċavetta tad-dar tiegħek allura jistgħu jidħlu xħin iridu anki jekk inti ma tridux jidħol da= ħa jidħol* that's all <directed to student raising his hand> *ejja* Denzel quickly shoot
Sg24:	Miss I understand how viruses enter the cells all they do is that they have special bumps on their jacket and there with like heels and the cell surrounds it and: em here's one question / if only you could ask the white blood cells what do bacteria and viruses taste like ↗ and the white blood cells would say mm they're delicious most likely
T88:	okay now *mela* let's see
Si8:	Miss *ħa mmur it-* toilet *nista'↗*
T89:	*issa xħin jiġi l-ieħor mur* // okay *mela* let's watch this <teachers plays video> // and this is why certain viruses attack certain species okay↗ *kif għedtilkom jekk jien għandi* influwenza virus *għandu ċ-ċavetta għal* human cells *iċ-ċavetta tiegħu ma taqbilx ma'* dog cells *jew* cat cells *u għalhekk l-istess viruses jekk jattakkaw il-klieb ma jattakkawx lilna
Si9:	Miss *x'inhu dak il-* cover↗
T90:	*il-* cover↗ *dak jifformah is-* cell *biex speċi iktar qisu jiġi parti mis-* cell *f'daqqa*
Sh6:	Miss our normal cells can evolve aswell like instead of the white blood cells↗
T91:	I don't know what can happen in the future
Sh10:	*issa dik li hemm magħha ma taffettwahiex↗*
T92:	*le hi l-* virus *l-unika ħaġa importanti hi l-* genetic strand okay↗ *issa dik kif qalilkom hi l-*welcoming cover just making it part of the cell it's been fooled to take it's XXX <teacher plays a video>

T93:	okay that's all // so the white blood cell will engulf it and then the enzymes in the cell will just destroy it // the virus will attack the immune system, if there is too much of the virus the white cells will just be ineffective against all those viruses
Sh11:	so it just attacks it by itself↗
T94:	no the virus enters the cells and the cells are making lots of photocopies *issa* if there are too many viruses the white blood cells can't cope and that is when the viruses are overcoming the person's immune system / like a war you have a hundred thousand soldiers on one side a just a thousand on the other side which is going to win ↗ // and that's what there is here
Sg25:	well technically the number of soldiers doesn't really necessarily matter <u>because</u>
T95:	<u>Let's say it does</u> // it's just that there are not enough white blood cells to remove all the viruses because white blood cells are trying to get rid of this virus so if another virus enters it won't cope // you don't just produce white blood cells, white blood cells are IN RESPONSE TO a virus so if the organism is – there are too many viruses it will stop producing and the white blood cells are specific to that virus // like in a war if you are only a thousand people and you see a hundred thousand people coming what do you do ↗ you just give up // *issa* we have a whole chapter on this immunity so that is what i'm going to say for now more than enough / *mela* let's go onto bacteria / so bacteria were obviously discovered before the viruses they were discovered in the 16th century by an amateur biologist *fil-fatt* he was not even a scientist *dan*
Sg26:	Miss you said 16th century, it says 17th century
T96:	*eħe* 17th century em and this person he was – he made cloth
Sh11:	German *dan↗*
T97:	*ee le minn* Netherlands *dan* and he found these bacteria basically by using his own body okay↗ he looked at some of his own saliva under a microscope of his design allright↗ *issa aħna* microscopes *diġà għamilnihom / Tiftakru min għedna kien ivvinta l-* microscopes *tiftakru↗*
Sh12:	*le*
T98:	Robert Hooke ↗ *konna għedna illi kien raha s-* cells *tal-* pork *u kien semmihom* cells *għax kull ma kien raha huwa s- *cellulose cell wall *u qal ii ara dawn jixbhu ċ-ċelel tal-XXX u dak iż-żmien il-XXX ma kinux jgħixu bħal ma jgħixu dan iż-żmien okay↗ imma Robert Hooke kien Ingliż dan kien minn* Netherlands and at basically the same time he was inventing his own microscope and using his own body fluids to look at microorganisms
Sh13:	wait so is this the electron microscope↗
T99:	no no this is just the beginning – the very beginning – the very first microscope that ever existed okay↗ *issa dan bażikament dan il-vidjow mhux se nurihulkom kollu ta' għax* this is the first simple microscope to exist okay↗ *nafu min hu* he was a cloth maker, this is his microscope and he made lots of different lenses which magnifying lenses he ground his own lenses / what did he do *=ġifieri biex tagħmel* lense *xi trid↗*

Sh14:	*ħġieġ*
T100:	*ħġieġ u x'tagħmillu l-ħġieġ↗*
Sh14:	*tagħmillu XX qisu*
T101:	yes you just polish it to a curved surface *imbagħad eħe iktar ma tagħmilha* curved * iktar se tkun imkabbra*
Sh15:	*u jekk tagħmilha* cone *tiġi aħjar↗*
T102:	cone↗ anyways if it has a curved surface it will magnify if it's cone-shaped it will not magnify all at the same angle so it will distort the picture it will make it big one end and small on the other end / anyway *li ridt nurikom minn dal-vidjow huwa bażikament dan dan* <teacher plays video>
Sh16:	*x'qal↗*
T103:	he was the first person to study spermatozoa <students laugh> he used his own body fluids to experiment
Sg27:	Miss I have a question, is he one of those heretics↗
T104:	no no in fact he didn't want to show his discoveries to the world he wanted to use his microscope to see about what interested him okay↗ *imbagħad wara ħarġu* // okay so characteristics of this kingdom, kingdom Monera another name for ↗
Students	BACTERIA
T105:	yes bacteria okay↗ and these are the general characteristics
Sg28:	and who's the king of the kingdom↗
T106:	*ejja ejja* and these are the characteristics which are found in all bacteria, there are many different species of bacteria remember last time we said basically half the living organisms on earth are bacteria okay↗ and there are many different types okay↗ BUT they are all microscopic you cannot see them with the naked eye you need a microscope / you don't need an electron microscope you just need a normal light microscope / they are all unicellular and they are PROKARYOTIC okay↗ this is an important word – as opposed to EUKARYOTIC *mela* this is what makes bacteria emm classified into one kingdom on its own not in the kingdom where we have unicellular organisms okay↗ *Tiftakru l-* five kingdoms *x'kienu↗ għandek* plants *u* animals
Sg29:	Monera
T107:	okay and then you have bacteria and unicellular organisms now the kingdom bacteria are made of prokaryotic cells we will see what this means // all the other four kingdoms the protists unicellular organisms, fungi, plants and animals are made of EUKARYOTIC cells okay↗ so we have PROKARYOTIC and EUKARYOTIC cells okay↗ so these are the bacteria ONLY and these are all other cells ALL the other four kingdoms *tajjeb↗ issa* let's see what we mean by prokaryotic cells they are very very simple cells
Sg30:	Miss bearing in mind that they are able to reproduce by multiple different ways most popularly by just splitting themselves up why do the minority tend to hijack us↗

T108:	bacteria↗
Sg31:	yes
T109:	because they are parasites
Sg32:	yes but why do they attack us↗
T110:	so they attack us for food, shelter and other purposes
Sg33:	so what's in it for me↗
T111:	nothing it's all about them // okay so bacteria are prokaryotic cells okay↗ which means they are very small cells compared to cells of other organisms / they have no true nucleus no TRUE NUCLEUS *aħna* why is it an important organelle↗
Sh17:	because it controls what happens
T112:	because it contains genetic material / does this mean that bacteria don't have genetic material ↗ no they will have genetic material but it's loose it's just a strand LOOSE in the cytoplasm NOT encapsulated in a nucleus *=ġifieri daw= kull m'għandhomx hu n-* nuclear membrane *imma s-* strand *tan-* nucleus *qiegħed hemm* that is what we mean by no true nucleus so write it on your notes NO NUCLEAR MEMBRANE that is what me mean NO NUCLEAR MEMBRANE
Sh18:	miss↗
T113:	*għidli*
Sh19:	how do they attack cells↗
T114:	*ee x'inhu↗*
Sh20:	how do they attack cells↗
T115:	*m'iniex nifhem*
Sh21:	how do the bacteria attack the cells↗
T116:	bacteria how they attack the cells↗ in many ways they will either produce toxins and kill them mmm in many ways *imma dan imbagħad għandna* chapter *fuqhom issa qed nitkellmu fuq* the bacteria themselves allright↗ not how they attack
Sd26:	Miss *jiena meta kont għamilt l-* operation *kienu* bacteria *sabuli*
T117:	yes yes they're very common okay↗ so that is what we mean by saying prokaryotic cells have no true nucleus and that other organelles are not membrane bound *oqogħdu attenti għax meta nkun qed nikkoreġi l-* lab report *indunajt li* i'm not very clear about what this word organelles means / give me some examples of cell organelles
Sd27:	Mitochondria
T118:	Mitochondria yes
Sh22:	Xylem vessels
T119:	no xylem vessels are not cell organelles by cell organelles we mean what's inside <u>the cell</u>
Sh23:	<u>Chloroplasts</u>
T120:	yes chloroplast / yes they are all organelles because they are structures within the cell: the cytoplasm is not an organelle because that is filling the material, the CELL MEMBRANE is not an

	organelle because it's on the outside of a cell okay↗ so the organelles are the structures that can actually be seen as *jien naf xi ħaġa li tidher li hi separata minn xi affarijiet oħra*
Sh24:	Miss cell wall↗
T121:	no no no cell wall is not inside the cell even outside the cell membrane / cell membrane *u* cell wall *mhumiex* organelles *u lanqas* organisms *bħal meta għandek il-brodu, il-ħaxix huwa l-biċċiet mhux l-ilma u lanqas il-borma* // so their organelles they are not membrane bound so would they have mitochondria↗
Students	no
T122:	they have the processes and the bits needed for the processes okay↗ for the respiration but not the actual mitochondria / but what happens in the mitochondria and the enzymes needed for the process they have them just not membrane bound and the genetic material is not wound on proteins like in viruses *di= diġà semmejna li dawn* viruses *u* bacteria they're so simple they don't need lots of instructions so this is just a small strand of DNA and in this strand they have all the instructions needed / other living organisms they have so much instructions that their DNA is long so it has to be wound *allura* bacteria *wkoll* we can't say that they have chromosomes they just have genetic strands okay↗ so know what prokaryotic is and what's the difference between prokaryotic and eukaryotic cells *nisperaw li ħħajlajtjajtuhom* now the structure of a bacteria
Sh25:	we draw it↗
T123:	yes you have to know how to draw it
Sh26:	no like what do we have to know how to draw ↗
T124:	you have to know how to draw a virus / not this this has a bit too much <pointed to the diagram in the powerpoint presentation> all you need to know IS that the bacterium is made – is actually a cell allright↗ *mela* it will have a cell membrane okay↗ it will have a cell membrane <while drawing on the board> // <students mumbling between themselves> *nista' nkompli↗*
Sh27:	*jien* miss *jew hu↗*
T125:	lesson *qegħdin* allright↗ // *mela* bacteria are cells *mela* they have a cell membrane okay↗ with cytoplasm inside / they will not have a nucleus but they will have genetic strand okay↗ *ir-* ribosomes *tagħtux kashom* AND they will have a capsule outside it's not really a cell wall it's a capsule which is going to protect the bacterial cell *tajjeb↗* some of them not all will have a flagellum, flagellum *qisu qisu* tail, it's like a tail which can be moved so that the bacteria can actually move from one <u>place to another</u>
Sh28:	<u>So like a fin</u>↗
T126:	*imma* a fin is made up of MANY cells
Sh29:	*ijja imma QISU*
T127:	it's like a tail you know the sperm and a tail *allura* the bacteria is also a type of cell that has a KIND OF tail called a flagellum for movement okay↗ but not all bacteria have flagella // <starts

	explaining again> bacteria vary in shape some are spherical okay↗ others are rod-shaped and others are spirali
Sh30:	Miss *imma* miss
T128:	YOU DON'T have to know all of the shapes just know that they vary in shape and know that – no no you just have to know that they vary in shape you don't have to ACTUALLY know the shapes / know also that you can find bacteria living on their own okay↗ OR in pairs OR in chains or in clusters okay↗ *skont l-i* species *=ġifieri haw=* species *pereżempju* diplococcus *ismu miegħu* they live always in pairs *dejjem tnejn* okay↗ this kind <pointed to diagrams on the board> *issibhom hekk u dawn hekk* what you need to know is the structure *naħseb aħjar inpinġuh*
Sd28:	*le* miss *jien qed inpinġiha*
T129:	*ee l-aħjar timxu fuq id-* diagram li għandkom fin-* notes okay↗ let's draw it together
Sd29:	*jien dalwaqt lestejtha* miss
T129:	eh↗
Sd30:	*jien dalwaqt lesta*
T130:	*aħjar timxi miegħi Mark*
Sd31:	*tajba naħseb*
T131:	ok so bacteria – you can draw it on the same foolscap where you drew the <u>virus</u> okay↗ about six lines
Sh31:	<u>Miss</u> // yeeey *qed tara Dylan dak li għamilna // ara ħażina: <referring to the other student who drew the diagram before>
T132:	shh <teacher drawing on board>
Sg34:	you can't really use your ruler or protractor for this
Sd32:	Miss *qisek tista tpinġiha ħafif tagħmel 'L' bil-magħqud u tiktibha kemm il-darba xi sitt darbiet u lest*
T133:	<after she finishes drawing the diagram> *insejna xi ħaġa↗ insejna xi ħaġa↗*
Sd33:	*xiex* miss↗
Sa2:	*is-* cytoplasm miss
Sd34:	Miss *aqtagħli l-kurżità aħna ħa nagħmlu dak l-* experiment *li għamilna fis-* science club↗
T134:	you're not going to culture bacteria no
Sd35:	ee okay
T135:	okay↗ *mela naraw malajr dan↗* <teacher plays a video> that's a MITOCHONDRIA <during the video> // <teacher stops video> *ee fimtu x'qal↗ =ġifieri probabbli* bacteria were the ancestors of all life because they are the simplest living organisms that we know of okay↗ they're much simpler than all the other forms of life <video continues> // okay SO they exist in various shapes okay↗ NOW reproduction of bacteria now bacteria will reproduce by ASEXUAL reproduction

	meaning that you don't need two parents just one living organism and asexual reproduction can occur in many different ways this is just one way in which asexual reproduction can occur okay↗ *'il quddiem meta nagħmlu* organisms *oħra ħa nsemmu* different types of asexual reproduction but bacteria always use BINARY FISSION okay↗ *mela* let's see what this means / FISSION is splitting okay↗ splitting of the cell into HOW MANY pieces ↗ BINARY means two so binary fission is the splitting of the bacterial cells into two okay↗ *ovvjament xi jrid jiġri qabel din *it it splits↗ the GENETIC MATERIAL has TO make a copy of itself okay↗ so that's the first thing that is going to happen / when the bacterium wants to reproduce it will first make a copy of the genetic material okay↗ *allura issa għandek tnejn imbagħad is-* cytoplasm *u s-* cell membrane *u daw= l-imbarazz jinqasam fi tnejn biex inti ħa tispiċċa bi tnejn imma t-tnejn għandhom l-istess* genetic material, the exact same copy of each other *u allura dawn ħa jiġu* CLONES of each other they are exactly the same okay↗ this is called Binary Fission AND if you have all the conditions suitable for the bacteria to grow it will grow very very quickly / bacteria grow very quickly about once every twenty minutes, what is needed↗ obviously you will need food okay↗ food in the form basically of glucose which it will need for energy for the chemical processes it would need a suitable TEMPERATURE because we have molecules called enzymes which only work in a particular temperature okay↗ *emm eħe* <looking at details on the board> some of them will need oxygen, water is always needed because you know all chemical reactions basically most chemical reactions occur in water okay↗ and a suitable pH what is pH↗
Sd36:	Phosphorous XXX PHOSPHATE hydrogen
T136:	*le u ejja x'inhi* pH↗ //* ħa mmur ngħid lis-* sir *tal-* Chemistry
Sh32:	pH level
T137:	ee pH LEVEL *x'inhi↗*
Sd37:	phosphate↗
Sh33:	*le x'* phosphate
T138:	*intom wasaltu* Year 9 *u ma tafux X'INHU* pH / *jaf is-* Sir *tal-* Chemistry *li ma tafux x'inhu* pH↗ // it tells you how acidic OR ALKALINE the environment is <bell rings>
Sh34:	*għax ħadd ma qalilna hux*
T139:	*ħadd ma qalilkom x'inhu* pH↗ / okay *mela* next lesson we'll continue
	<students leave the classroom chatting in Maltese>

Appendix L: Transcription – Independent School 1

T1:	allright guys *ejja* settle down // In the name of the Father, of the Son and of the Holy Spirit
S:	Amen
T2:	*mela* goodmorning everyone
S:	Goodmorning
T3:	*mela* first things first, what I am going to do in this lesson is first to collect your write-ups ee make sure please that there's your name on them IDEALLY your name should be in the front ideally your name is in the front
Sa:	Mine is in the footer
T4:	Okay so we have to collect those and then what we're going to do is we're going to work on plants as much as possible I want to get the details of plants over and done with between today and Friday allright↗ *issa* last lesson we went out and I explained a few *aw* a few of the stuff we needed to see / today we're going to focus more on actual note-taking, asking questions if need be and stuff like that okay↗ *mela* Jordan did you have a question↗ no okay Jaden↗
Sb:	Emm did we have to write the date↗
T5:	Did you have to write the date↗ *mela* ideally you have to mention at least when it was done so April:
Sb2:	You told us March
T6:	*eħe* it was March not April yes
Sb3:	Miss and how many pictures↗
T7:	It's irrelevant how many as long as you have a few pictures
Sb4:	So three is enough↗
T8:	It should be / *MELA* GUYS I'm coming round collecting them just ten minutes and we continue <teacher goes round the classroom to collect the work> you were absent so you won't be doing it <to a particular student> Emma (?) sorry my fault // LUKE Luke I need your write-up
Sc:	Miss the change I couldn't do it
T9:	The what ↗
Sc2:	The change in the last paragraph I couldn't make it
T10:	Why not↗
Sc3:	Because the document I sent it to my dad and
T11:	It wasn't PDF *jaqaw*↗ it doesn't matter it's okay it's okay // *mela* attendance // ee we are in the fourth lesson // fifth sorry JORDAN↗ Jordan is here / Abel is here but not here right now, Jaden is here, Julia↗ here, Fredrick is here:, Lisa↗ *fejn qiegħda↗* here: David↗ is here Sarah is here, Emma is here as well, Mia is here, Luke↗ here and Julie here as well/ Luke I need your report don't tell me you're looking for it now
Sd:	no no no

T12:	Can you write your name at the top↗ GUYS notes out *ejja* let's get started
Se1:	Can you give me a file paper↗ <directed towards another student>
T13:	Okay I need to split you two and two // split yourselves two on that table and two on the other and if you talk / no two and two, Jaden back there and if you talk you're out next / girls you too as well
Sf1:	Miss I apologise
Sg1:	Miss i'm sorry too
Sf2:	Miss we were talking about Biology
T13:	I'm sure / *mela* guys last few lessons we started talking a bit about plants and what we said very very briefly about plants and what we said is this ee especially the last week / when I took you out into the carpark etc etc *mela* what we said is // what we said is this *suppost* you have this on your notes but just double check this *mela* if we're talking about living organisms // GUYS settle down *ejja* // if we're talking about living organisms we know that all living organisms are split into two domains,
Sf3:	prokaryotes and eukaryotes
T24:	prokaryotes and eukaryotes *bravi* ee *mela* i'm just going to write them in short here // if we had to look at the prokaryotes we said that there are a number of kingdoms and with prokaryotes the kingdom you need to know is ↗
S:	Bacteria
T25:	Bacteria / prokaryotes bacteria / if we look at the eukaryotes there there are four kingdoms linked with that *mela* simplest eukaryote ↗
Sg1:	plants↗
S:	PROTISTS
T26:	Protists, next / they're a stepping stone
Sg2:	Fungi
T27:	Fungi very good
Sg3:	Plants and animals
T28:	Plants and animals very good / and we're having a closer look at the plants / now the plants like the animals they are complex – you try to rush *u għalxejn* / and because they are complex they are multicellular and the kingdom of plants is split into four smaller divisions / there's the division of ↗
S:	Mosses
T29:	Mosses yes
Sg4:	The ferns
T30:	The ferns
Sf4:	The conifers and the flowering plants

T31:	Yes very good the conifers and the flowering plants / can anyone remember what the scientific names were ↗
S:	<students shout out the names to the teacher> Bryophites Pteridophytes Gymnosperms Angiosperms
T32:	Yes there are Bryophites, Pteridophytes, Gymnosperms and Angiosperms <teacher writes the names on the board> what we're going to be doing now is we're going to have a closer look at each of those divisions *issa* first what you need to know is that most complex of the plants are these the conifers and the flowering plants <points at board> and they are complex because they produce seeds not spores *issa* last time I was trying to explain something about the seeds / the seed contains an embryo: <u>if you look at it</u>
Sh1:	<u>Miss what's the second term for that / ferns</u>
T33:	Pteridophytes it's p-t-e-r-i-d-o-p-h-y-t-e-s gymnosperms then and angiosperms *mela* if we look at the gymnosperms and the angiosperms they are the most complex because they cater for their young / they actually promote the growth as much as possible of their young // *tgɦiduli* but plants are plants they pick and yet these organisms are very highly adapted to give the best kick off, if you want to put it that way, to life for their young / what do they do↗
Sg5:	They give them water
T34:	Yes *eɦe* they pick up their roots they go fetch water and water them <students laugh> no they don't give them water they give them protection // tell me Jaden
Sd2:	The Venus Flytrap what (?)
T35:	I'm not hearing you
Sd3:	The Venus Flytrap (?)
T36:	The Venus Flytrap would fall under the flowering plants / it is an exception because it's a carnivorous plant ee *però* it's a little bit different / keep in mind that flowering plants are then divided into smaller sub-groups but it would fall under one of the exceptional sub-groups because it does not photosynthesise
Sd4:	And they actually they XX the difference of the flowering plant↗
T37:	Yes they do they do they secrete digestive enzymes and the digestive enzymes break down the chemical particles of the fly the actual substance of the fly and the insects ee and they absorb all the nutrients then // Luke↗
Si:	Are there any plants that can eat humans↗
T38:	So far no // tell me you had your hands up <directed towards another student>
Sj:	No nothing miss
T39:	Okay no
Si2:	Someone lost this↗ <refers to an earring which was found on his desk>
Sj2:	Oh yes it's mine // no

T40:	I don't think you wear earrings / okay I know of whom it might be thank you / can you tell↗ *intom* you meet eachother in break↗
S:	yes
T41:	Ee can you tell either Gabrielle or Angelina
Si3:	Angelina hasn't got earrings on and Gaby's wearing dolphins
T42:	*mela* i'll tell the rest of the group let's get back to this *ejja* guys
Sa2:	(?) you said they are carnivores it doesn't mean that ee they can eat strawberries if they want // for example
T43:	No they're not going to eat strawberries // just insect material
Si4:	So they don't photosynthesise↗
T44:	They don't no they are green but they don't photosynthesise
Si5:	Miss what if insects learn that they're dangerous and don't go to them anymore↗
Sa3:	No: no: they won't
T45:	*mela* guys listen up ee when we're talking about the angiosperms and the conifers I pointed out the fact that they produce seeds / angiosperms and conifers produce seeds ee pteridophytes and bryophotes so mosses and the ferns don't produce seeds simple because they are not complex enough / they produce what we call spores so you can split them if you want into seed-producing and spore-producing plants now what's the difference between the seed and the spore↗ very very simple / if you look at a spore you have something like this / a round little structure: which is in actual fact the embryo of the plant / the embryo of the plant will literally be the baby / if you want to put it that way allright↗ // if you look at seeds on the other hand you have the embryo of the plant // that embryo of the plant has attached to it a HUGE food store // that food store <student enters class> welcome back: / is also covered by an outer covering *mela* if I look at //Luke↗ // if I have a look at a seed a typical seed is made up of the embryo which is the baby
Sk1:	Miss *sibtha l-karta*
T46:	Ee thank you // *mela* the seed the actual seed is made up of the embryo which is the baby plant and: to make sure that the embryo has a good start in life attached to it you also find a good food store / that food store will provide all the energy that the embryo needs when it's starting off when it's germinating // not ONLY / keep in mind that seeds and spores
Sk2:	Hey XX
Si6:	Miss –cos someone's calling (?)
T47:	*ħa nibdew* use another pen let's continue // give it to him / the food store will ensure that the embryo has a good amount of supply of energy while it is growing / not only that / the seeds and the spores are found in soil now soil is made out of rocks, stones, humus, decayed matter, animals that are going through like worms and stuff like that / it's made up of a lot of rough things / anything that is rough is going to damage the embryo / a spore: won't survive that easily

	it's very difficult for a spore to survive being moved around, braised and stuff like that in the soil / but a seed: has the embryo that is protected by an outer most cover which we call the testa / keep in mind think of it this way / you can imagine a broad bean the *ful il-ful* they're in season right now we make *kosksu* from them ee we make a lot of things / you break open the pods and you've got a lot of seeds inside and if you look at the seeds you've got a little white embryo that little white thing that there is at the edge of the bean that is the embryo / attached to it there's a huge green food store, that food store is going to supply the embryo as it is growing through the dark soil because there's no light under the soil / is going to supply it energy to grow roots to grow shoot etc etc and not only / it has an outer most cover which is the testa that will protect the seed from getting scratched while it's in the soil / who had a question↗ ok Anna
Sk3:	Ee for the spore the embryo's going to the outer shell or the inside↗
T48:	Ee it's the whole thing this is just a whole thing SOMETIMES in some spores you might have a little bit of a food store sort of but that is the maximum they can supply // they are released they will germinate almost immediately / if they are too deep down in the soil they won't make it to get to the top because they run out of energy allright↗ tell me:
Si6:	miss two questions one of the spore what's that second curve↗
T49:	The second curve here↗ <points at board> because sometimes you might have some spores that have a food store but it's not always the case many times it's without a food store
Si7:	Ee okay and: the testa protects the embryo from trampling↗
T50:	Trampling, getting scratched by the stones or being eaten stuff like that okay↗ // *mela* the testa protects the seed from being eaten, it protects it from the digestive tract of animals if it's eaten, it protects it from being scratched by the soil
Si8:	Miss so then how hard is the testa↗
T51:	Sometimes they can be very hard especially when they're dried
Si9:	what happens if you bite will it hurt↗
T52:	Yes you can break your teeth then // when it's fresh it's quite soft but when it's dried it's even harder than the carob one // you break your teeth on it literally and the teeth are very hard // right let's have a look at some details // *mela* this presentation is going to be up on the Klikks system allright↗ with the annotations and everything *però* if you want to take down notes I strongly recommend that you do / we're going through ALL the systems of the plant we will start from the root or the shoot and the leaves or whatever
Si10:	Miss you posted the protist powerpoint↗
T53:	Yes I did
Si11:	Because I didn't find it
T54:	*mela* give me a pendrive and I will save it there
Sk4:	I think she gave a copy
Si12:	No that was of the bacteria one

Sk5:	No of fungi fungi
T55:	*suppost* I did as well / okay don't worry let me tell you in break / I have it saved on my other computer I'll save it for you allright↗ *mela* guys plant structures these are things that you need to know *mela* ee when we're talking about plants in general we are talking about most plants that are around us and those are the angiosperms / so what I am going to be explaining right now has mostly to do with angiosperms and gymnosperms as well the most complex of the plants / we're going to see the root system: their transport system, the leaves, the shoot system etc etc all right let's kick off with them *mela* having a look at plants *mela* plants are made up of a number of cells they are multicellular and because they are multicellular they are made up of specialised cells allright↗ keep in mind specialised cells are cells that have a particular shape in order to carry out their own function / if you look at plant tissues if you look at what: plants are made up of / the most important thing that you need to know is that they are made up of a root system and a shoot system / the root system is what system the one that you can see or that you cannot see ↗
Sk6:	The one under
T56:	The one that you cannot see it's the one underground
Sk7:	Miss but you can see it if you pull it out:
T57:	If you pull it out yes but under normal circumstances you don't usually see the roots // so the root system is the one that you cannot see and then you have the part of the plant that is above the ground that is the shoot system
Si13:	Miss sometimes with trees when they're really big you can see
T58:	Yes because they grow all over the place
Si14:	So basically the roots they can be a few kilometres long↗
T59:	Not kilometres a few metres yes
Si15:	So you pull it out↗
T60:	You won't be able to pull it out you'd have to cut the roots then because they'll be so strong and wide and deep that it's practically impossible to pull
Si16:	Miss how deep do they go ↗
T61:	They can be very deep and we're going to see this as well // *mela* the root and the shoot system // <points to student> put that away // away means in your bag not under the desk guys // the root and the shoot system are connected together by a number of tissues / first and foremost they are connected together by a number of tissues a number of systems / the first system is not on the slide just yet / is the vascular system / a vascular system is literally like a vein system we have a vascular system
Si17:	The veins↗
T62:	Yes the veins and the↗
S:	Arteries

T63:	Yes the veins and the arteries and the veins and the arteries allow a fluid to go through them // *mela* in the case of animals you have a transport system and a vascular system that transports blood and the blood transports other things food, oxygen, carbon dioxide, heat whatever / in the case of plants they don't have blood but they still need a system that runs through them that carries water and food
Si18:	The xylem and the phloem↗
T64:	Phloem is something else
Sk8:	Miss some big trees have really big roots but how do they fall over with the wind↗
T65:	We're going to come to that that's a very very very good question but <u>massive roots</u>
Si19:	<u>Miss miss miss</u>
T66:	*iva ieqaf naqra* // there are fibrous roots and there are tap roots that go deep down the ones that go deep down there's no way that the tree is going to tip over because they are anchored really deeply and the fibrous roots are spread wide so if there's a really strong hurricane it can blow the tree over and the whole root system can be uprooted
Si20:	It's quite stupid though why can't they all have deep roots ↗
Sk9:	You think they can choose what they have↗
T67:	*mela* two things can happen, tell us:
Sk10:	=cos maybe there's rock underneath↗
T68:	There could be rock underneath that is one but the more important thing is this // the plants that have widespread roots are designed to collect as much water as possible for them it makes more sense to collect water from the surface / those who have roots that go deep down require sort of less water because it takes them a much longer time to find water deep down / does it make a bit of sense like that ↗
Si21:	So it's easier for them↗
T69:	Yes it's sort of an adaptation
Si21:	Allright miss
T70:	Allright miss: so you're not convinced ↗
Si22:	Miss but what it the rocks underneath them are just XXX and then they go down and they die because they don't have enough water ↗
T71:	And then they die // *mela ejja* let's continue function of the roots: try to focus on plants it makes more sense
Si23:	Miss if you give a plant steroids will it grow faster↗
T72:	Yes // there's a way to give them but you don't inject them // you don't give them steroids you give them hormones many times for them it would be like a drug / PEOPLE
Si24:	Miss do we have to write everything↗
T73:	I would be taking down notes *mela* guys FUNCTIONS of the roots very very simple / there are two main functions of the root / the root is there to ABSORB water / on the slide there is written

	nutrients / the proper form of the nutrients are minerals why↗ because you've got XX that are dissolved in the water those are in mineral form so we say that the roots are used for absorption of minerals in the water okay↗ they absorb water and minerals that are dissolved in them // another function would be that they anchor the plant to the ground / if a plant had no roots so this is the ground and this is the plant <pointing to diagram on board> if a plant has no roots then it's simply going to fall / but if it's got roots deep down it's going to be anchored okay↗ *issa* how good and how bad it is anchored is a totally different matter / but at least for some time it is anchored
Si25:	Miss how deep down can the roots go↗
T74:	As deep down as possible
Si26:	Miss what if they go to the centre of the earth and break↗
T75:	It's a figment of your imagination they cannot go beyond the crust it's impossible because underneath the crust is magma which is molten lava and no living organism can survive molten lava yet
Sk10:	Luke let's see Luke now
Sa5:	Miss you know XX there are like small bushes and stuff / because it's like rock how can it break with the roots ↗
T76:	The roots are very very strong actually they begin the first breakdown of rock into soil so it is slow but the minute there is a small crack in the rock / keep in mind that that rock is exposed to rain, heat and things like that so it cracks / roots can find that crack they can grown through it and they will expand / if you look at certain roots like of fig trees for example the fig tree is strong enough to break thrugh solid concrete for example at home my parents have a well that has a concrete wall this thick <shows approximate thickness with her hands> it's about what ↗ ten centimetres ↗all around / further up in the garden they had a fig tree and that fig tree was sensitive enough to detect where the water was coming from *coe* where the water was through the concrete *gifieri* and the roots grew all the way through the garden and they cracked right into the concrete
Sa6:	Miss how long is the garden↗
T77:	My parents' garden↗ the length is about three times bigger than this room
Sa7:	Ee so they can grow↗
T78:	Yes they can go but not fifty kilometres it's just a few metres I mean *mela* guys another very important function of the roots / it might not be directly related to the plant itself *però* it poses a very important factor for plants because roots prevent soil erosion their actual root holds the soil around it together / if you look at the root structure here <points at board> you've got the number of roots and those roots are actually clumping the soil together / that clumping of the soil prevents the soil from being blown away or being eroded very easily okay↗ so plants roots prevents soil erosion <first bell rings> see that's already one lesson gone / okay so

	obviously you want to prevent soil erosion because if there's no soil plants will not grown that well
Sa8:	Won't they get washed away↗
T79:	They will get washed away, won't absorb the minerals that they need and just die ee next thing the functions of the roots are also to carry the water and the nutrients and to provide the upright support okay↗ so that anchorage down provides the upright support / why do plants need to grow upright↗ hands up let's see
Sk9:	For competition with other plants↗
T80:	For competition with other plants for the sunlight they need the sun without the sun they are nothing okay so they need the light and they will grow as far up as possible for that sunlight
Sa9:	Ee the roots are obviously competing for water / is it possible that like the roots wrap around each other↗
T81:	Yes very possible if there is enough water and nutrients they won't kill each other off but yes if there is a lack of water the plant will react it will grow roots faster and they will strangle the other ones // *mela* next question guys *aw* next slide / the next system in plants is the stem system *issa* the stem is that stick if you want to put it that way that actually supports the photosynthetic organ / can anyone tell me what the photosynthetic organ is↗
Sa10:	Leaves
T82:	It's the leaves okay *issa* the stems have a long list of functions / the first one and the most important one is that they support the plant <teacher stops because someone is not attentive> are we going to stay in break↗ no I'm serious / you've got this for your O-level // okay *mela* the stems produce *aw* are responsible for support of the plants / another thing they do is that inside them if I have to draw on the inside they have veins that carry the water and the food / they are responsible for transporting the nutrients and the water throughout the plant
Sa11:	Miss which is the stem↗
T83:	The stem is this this thing right here
Sa12:	Ohh
T84:	Even this particular thing right here it's the stem
Sa13:	Miss so a trunk is basically a big stem↗
T85:	Exactly it's a mature stem
Sk10:	Miss so how do they how do they decide which it's going to be for example a tree how <u>do they</u>
T86:	<u>It just grows it just grows</u> how did you decide that this is your right leg and this is your left leg↗
Sa14:	We didn't decide science did
Sk11:	So it's like they invent it
T87:	No they didn't invent it it's just there okay↗ it's the same with plants they just are
Si6:	Miss so you know the vascular system / we call them our veins / what do plants call them↗

T88:	The vascular system ee xylem and phloem we're going to do that aswell *mela* guys back here / i'm going to rub this off <grabs board eraser and it almost falls> *u ejja* right guys another important function of the stem is that besides supporting and carrying the nutrients and the fluids it also provides a very good defense system against the XX for example the thorns ee it also provides defense against bacteria why↗ because it's got a very thick epidermis / epidermis means skin / and it prevents bacterial infections so obviously if you go along scratching that stem you're going to scratch through the epidermis and bacteria and viruses can get it from there okay↗ // ee it can vary for a few millimetres to a few hundred metres and an example of this <searches picture> *mela* this is how wide
Si7:	MISS but that's not a hundred metres
T89:	No it's not a hundred metres but it's just one example / anyways i'm going to keep it to this / right so if you have a look at some stems
Si8:	MISS a hundred metres
T90:	No it's not a hundred metres but i'm not going to stay looking for one with a hundred metres // mela some stems can grow so large that they are a few good metres let's not say a hundred *mela* they can grow a few good metres in width *issa*obviously this does not happen overnight it takes years to happen *però* these are some of the largest trees / some twats if you want to put it that way actually cut out drivers through them nowadays it's illegal you can't do it anymore but during the 1960s when these forests of red woods / what happened was people discovered these forests and they thought it was so cool and they wanted to share how big these trees were that they actually started cutting drivers into them they actually built houses in the whole tree / some of the red Woods died unfortunately / obviously if you cut off too much of the stem then you won't have enough transport of water and food throughout the plant so it will die
Si9:	Is there a chance of collapsing↗
T91:	Yes there's a big chance of it collapsing
Si10:	So why do they do it↗
T92:	Because humans are weird <students laugh>
Si11:	But can it like repair itself↗
T93:	Yes it can kind of repair but not to that extent / anyway so that's enough about the width // SPECIALISED TISSUES talking about the leaves now if we're looking at the leaves leaves are part of the shoot system and they are mainly responsible for photosynthesis / infact they are what we call the photosynthetic organ of the plant allright↗ ee because they are responsible for photosynthesis they are responsible for providing the food / the food comes in the form of glucose / that glucose is then burnt during respiration to provide energy in the form of ATP / this you already know *suppost* plus it releases some carbon dioxide and it releases some water *issa* many of you might not have yet realized that plants also need oxygen / we always say at least up until Grade 7 that plants <u>absorb</u>
Si12:	<u>absorb carbon dioxide and give oxygen</u>

T94:	But in actual fact they do two processes / one process that is happening twenty-four hours a day and night is the process of respiration which is converting food into energy for life, energy for growing, for producing seeds for whatever / so that process respiration has to happen all the time / now plants are aerobic organisms meaning they require oxygen so a plant is always taking a volume of oxygen in the only thing is this / during the day a plant: can carry out photosynthesise whereby it absorbs a lot of carbon dioxide and together with water than carbon dioxide is converted into sugar // as a result during the day the plant gives off a high amount of oxygen so high: that it covers up the amount of oxygen that it is taking in / does it make a bit of sense like that ↗
Si13:	Yes miss it's kind of like a solar panel / it uses electricity but then it reduces and makes up for it t↗
T95:	Yes yes exactly / let me try drawing it out with units <drawing on board> Jaden tell me:
Sk12:	Ee it produces more oxygen or ↗
T96:	Much more oxygen much more during the day / we're saying this that during the day and night / this you might want to copy out / during the day and night there is a very important process which is respiration
Sa10:	Miss can plants kill themselves↗
T97:	No *ħanini* they cannot // *mela* during the day AND night there is a process which is respiration and that is happening all the time / during respiration what happens is that food in the form of glucose is burnt using the oxygen and as a result energy is <u>given off</u>
Sa11:	<u>Miss if there</u> is plants in your room is it good or is it bad so↗
T98:	No on the whole it is good
Sa12:	No during the night↗
T99:	During the night they will take up a bit of the oxygen / you can just take out the plants during the night
Sa11:	They will kill you
T100:	*hux* kill you / *mela* some carbon dioxide is given off and some water is given off *issa* i'm going to give a fictitious ammount here / let's say that during the day and night a hundred units of oxygen are being used up so here the plant is using a hundred units of <u>oxygen</u>
Sa12:	Miss so like will you die with a hundred plants↗
T101:	Luke *aħjar* you focus here *mela* during the day and during the night the plant is constantly using up oxygen / let's say that it uses up a hundred units in a day and a night *issa* during the part when there is the sun so during the day it also carries out photosynthesis so during the day there are two processes which are happening in a plant and during photosynthesis what it does is it takes up carbon dioxide and water and it releases oxygen and sugar / that oxygen could be

	five hundred units and it's given off / so plants actually during photosynthesis they give out much more oxygen that they actually use up / so during the day we are not going to notice any ee oxygen used up we are going to notice *anzi* that there is a lot of oxygen / am I making myself a little bit clear here ↗ Jaden tell me
Sk13:	Ee how much CO_2 does it give off↗
T102:	That's a good ques- *aw* good question as well *mela* if we had to use the unit system which is fictitious but anyways if we had to use the unit system during respiration let's say it gives off twenty units / during photosynthesis it won't use twenty units / let's say this is given off <writes on board> during photosynthesis it's going to use for example four hundred units / so it uses much more carbon dioxide than it actually gives off
Sk14:	And how do they give off water ↗
T103:	Ee as evaporation / we're going to see this aswell / ee *gɦidli* <student wanted to ask another question>
Sk15:	Where does it come from / where does the oxygen come from ↗
T104:	It actually creates it from these two the water and carbon dioxide *gɦax hi* what it does the plant actually splits the molecules and it seperates them / now some of the chemicals is going to form the sugar and the rest is pure oxygen given off just released into the air / okay↗ are you okay so far ↗ *mela* if you want to copy that out copy it out / done↗ done I guess // guys let's continue back to here *mela* what we've got here at the bottom of the slide is that during respiration food and oxygen are burnt up / energy is released in the form of ATP / carbon dioxide and water will be then used again during photosynthesis but as I mentioned before the amount of carbon dioxide used up during photosynthesis is much more than the plant actually gives out okay↗ next slide / specialized tissues in plants we're looking at the transport system in plants *mela* in the diagram over here what you've got is a cross-section of a stem now if you just look at it under the miscroscope / now you don't need to know what these different cells are // if you look at the diagram you're going to see through the different coloured cells that there are different types of cells within a stem or a root / the different cells constitute the different tissues / the first part that we're going to have a look at is the dermis / the dermal tissue which is the skin tissue / anything with dermis in it like epidermis has to do with skin / dermis means skin / epidermis means outer skin *mela* you've got the dermal tissue then we're going to be seeing the vascular tissue which is the vein system and then we're going to be seeing the ground tissue / the ground tissue is packing tissue / keep in mind plants don't have skeletons so what we're going to see is a lot of packing material to keep them supported growing up towards the light
Sk16:	Miss so these are all in the shoot system↗
T105:	And in the root system as well // can I flip↗ next: this is a bit weird / if we had to look at the skin of a plant the epidermis / you're going to notice this you're going to have a layer of cells all around the leaf and those cells are all packed together so they prevent bacteria from coming in / the only problem is this it's going to protect the plant from bacteria and viruses from getting in

	but the thing is this / a plant needs oxygen and it needs carbon dioxide so through some way the gases need to get into the leaf / to allow: the gases into the leaf what happens is this: you have a leaf that is covered with the skin the dermal tissue and normally underneath you get the funny-shaped cells that look like beans: sausages: they are curved tissue / we call them guard cells / they are normally flocked against each other / now imagine I'm inside the leaf / here there is all the skin tissue / my hands are the guard cells / oxygen and carbon dioxide need to get in and out of the leaf so what happens is the guard cells flock because they don't have enough water in them but when you water a plant the water fills them up and they fill up in such a way that they bend / they become sausage-shaped / they open up between them a hole we call it a pore and through that pore gases can be exchanged so oxygen can pass in and out and carbon dioxide can pass in and out // that pore is called a stoma or stomata many / so you've these guard cells WHEN they fill up with water they become sausage-shaped and they open up a hole and water and carbon dioxide can pass through does it make a bit of sense↗
Sk17:	Miss we need to know how to draw it↗
T106:	*issa imbagħad* I'll show you how to do the biological drawing as well // okay↗ not very convinced aye↗
Sa13:	Miss =cos for us it doesn't make a lot of sense
T107:	why↗
Sa14:	Because we're not plants
T108:	Okay *mela* let me put it on par with us / we need oxygen and we need carbon dioxide / we have lungs: to do so and we have intercostal muscles to contract our rib-cage and force the air out etc we have a breathing system / plants also have a breathing system all they have are these little cells the guard cells what they do is when the cells fill up the water the hole opens: and gases can pass through okay↗ that is all it is
Sk18:	Miss how can the gases pass through if there's water there↗
T109:	The water is in the cell // give me a second *mela* if you look at a leaf there are two parts to the leaf // <drawing on the board and looks at a student playing with the scissors> is this David's↗
Sa13:	No *u ejja* miss <laughs> <teacher takes the scissors>
T110:	Can we look here it's almost break I think you want a break / if you look at a leaf you have the top and you have underneath the bottom side *issa* if you look at the bottom side what i'm going to see are a lot of cells all packed all together
Sk19:	Miss we draw this↗
T111:	Understand it first i'd rather you understand it / *mela* i'm going to see like a brick wall with all cells packed together / that is the epidermis that's the skin and it goes on and on and on but ever so often i'm going to notice a different shape some of them are like this <draws on board> and some of them might look like something like this // i'm really exagerating this on purpose *mela* this thick line over here is the cell wall / these cells are known as the guard cells now the funny thing about them is that guard cells have a thick wall in the middle / where they meet: the cell

	wall is extremely thick *issa* under normal circumstances: they don't have enough water in them and they're flocked against each other THAT closes the hole / but when the guard cells fill up with water because of the thickness in the middle this bends slower that the outside so automatically they become sausage-shaped / as a result / I can use my pen now <uses own pen> as a result of the two guard cells bent like that: a hole is open / this area over here is all air space and that opens up a passage way to the inside of the leaf / in that way any carbon dioxide or oxygen that there is inside can come out / and any oxygen and carbon dioxide outside can go in // the guard cells are specialised cells in the epidermis they open up the pores and gases can be exchanged / so that's just part of the dermal tissue / the next part that we have is what we call vascular tissue which is a bit different / vascular tissue can be found on the inside of the plant and it is found in the roots, in the shoots, in the leaves wherever but always inside the plant / so you might want to take a note down of this / the dermal tissue is found on the outside: of the plant / the vascular tissue is found on the inside: / dermis outside vascular tissue on the inside // shall we go on↗ // what on earth is the vascular tissue↗ the vascular tissue is very important for the transport of the water and the food and it's made up of two sub-systems / two sub-cells if you want to call them that / the xylem cells and the phloem cells / xylem carries water and the water is carried upwards from the roots up to the leaves where it is needed / the phloem is responsible for transporting the food and the food is transported in the opposite direction because the food is made in the ↗
Sk20:	leaves↗
T112:	In the leaves very good and it goes down to the roots or wherever else it is needed / so you've got a two-way system water goes up against gravity and sugar goes down // the way I used to remember which carries what maybe it will help you remember / xylem carries water fine but the phloem carries food remember the 'f' sound 'f' 'f' okay ↗
Sk21:	Miss in humans the arteries do this↗
T113:	In humans the arteries carry oxygenated blood so they are a brighter red
Sk22:	But like the xylem and phloem have a colour↗
S114:	No no they're transparent many times or they might be coloured according to the cell sap *mela* ee the xylem and the phloem are responsible for carrying the water and the sugars throughout the whole plant *issa* what we've got over here is this sort of diagram / if I have a plant and I cut the stem: lengthwise / what i'm going to see is the outer skin then i'm going to have a lot of tissue in between and i'm going to notice a lot of tubes in the middle / the tubes carry water up those are the xylem and there are tubes that carry phloem *aw* sugars down and that's the phloem / what's the difference between them↗ it's the structure of the cell *issa* I'm going to stop that over there and next lesson we're going to be talking about xylem and phloem in a little bit more detail ee you can pack up because the bell is about to go and you can have two or three minutes break / I recommend that the papers that are on the floor you pick them up or

	else I’m going to have some students in break picking them up <students pick up the papers and pack up>
	<when packing up the students continue to speak to each other in English>

Appendix M: Transcription – Church School 2 and Independent School 2

Church School 2:

T1:	In the Middle Ages it was a time *fejn kellna ħafna ħafna* plagues *il-* Black death it caused quite a drop in the population of the world
Sa1:	*hemm ċans li tiġi oħra bħal ma ġara↗*
T2:	It is actually treatable now *imma dak iż-żmien ma kinitx treatable Malta kienu darba għamlu* series *il-pesta kienu semmewh għax il-* plague *il-pesta / l-isptar ta' Malta Manoel Island kien*

T3:	Another part of the population is the predator-prey cycle / it's a graph okay *ħa nurikom il-* graph and then you will understand me
Sb1:	Miss *di rridu nikkuppjawha jew↗*
T4:	*għandkom fin-* notes *ġifieri ħarsu 'l hawn* so you will understand it

Independent School 2:

T1:	All of my hyphae that are going to be involved in reproduction collectively we are going to call them the mycelium so mycelium can collectively be referred to as the vegetative part of the fungus okay↗ this is written all of it on page three highlighted there is also the definitions of mycelium and hyphae it's at the bottom of page three

T2:	When we looked at our onion under the microscope what did we see
Sa1:	Our onion epidermis
T3:	Yes our onion epidermis

T4:	How does nutrition in a fungus difer from nutrition in a protozoa
Sb1:	In a fungus the digestion takes place externally but in a protozoa it happens internally
T5:	Exactly