How does differentiation in homework informed by formative assessment influence students' academic performance?

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How does differentiation in homework informed by formative assessment influence students' academic performance?

Abstract

The purpose of the study was to establish if differentiating homework informed by formative assessment influenced student achievement in biology.

A mixed methods approach was taken involving two Year 10 and two Year 12 biology classes. The design of the intervention emerged from relating concepts from research regarding the positive influence of formative assessment, differentiation and homework on student achievement and to the specific context at School X[1] as a development target. The intervention employed an online formative assessment in the form of a ten-question multiple choice quiz, followed by a differentiated homework task informed by the quiz score. The quiz questions were guided by the use of Bloom's Taxonomy verbs to distinguish the various learning styles.

The experimental design of the research composed of a control group that received the traditional homework, and an experimental group that was offered the intervention. Quantitative analysis of pre and post topic tests before and after the intervention revealed no significant difference in scores for both groups. However, qualitative analysis of the intervention suggested positive outcomes, revealing that differentiating homework benefits all students; it enhances gifted students while it supports struggling learners to be appropriately motivated in their learning process.

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[1] The researchers School

Table of abbreviations

MCQ-Multiple Choice Quiz

Di- Differentiation/ Differentiated Instruction

FA- Formative Assessment
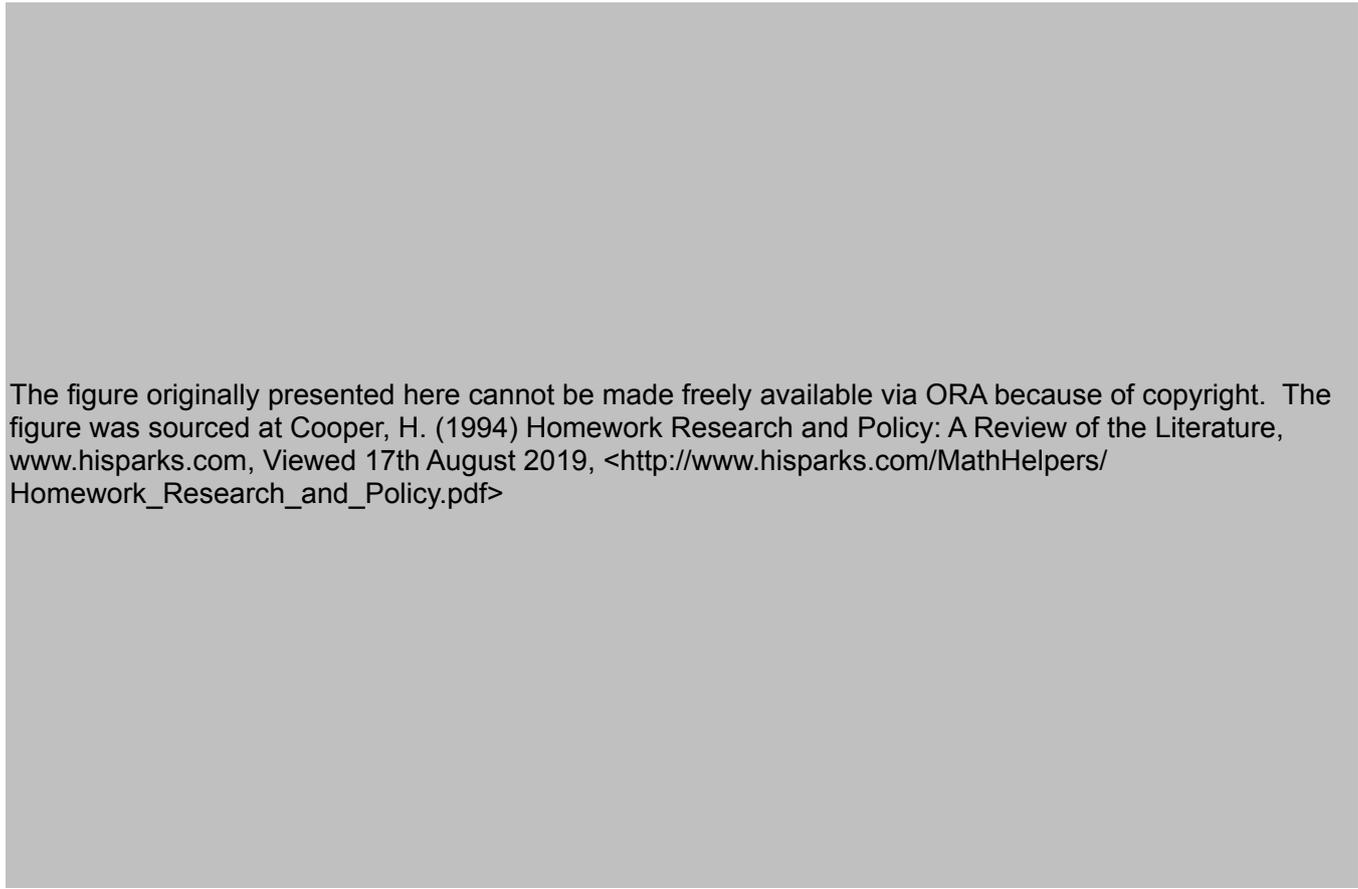
HW- Homework

EoY- End of Year

Chapter 1

Introduction and Rationale

> *When teachers design homework to meet specific purposes and goals, more students complete their homework and benefit from the results*
> (Epstein and Van Voorhis, 2001, p. 191).

The following section will explore the rationale for this study in terms of research, school and national priorities and why this study has been conducted.

Homework continues to be a subject of lively debate and discussion for many decades. Cooper (1994) summarised the effects of homework quite concisely in the following table.

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Cooper, H. (1994) Homework Research and Policy: A Review of the Literature, www.hisparks.com, Viewed 17th August 2019, <http://www.hisparks.com/MathHelpers/Homework_Research_and_Policy.pdf>

However, there are numerous factors that influence the effect of homework as again summarised by Cooper (1994) in Table 2. For the purpose of this project, the

exogenous factors and assignment characteristics outlined on the table have been focussed on.

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As seen above, homework is beneficial for students. However, for it to be productive, the teacher, students and parents must have a shared understanding on "why homework is assigned, whether it is appropriate in quantity and quality, and how it is structured to fit into teaching and reteaching skills in the classroom." (Epstein, 2015, p. 232) Where purpose and process are not associated, then it is likely the potential benefits will be significantly reduced, contradicted or counterproductive (Alanne & Macgregor, 2007)

Having taught biology for the past seven years, I have also observed a correlation between homework completion and academic success. As a teacher, I try to continuously monitor my students' progress and my own teaching practices so that I can cater for all students effectively.
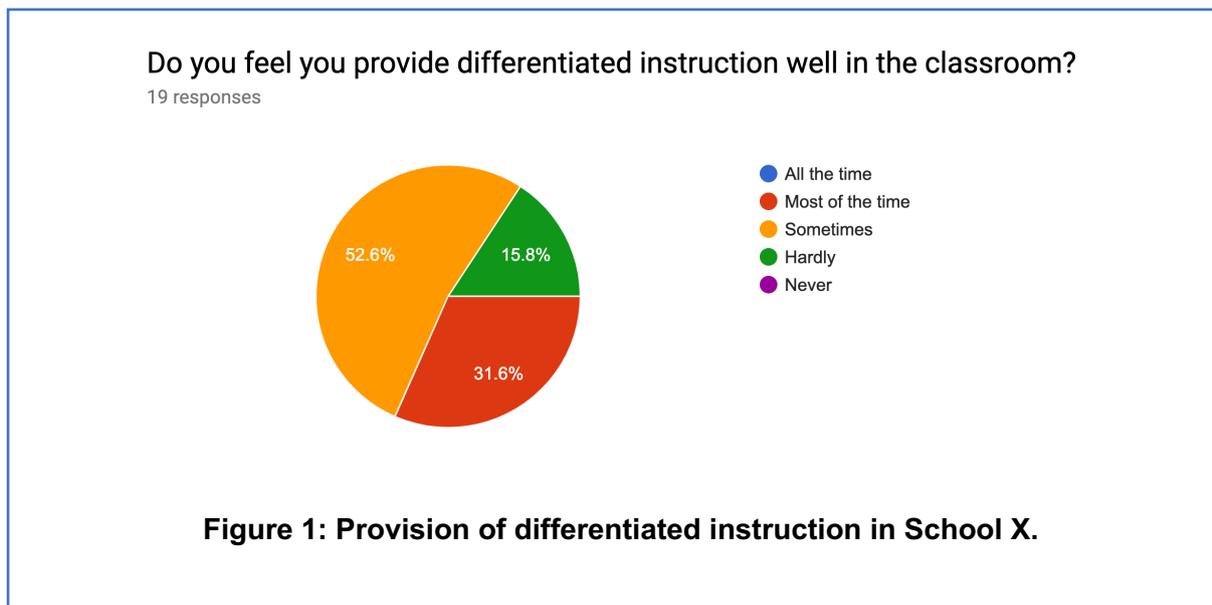
The student population at my school is multicultural and from diverse socioeconomic backgrounds. Extensive research has been conducted on differentiating in the classroom environment (Thakur, 2014, Kiley, 2011). However, can the same principles be applied to differentiating homework where it is tailored to meet the needs of the diverse student population present in my biology classroom?

The type of homework I previously assigned did not address the diverse learning styles in my classroom. In this study, I aim to find a more effective homework process that results in overall academic and emotional growth for students to use and promote within my classroom. I wanted to explore within my own practice how I can set homework that is more meaningful to students by differentiating it to address various learning needs. The part 2 project of my Masters qualification explored how 'gifted underachievers view giftedness and what factors influence them from achieving their potential '(Author, 2018). One of the factors was that a lot of students develop an unconstructive attitude towards subjects because they find homework unengaging. These are the remarkably gifted students who fail to achieve their true potential and often complete school with average to high average grades. I hope that this part 3 project for my Masters would extend this by understanding why this is the case and developing an intervention that would foster learning as opposed to handing in homework for the sake of it.

Department and school priorities

When introducing new topics to the whole class it can be difficult to identify weaker students who are hiding their lack of understanding by using the answers and ideas of others around them (Teacher, School X)

A pre-intervention survey of 19 teachers within School X highlighted concerns about differentiation and efficient homework which merited continued research. When asked if the teachers provided differentiated instruction in the classroom, 68.4 % of teachers admitted that they rarely or sometimes did (Figure 1), with test papers being the most common type of homework set (Table 3).

Do you feel you provide differentiated instruction well in the classroom?
19 responses

- All the time
- Most of the time
- Sometimes
- Hardly
- Never

52.6%
15.8%
31.6%

Figure 1: Provision of differentiated instruction in School X.

What sort of homework do you tend to usually set? Please choose TWO which most apply to you.

19 responses

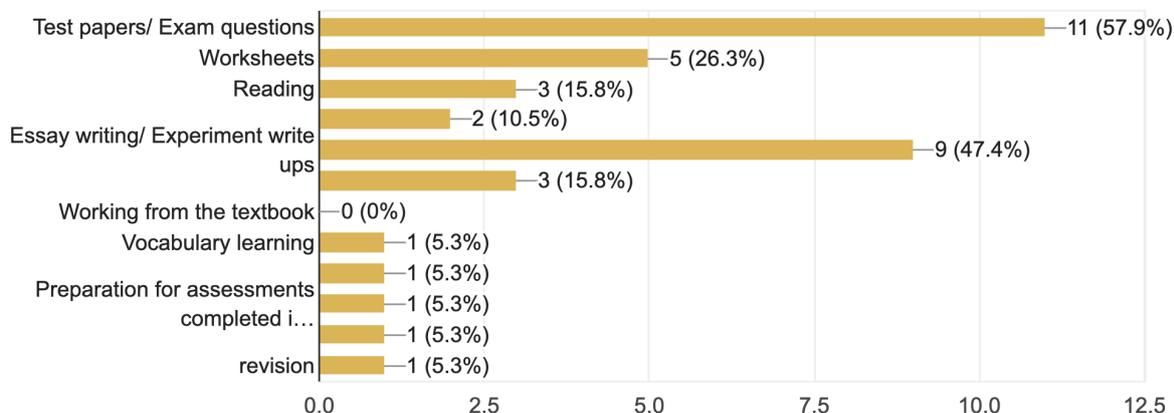| Type	Count (Percentage)
Test papers/ Exam questions	11 (57.9%)
Worksheets	5 (26.3%)
Reading	3 (15.8%)
Essay writing/ Experiment write ups	2 (10.5%)
	9 (47.4%)
	3 (15.8%)
Working from the textbook	0 (0%)
Vocabulary learning	1 (5.3%)
Preparation for assessments completed i…	1 (5.3%)
	1 (5.3%)
	1 (5.3%)
revision	1 (5.3%)

Table 3: Type of homework set by teachers in School. X.

The KS3 School homework policy 2019-20 at School X aims to promote students' self-discipline and personal responsibility for their learning and organisation. Teachers are urged to set homework which is appropriately challenging for all students. As seen in the survey, majority of the teachers tend to set one type of homework which may or may not be equally challenging and appropriate for all students.

The whole school focus is also on developing approaches to differentiation to support the progress and outcomes of all learners, particularly those at risk of underachieving. Hence, there was a need to produce an intervention that firstly identified the students who are underperforming, and individualising their support. In the case of this project, by differentiating their homework.

National priorities

> *The constant pressure for pupils to reach impossible standards, and the constant tinkering with the curriculum, leaves them feeling demoralised and disillusioned by education. This is no way to encourage more children to do well at school or college*
>
> Mary Bousted, joint leader of the NEU (Busby, 2018)

More and more students are getting discouraged from attending school due to the stresses and unmanageable expectations, leading to mental health issues. Mental health is a big issue in schools and university at present. In a survey of 4317 students from high performing schools in California by the Stanford Graduate School of Education, found that 56% of students considered homework a primary source of stress. Some secondary schools are banning homework to alleviate what they describe as an "epidemic" of mental health problems (Pells, 2016).

However, in a contrasting large study of 3000 children by the Department for Education concluded that secondary students who spent between two and three hours on homework per night were approximately 10 times more likely to achieve five good GCSEs (A*-C) than students who did no homework at all (Sylva et al., (2014). So how can teachers set homework which will not cause stress to their students and yet benefit their grades? Education researcher, Professor John Hattie suggests that for homework to be effective, it has to be the right type of homework where it is pitched to a student's age and skills encouraging them to complete it (Silvester, 2017).

The importance of differentiation, formative assessment and homework has been established; the challenge lies in establishing their use together. The purpose of this

study was to therefore make homework more meaningful to students by differentiating it to address various learning needs and levels. This study also investigates how formative assessment using computer systems can help differentiate accurately, conveniently and provide instant feedback for both teachers and students. Little research has been done on this concept. This study sampled secondary educators and students in Year 10 and 12 to determine the factor that increase the likelihood of differentiated instruction in homework or impede its use.

The findings of this research will essentially inform the Biology department and the school, highlighting the benefits of differentiation in homework. Additionally, it is hoped this will contribute to the field of educational research despite the small scale of practitioner research.

Key definitions

There are some terms that I deliberately use interchangeably throughout the project. Although the terms appear discrete in some parts of the literature, my teaching experience suggests meaning is consistent in a school setting.

Differentiated instruction and assessment, **differentiated learning**, **differentiation**

According to Carol Ann Tomlinson, (as cited by Ellis et al., 2008) differentiated instruction, is the process of 'ensuring that what a student learns, how he or she learns it, and how the student demonstrates what he or she has learned is a match for that student's readiness level, interests, and preferred mode of learning' (p.32).

Formative assessment/ assessment for learning

Formative assessment is defined by McManus (2008) as a process in which 'teachers and students provide feedback during instruction to organize the learning and teaching process in order to increase student achievement.' (p.3)

Homework

According to Dr Harris Cooper (1989), homework is defined as 'any task assigned by school teachers intended for students to carry out during non-school hours' (p.7). This should not make homework a displacement or substitute for classroom work. As such, Alanne and Macgregor (2007) define homework as 'the time students spend outside the classroom in assigned activities to practice, reinforce or apply newly-acquired skills and knowledge and to learn necessary skills of independent study' (p.2)

Summative assessment/ assessment of learning

Summative assessment is an 'overview of previous learning' (Black, 1998, p. 28), either by accumulating evidence over time or by testing at end-phase or other transition times.

Chapter 2

Literature review

Chapter 2 covers a review of the literature concerning differentiated instruction and formative assessment particularly in homework supporting the need for the current study.

Over the past seven years as a secondary school teacher, I have observed a convincing link between the completion of homework and academic success. However, the type of homework I currently assign does not address the diverse learning abilities in my classroom. Considerable research has been conducted on the adjustment of instruction methodology to accommodate differing learning needs in the classroom (Deunk et.al, 2018, Thakur, 2014). However, can the same principles be applied to differentiating homework? My research will therefore try to determine whether when given a differentiated homework task (based on a short formative assessment to identify their needs), students will be more likely to complete and submit their own work and take control of their learning and progress. It is hoped that this will consequently improve their academic performance in summative assessments.

The following research questions will guide my inquiry

1. How can formative assessment be used to differentiate instruction?
2. How does differentiating homework address the needs of various students, for instance improve their understanding of the topic?
3. Does differentiation influence students' academic performance, particularly the end of topic grades?

My literature review will focus on the following three sections. The first section will look at the use of formative assessment as a foundation for differentiated instruction. The second will focus on differentiation and how it can be used to make tasks (especially homework) more accessible to all students. The third section will explore the use of differentiation (especially in homework) and its influence on student academic performance.

Use of formative assessment as a foundation for differentiated instruction

Formative assessment is defined by McManus (2008) as 'a process in which teachers and students provide feedback during instruction to organize the learning and teaching process in order to increase student achievement' (p.3). This is usually done through adjustment of instruction in response to feedback described by Cauley and McMillan (2010). They propose the curriculum-assessment-instruction connection (CAI connection) when looking at formative assessment. The CAI connection simply asks teachers to reflect on and respond proactively to the following three questions;

- Where do my students need to be (curriculum)?

- Where are they currently (formative assessment)?

- What am I going to do as their teacher to help them progress (instruction)?

All three elements are crucial in moving a student's learning forward.

An alternative way of thinking about formative assessment is to contrast it with summative assessment (Tomlinson, Moon and Imbeau, 2015). Summative assessments usually only record student current achievement whereas formative

assessment can be performed after summative tests and during instruction to identify specific student misconceptions. Feedback can then be provided to students to help them correct their mistakes (Cauley and McMillan, 2010).

Black et al. (2003), describe the features of formative assessment adopted in schools namely 'classroom questioning (or dialogue), feedback through marking, peer- and self-assessment and formative use of summative tests' (p. 69-70) Elucidating the fourth strand of formative assessment, Black et al. (2003) explain that any assessment activity can become formative if it 'provides information to be used as feedback by teachers, and by their students in assessing themselves and each other, to modify the teaching and learning activities in which they are engaged' (p. 17). Therefore, when combined formative and summative assessments can become a powerful tool for maximizing learning outcomes. I will focus the literature review on formative assessment for the purpose of this project.

Research has always suggested that formative assessment improves student learning (Black and William, 1998). Even today, Jones, Bradley and Love (2018) still echo what Black and Williams (1998) have always believed; to achieve greater student achievement, teachers must utilise assessment techniques to guide instruction. It is fundamental for teachers to have a daily picture of their students' present academic levels of performance so as to identify gaps in learning and plan instruction to respond to the needs of the class (Jones, Bradley and Love, 2018). So, do teachers recognise the benefits of formative assessment and confidently utilise techniques in the classroom?

Friesland (2010) explored the impact of formative assessments on student outcomes with 164 teachers in Grades 3 to 6. He reported that 97% of teachers confirmed they adjusted instruction on the basis of feedback from formative student assessment results. Teachers agreed that the modifications to instruction based on formative feedback helped the students. They felt confident they were able to assess when students were struggling with a concept and could tailor the help given (Friesland, 2010). Although the teachers were unsure whether these resulted in higher student achievement scores. Ontiveros (2017) interviewed teachers before commencing research. The teachers also claimed that formative assessment helped them gauge which students needed more practice with certain concepts.

> *I form small groups based on the data. I consider each student's learning*
> *needs and adapt instruction accordingly*
> *If my students are not grasping the concept based on the data; I will reteach*
> *the lesson the next day in a small group or during individual conferencing*
> (Ontiveros, 2017, p.31)

Despite its benefits, many teachers find it challenging to utilise data generated from formative assessment to plan instruction and integrate its practice into their classroom (Doubet 2007, Morrison and Lederman 2003). Time constraints, high expectations and the pressure to perform on end of year assessments remains prevalent in present day classrooms. Formative assessment is regularly lightly perceived as simply gathering information from students and using it to improve learning, when actually it is far more. Students tend to take minimal responsibility for their learning or are unaware of their results on assessments or goal attainment when this is the case. Hence, they do not understand where they are and where they need to be.

By using its specific formative assessment techniques, teachers can realize just how valuable it can be for student learning (Cauley and McMillan, 2010).

> *Teachers should reflect critically about their instruction and make important instructional adjustments; and students to adjust their thinking processes, engage in self-assessment, and have multiple opportunities to improve and demonstrate their learning* (Coderman and Hedin, 2012, p. 162).

Without a clearly defined process, formative assessments alone cannot validate the growth expected from students (Ontiveros, 2017). For example, Morrison and Lederman (2003) reported that four model teachers in their study acknowledged the need to access student understanding before instruction. However, they did not appreciate the importance of understanding students' presumptions. Further, these teachers 'had a weak repertoire of strategies to use in diagnosing students' ideas' (p. 862). They regularly employed only questioning and class discussion as formative assessment strategies. Therefore, these teachers did not tailor their teaching to students previous knowledge. In fact, the research carried out by Ontiveros (2017) revealed that teachers were not always using formative assessments to reteach concepts or adapt their instruction contrary to what they claimed. She examined the teacher-created formative assessments and their configuration to the Common Core Standards[2]. She also reviewed student performance on the formative assessments in form of mini assessments, studied current practices of teaching maths, assessed resources used for instruction, and reviewed summative data in the end of the year exams. She found that the teachers tailored their instruction based on the mini assessments rather than the end of year exams which demanded more skill in

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[2] (in the US) a set of educational standards for teaching and testing English and mathematics between kindergarten and 12th grade.

accordance to the Common Core Standards. Ontiveros (2017) also found that teachers seriously lacked defined knowledge of the Common Core Standards and the necessary skills to teach mathematics to the rigor that was necessary for achievement. The questions in the mini assessments produced by the teachers were more 'skill and drill' and lacked scaffolding or critical thinking expected in the end of year exams. This type of rote memorization interferes with the theoretical and higher level thinking necessary to demonstrate understanding of the learning objective (Black and William, 1998). For example, the exam may give students a problem about a bacterial infection where they need to use the knowledge of the pathogen to answer it. However, if the students were only taught about the structure of the bacteria then they may not be able to answer questions on how it causes diseases. The assessment would focus on the higher-level thinking about relating the bacterial structure to how it causes infections, rather than the basic parts of it. Furthermore, if the lesson was taught incorrectly the first time, the students will be retaught incorrectly again. This was discovered by Ontiveros (2017) too. Although teachers presented information and carried out assessments on it, they lacked the ability to transfer the content. The mini assessments used by the teachers did not meet the criteria for depth and problem solving for the standards; rather they skimmed the surface of it.

So, how can teachers improve their formative assessment strategies to encourage deeper thinking? Herlofsky (2010) conducted research on five primary teachers. They described the formative assessment strategies they used and shared their perceptions of the impact of the strategies upon student learning. Herlofsky (2010) observed that the teachers taught students to complete learning logs of open-ended

questions at the end of the class. The teachers would then collect these, assess the level of understanding by student responses, and act on the appropriate remediation needed. Teachers employed Bloom's taxonomy tactics of higher-level questioning to gauge the student's level of understanding and provide guidelines to help them take ownership of their efforts in an assignment. The teachers also circulated through the classroom to observe and assess students at work. This assisted them recognize those students who were struggling in the lesson and guide them with formative feedback. Popham (2011) described the use of this style of formative assessment as assessment for learning.

Wilson (2010) investigated the use of formative assessments by secondary school chemistry teachers. He based his research on the belief that students with less academic potential in chemistry could overcome the weakness through hard work and still perform well in the subject. In contrast, students with high academic potential could perform poorly on assessments because of a lack of effort. Teachers in the study used homework assignments as formative assessments to assess student learning levels and provide feedback to develop student knowledge and motivation. All students, regardless of their ability in chemistry were more motivated by graded formative assessments than by nongraded assessments (Wilson, 2010). Therefore, improving the effort put in work.

Holman (2007) formatively assessed students simply through the use of traditional multiple-choice quizzes. He communicated learning objectives and assessment dates to students, and then differentiated instruction to small groups created from students' progress towards the objectives. He assessed the students to find out

whether they knew the material or not by using a multiple-choice quiz. The students were then put into groups based on the results, to provide the best learning environment and experience. The same students were not always in the same groups and were flexible to move from one group to the other. For example, on one day a gifted and talented student would need remediation and there would be a less able student who would have understood the content. Students were quite positive about this form of unpressured instruction. They reported feeling responsible for their own learning rather than being compared to their peers' progress. One student expressed that they felt it is permissible not to get it right the first time, so long as they learnt from their mistakes and showed an improved performance next time. Another student reported that his learning was being extended in Holman's classes rather than the repetitive work given in other classes.

Theoretically, this all sounds promising. However, as mentioned above, certain factors constrain teachers effective use of formative assessment and can be alleviated by use of technology. Computer-assisted assessments have proved quite useful for summative evaluation (Crisp and Ward, 2008). Therefore, they can also be utilised with great efficiency and effectiveness for formative evaluation (Crisp and Ward, 2008). Research suggests technology can simplify teachers use of formative assessment to tailor the interventions (Maeng, 2017, Irving et al., 2009). Just like Diane (participant teacher) in Maeng's (2017) study, Irving et al. (2009) reported similar results. In their study, three physical science teachers used student response systems called connected classroom technology as a formative assessment instruction to collect information about student learning in their classrooms. They most frequently employed the technology as a planned formative assessment at the

start of a lesson. They then tailored questioning spontaneously within a lesson depending on the results of the formative assessment. The teachers discovered that their students were more engaged and on-task as a result of this intervention (Irving et al. 2009).

Wilson et al (2011) also researched the effectiveness of computer-assisted formative assessment. They asked a large group of first-year undergraduate geography students to complete multiple-choice practice tests. He then evaluated the impact of these tests on student performance in the course as well as their views on this kind of formative assessment over two academic years. The multiple-choice questions included in the formative assessment varied in level of difficulty and ranged from those that focussed on knowledge and comprehension to those demanding application and analysis. 50 percent of students used these tests despite it being voluntary. Feedback questionnaires from both academic years revealed that 95 percent of students were overwhelmingly positive about the computer-assisted practice tests. It aided them in identifying their strengths and weaknesses and helped them prepare summative assessments. Statistical analysis of the assessments showed that students who used the formative assessment scored significantly higher grades (by at least 10 percent) than those students who did not.

Poljičanin et al., *(2009)* echoed the same results in their study where they evaluated 10-question quizzes written on a daily basis in a medical anatomy course. Despite their regularity and possible associated stress perhaps of having to perform well or better each time, these daily quizzes resulted with better academic success in the anatomy course. They were used as a tool to encourage and monitor students'

progress. Though both these studies focus on undergraduate university students, the benefits are clearly visible and can be utilised in secondary schools and colleges.

However, there are some factors which determine a teachers' use of technology for formative assessment. These include their understanding of formative assessment, the resources needed to develop formative assessment items, their proficiency in operating technology, and the instructional framework (Feldman and Capobianco 2008; Lee et al., 2009).

This section has revealed the harmony amongst teachers on the benefits of formative assessment. However, there is a need for a clearly outlined process to understand student presumption and facilitate critical thinking by tailoring support. This leads to differentiated instruction. The use of computerised technology and varied strategies such as quick quizzes may help alleviate the barriers to teachers' face to effectively use of formative assessment to differentiate. The next section explores differentiation and how data collected from the formative assessment can be used to modify instruction for all students.

Differentiation and how it can be used to make tasks (especially homework) more accessible to all students

Differentiation is 'an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to

maximize the learning opportunity for each student in a classroom' (Tomlinson et al., 2003, p.120).

Tomlinson and Imbeau (2010) defined differentiation as 'classroom practice with a balanced emphasis on individual students and course content' (p.14). This does not mean assigning more work to some students and less to others; rather adjusting the quality of work not quantity.

Teachers always want to ensure that students succeed in their subject regardless of their previous exposure to it. When work is consistently too challenging or too easy, students do not develop greater knowledge, understanding, or skill (Sousa and Tomlinson, 2011; Tomlinson, 2014). Students tend to use information available to decide if learning is worth the effort. If they believe learning is important, they will exert greater effort and those who do not believe learning is worth the effort tend to give up (Stiggins, 2005). Schools have therefore turned to differentiated instruction as a curricular target to cater for all students.

Vygotsky's (1978) zone of proximal development states that there is a distance between a student's ability to perform a task with and without any assistance. According to Vygotsky (1978), when a student is in the zone of proximal development for a certain task, offering the correct assistance will encourage the student to succeed in the task. A teacher therefore needs to first identify what a student can accomplish independently and differentiate tasks accordingly to facilitate independent learning (Thakur, 2014).

Based on student readiness, interest, or learning profile, teachers can differentiate according to four classroom elements (Tomlinson & Imbeau, 2010).

- Content – this refers to the curriculum, what the student needs to learn, and skills being taught.
- Process – these are the activities the student engages in in order to learn the content.
- Products – culminating projects that the students have produced to display their learning.
- Learning environment – the way the classroom is set out to facilitate learning.

Homework is beneficial and does improve academic achievement as outlined in the third section of the literature review. For the purpose of this project, homework will be studied further as it can be part of process and product. For example, students can show their learning in different ways for product and options can be given for homework tasks with varied success criteria for process. It can be made interesting and engaging by making tasks set relevant to the student through differentiation, by offering the choice of homework tasks tailored to individual students' learning needs. This is because many students find completion of homework challenging. Polloway, Foley and Epstein (1992) found that 28% of average achieving students and 56% of students with learning disabilities struggle in completing their homework. However, do teachers correctly differentiate homework according to student ability?

In a survey carried out on homework and differentiation, Allen (2008) found that most teachers tended to differentiate homework by changing the length of assignments.

Some teachers acknowledged that they assigned simpler reading passages to lower ability students. Only two teachers differentiated on students after being assessed for ability. The lack of use of effective differentiation amongst the teachers fuelled the investigation of the use of differentiated homework by ability (Allen, 2008). Sixty-two eighth-grade students taught by the same teacher, were therefore given differentiated homework based on their performance on a pre-assessment. The study revealed that differentiated homework improved homework completion rates and student achievement on summative assessment (Allen, 2008).

The use of technology especially through online platforms has greatly increased in the modern-day classroom and has shown great promise for facilitating teachers' efforts to differentiate. Deunk et al., (2018) expands that using online systems as a differentiation tool has positive outcomes on students' performance. Maeng (2017) recently explored this where one secondary science teacher (referred to as Diane) planned for and implemented differentiated instruction in her Biology and Ecology classes. She paid specific attention to how technology supported differentiation practices and formative assessment in a differentiated classroom. Dianne discovered her students' learning needs through the implementation of various pre-assessment and formative assessment strategies. She used a type of classroom response system (known as clickers to her students) as a tool to collect and analyse data from formative and summative assessments. The use of clickers enabled her to gain immediate information about a particular students progress compared to the lesson objectives. This then prepared her for adjustment of instruction within a lesson accordingly. Results suggest that technology assisted Diane to gather and scrutinise data on formative assessment to support differentiation. The students' different

learning profiles and interest were accommodated through Diane's technology-enhanced differentiated lessons where she modified content, process, and product. This suggests the ability of technology to be a powerful tool in supporting teachers' differentiated instruction. Studies by Ysseldyke et al., (2003, 2004) support this claim.

Ysseldyke et al., (2003) explored the use of a computer program (Accelerated Math-AM) to support differentiated mathematics instruction on almost 400 grade 3, 4, and 5 students. Students who followed the AM program were provided with computer-adaptive maths tests. The computer program produced individual level-appropriate mathematics exercises based on test performance. The students were provided with immediate feedback and new exercises by the computer program following completion of the exercises. Mathematics teachers in four schools and from 10 out of 18 classes volunteered to trial the computer program. The teachers automatically received information about students' progress, which facilitated them to modify their teaching to students' needs. Student scores from the classrooms where teachers fully implemented AM were compared with scores of a control group of students from other classrooms. Compared with the control group within the schools, substantial small to medium positive effects of fully applying the AM program were found.

Ysseldyke et al., (2004) also looked into the efficacy of the AM computer program for differentiation specifically in gifted grade 3 to 6 students in regular classrooms. The teachers utilised the AM program in their classrooms for approximately four months. Both gifted and non-gifted students worked on the exercises from the AM program regularly as part of the experimental group. The control classrooms consisted of

students who had no access to the program regardless of being gifted or non-gifted. Students who were gifted in the investigational classrooms scored notably higher than their gifted peers from control classrooms. Comparing the non-gifted students revealed similar results: the non-gifted students who employed the intervention scored significantly higher than their non-gifted counterparts.

In 2007, Ysseldyke and Bolt investigated the influence of AM on students' math achievement in primary and secondary schools. Seven primary school teachers were randomly allocated to three groups: The first two were made up experimental groups of students who used the AM program throughout the year (41 classrooms) and halfway through the school year and onwards (20 classrooms). The third was a control group of those not using the program (39 classrooms). Students in the experimental classrooms where AM was fully implemented scored considerably higher than students in control classrooms.

These three studies and the literature review for this section confirm that differentiation does indeed have a positive influence on student summative achievement. However, can the same be achieved when homework is differentiated especially through the use of online platforms? This will be explored in the next section.

Improving academic performance using homework

According to Dr Harris Cooper (1989), homework is defined as 'any task assigned by school teachers intended for students to carry out during non-school hours' (p.7). This should not make homework a displacement or substitute for classroom work. Instead, homework should be 'the time students spend outside the classroom in assigned activities to practice, reinforce or apply newly-acquired skills and knowledge and to learn necessary skills of independent study' *(Alanne and Macgregor, 2007, p.2)*. Homework should therefore facilitate students to master a concept and retain information by practising it.

So why do teachers set homework? Is it necessary or effective at improving academic success and student learning? Epstein and colleagues' (Epstein & Van Voorhis, 2001; Van Voorhis, 2004) identified 10 purposes of homework (The Ten P's) from their review of literature, that can be organized into three groups:

- Instructional (i.e., practice, preparation, participation, and personal development)
- Communicative (i.e., parent–child relations, parent–teacher communication, and peer interactions)
- Political (i.e., policy, public relations and punishment)

(Epstein, 2001, p.237-241)

Teachers usually set students homework for several purposes rather than just one. This could be for instructional and non-instructional reasons (Cooper, 1989). Instructional homework serves one of the four purposes; namely practice,

preparation, extension and integration homework. Non-instructional homework also comprises four subcategories (Epstein and Van Voorhis, 2001): Homework allocated for personal development, to increase communication between parents and their children, to allow peer interaction and because of policy. Epstein and Van Voorhis (2012) reinforced that for successful homework completion and to maximise impact on students learning and academic achievement, the purpose of homework must be clear.

According to the Education Endowment Foundation (EEF, 2018), homework has on average an impact of five months additional progress with the optimum amount of homework being between one and two hours per school day. A meta-analysis of homework research by Cooper (1989) was carried out involving twenty studies comparing results of students receiving homework to those receiving no homework were looked at. 14 of these found that homework was an effective approach for increasing academic achievement. 43 out of 50 studies on the amount of time students spent on homework showed an increase in academic achievement with only seven highlighting a negative effect. No reason could be found for this negative outcome. It could be that too much time spent on homework could result in lack of sleep and stress which could influence academic achievement unconstructively.

Trautwein (2007) carried out three separate studies on homework and achievement. The first study looked at time spent on homework by controlling variables such as school type, intellectual abilities and gender which had been previously omitted from many studies. Trautwein (2007) used hierarchical linear modelling (HLM) on data from the German extension of PISA 2000 (n=24,273) to study impacts of homework

time and mathematics achievement of German 15-year olds, at a school and student level. The results for the school level revealed that schools that assigned higher amounts of homework achieved higher mean scores compared to those who assigned less. However, students who spent more time on homework tended to underachieve score wise to those who spent less time on homework. The cross-sectional nature of PISA data may have limited this study by prohibiting whether there was a causal link to the observed effects. It combined two different variables of "time spent on homework" with "homework frequency" which may be associated differently with achievement. Perhaps Trautwein should have used classes as a unit of observation rather than the sampling unit.

Trautwein (2007) attempted to address the above limitations in his second study. 91 classes with a total of 2216 German Grade 8 students were sampled rather than schools. Homework time and homework frequency were separated. Again, using HLM on data, Trautwein (2007) found that the number of times the teacher assigned homework per week (homework frequency) was a statistically significant predictor of achievement at a class level compared to homework time. And at a student level, an increase in homework time was associated with decreased achievement. The final study by Trautwein (2007) examined the relationship between time and effort on homework. Student achievement for the third study was measured by both grades and test scores in mathematics, while the previous two studies used test scores only. The results highlight that homework effort has a positive and suggestive influence on mathematics achievement compared to homework time which has a negative effect. He further stressed that homework time is not the same as the homework effort put in by students. Trautwein (2007) used student self-report surveys to gather data and

all three studies sampled students from a restricted age range (eighth and ninth graders). Therefore, the results may not be generalized to the entire population. Furthermore, all samples were taken from German schools and restricted to mathematics homework which questions whether the results are country and subject specific. Despite these limitations, the large sample sizes added to the reliability of the studies. Trautwein's (2007) studies, if still modest, do support a positive correlation between homework frequency, amount and effort on student achievement.

If homework has such a positive effect on academic achievement, what type of homework should teachers set? Homework usually falls into one of three categories: preparation, practice and extension (Rosário et al., 2015). However, as established earlier in the literature review, students' study differently and have varying learning needs. In fact, tasks that are tailored to academic level have a positive impact on students' performance (Zakharov, Carnoy, and Loyalka, 2014). Therefore, differentiating homework can assist a student in being successful.

Homework can be differentiated based on its 'amount, skill area, purpose, degree of choice for the student, completion deadline, degree of individualization and social context' (Cooper, Robinson and Patall, 2006, p. 1). A study by Stefanek (2008) examined whether different types of homework assignments had an impact on student achievement in Mathematics as well as on student completion of homework. The findings of the study suggested that students who were assigned homework that required practicing tasks, writing activities, and higher-level thinking completed more homework than students who were allocated homework containing only practice

exercises. However, no difference was found in academic achievement between the control and experimental groups.

Teachers face several practicality constraints in performing this instructional practice in reality. These include the number of topics to be taught, large class sizes, the different year groups taught and the limited amount of time for monitoring students' homework. Thus, teachers often assign the same homework to all students most of the time (Rosário et al., 2015) with mainly purposes of drill and practice (Danielson et. al, 2011).

On reflection, I also experience similar constraints mentioned above and often set homework which requires practicing and reviewing material taught in class. I am reluctant to set homework with the purpose of extension as it is usually perceived by students as academically demanding which in turn means submission of late or incomplete homework by some students, usually those with lower academic ability. To minimise these difficulties, I chose to further explore the use of technology especially in the form of online platforms for homework, as it had revealed to be successful in the earlier section for formative assessment.

Burch and Kuo (2010) compared traditional and online homework at college level. Their study spanned over two semesters and focussed on five separate sections of algebra at college level. The control group (n=21) used traditional pen and paper homework for three sections while the treatment group (n=31) used the program MyMathLab for two sections. Only two sections' final exam scores were compared though, as only one section of traditional homework and one section of online

homework used the same final exam. Final exam scores revealed that students from

the treatment group out-performed students in the control group. Burch and Kuo

(2010) credited the increase in achievement for the online homework group to the

hints MyMathLab offered students whilst they worked through the problems. The

online students were also able to rework and resubmit problems they answered

incorrectly, both of which the traditional homework group lacked. This was because

of the instant, tailored and detailed feedback they received in the online intervention.

This also raises the question as to whether students were successfully completing

the problem through repeated guessing without comprehending the concepts and

the authenticity of who was actually completing the online homework. Another

difference noted between the groups was that the online homework sections had a

higher retention of students (86%) compared to traditional homework (58%), though

whether or not this was a result of using online homework was not discussed. And

this finding is not directly related to achievement.

Dean (2004) conducted a study with ninth and tenth grade biology students to

determine the value of web-based homework versus traditional homework

assignments. Dean (2004) hypothesised that web-based tasks could boost critical

analysis, teamwork and make homework more appealing to students. The study was

conducted in two classes taught by the same teacher. The results were measured

using quizzes, science pre-test, post-test and post- post-tests.

The treatment group (n=20) completed homework activities online for roughly eight

weeks. Feedback was given by teachers and peers through email, chat, and a

dialogue platforms. The control group (n=23) completed tasks traditionally with paper

and pencil. Results revealed that scores for the treatment group on teacher-administered quizzes improved statistically significantly more than scores of the control group. However, the statistical identification of differences in group achievement was prevented due to the small sample size. Nevertheless, since all students were taught by the same teacher, the reliability of the investigation increased as teacher effects were consequently controlled. Dean's (2004) study therefore suggests that web-based homework is just as effective at raising biology achievement as conventional homework.

Another comparison between traditional and online homework was completed by Bonham, Deardorff, and Beichner (2001, 2003) on two sections of introductory physics, taught by the same lecturer. The treatment group was assigned homework using WebAssign (a web-based homework system) and the other had traditional homework peer marked by graduate students. Achievement was recorded using scores from exams, quizzes, experiments and homework. No significant difference was found between students using either method. Bonham, Deardorff, and Beichner (2001,2003) summarized that whilst online homework offered instant feedback, traditional homework students received more feedback. This is because online students only submitted a numerical answer whereas the traditional students had to show their working for each step, which was commented on by the graduate students. However, does this guarantee that traditional students reviewed their returned work? Also, present online learning platforms can offer students a chance to submit non-numerical answers too.

A similar result was found in a study by Granger et al*., (2012)* on the effectiveness of an online homework program called Mastering Chemistry. No obvious difference on ACS Final Exam[3] scores was found between students who used the program and the control group that used a much simpler online quizzing system.

In summary, qualitative data collected from students in all the studies suggests favourable views of online homework mainly due to the regular, automated grading and instant feedback with enhanced visualizations which positively impact student learning. However, there is a discrepancy when it comes to their achievement. So how can online homework be made more effective in terms of achievement? The best way to tackle the homework debate is not to abolish homework. In her recent book Rethinking Homework, Cathy Vatterott (2018) urges educators to design high quality homework tasks instead which are differentiated to improve the value of homework. According to Vatterott (2018), homework that allows students choice and independence in picking what they are doing according to what works for them could be the answer. Effort must be made to structure homework around time rather than quantity.

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[3] The exam presented and maintained by the American Chemical Society that pertains to all branches of chemistry.

Chapter 3

Methodology

Sample and school context

The research was carried out in a selective, all girl's secondary grammar school in a suburb of south Birmingham, England known as School X for the purpose of this project. It is a multi-ethnic and socio-economically diverse institution comprising of 950 highly able students. Participants were from two Year 10 (15-16 year olds) and two Year 12 (17-18 year olds) biology classes. At the time of the research, there were 47 Year 10 and 39 Year 12 students enrolled in the focus groups. However, the sample size was reduced to 39 Year 10 and 21 Year 12 students. To improve the validity of the research, only those students who completed all the pre and post topic tests as both an experimental and control group were included. Some students missed one or two topic tests dues to absences, music lessons or class trips. They were not asked to re-do the missed tests to avoid any extra burden.

The advantages of using these classes were:

1. Having an excellent relationship between me and the students resulted in their willingness to be honest and critique the research.

2. The classes were both in their pre-GCSE and pre-A-level years respectively which meant they were likely to be highly engaged, yet not too stressed about their final exam to influence their motivation to partake in the research.

3. I was fortunate to teach all four classes which ensured everyday contact with them making organisation convenient and improving the validity of this research by having the same teacher.

The following disadvantages were considered:

1. The students were aware of the importance of the research project to me and the effort put into constructing the intervention tasks. Despite appearing honest to me, a degree of acquiescence must be considered likely (Cohen et al., 2018).

2. The participants were mostly students who were extremely confident with their studying skills and were more probable to feedback the positives of any schooling instruction.

Research questions and approach

The purpose of the research is to establish if differentiating homework in Biology, informed by a convenient formative assessment will address the needs of diverse learners, and improve academic achievement. The research questions below were formulated to meet this objective:

a) Can formative assessment be conveniently used to differentiate classroom learning?

b) Can a formative assessment be used to guide and set differentiated homework?

c) Does differentiated homework influence academic performance?

This investigation is classified as a practitioner research. This is research that is directed by an individual (in this case me, the teacher) who undertakes a twofold role of providing the service as well as carrying out the research itself (Cochran, Smith and Lytle, 2009, Menter et al., 2011).

A practitioner research is ideal for many reasons. Firstly, being both the researcher and teacher facilitates the generation of a truthful description of the qualitative data, providing an insightful data for analysis (Menter et al., 2011). Secondly, the aspect of collaboration produces several data sources which increase the reliability of statements made (Cochran Smith & Lytle, 2009). Thirdly, regular analysis of data will allow me to inform my practice in the centre of the study and to act on my findings without having to modify the study.

Nonetheless, there are limitations to practitioner research. The data and assumptions made are specific to the school, teachers and students of that particular establishment and cannot generalised to other contexts (Cochran, Smith and Lytle, 2009). Additionally, my views cannot be completely objective being the researcher of the school being studied. There is a possibility for bias in the interpretation of data collected (Menter et al., 2011). To avoid this degree of prejudice, all data collection methods employed, and presentation will be warranted for readers to make their deductions from.

The intervention: Differentiated homework informed by formative assessment

> *Every pupil at every level of their academic development needs to answer questions on the full spectrum of Bloom's Taxonomy (*Bromley,2019, p.24)

Tomlinson (2001) describes how teachers can adjust content, process, and product by differentiating instruction based on ability and interest. The objective of this study will be differentiating product, specifically, homework. However, formative assessment is fundamental to differentiate more accurately (as revealed in the literature review).

Data collection and instruments used

A mixed method approach was employed to answer the research questions where both quantitative and qualitative data was collected and analysed. This method allows for triangulation where the subject can be examined from a various angles. A ten-question multiple choice quiz on Google forms (as a formative assessment tool) followed by differentiated homework, teacher and student surveys and pre/post topic test scores were the data collection methods used. A quick summary of the intervention is outlined below with justifications for choices of instruments explained later in the report.

A short teacher survey was conducted at School X using Google forms during the winter term requesting the sharing of views and practises on differentiation, formative assessment and homework. Nineteen responses were received (Appendix A)

Four biology classes all taught by me (10A, 10B, 12A, 12B[4]) were divided into two groups made up of each year group; one control group (C1 consisting of 10A and 12A) and one experimental group (Ex1 consisting of 10B and 12B). Data was collected from January through April 2019. The first cycle ran for the earlier part of the spring term (January-February 2019) with C1 and Ex1. The second cycle for the later part of the spring term (March-April 2019) when the C1 become the experimental group (Ex2) and Ex1 became the control group (C2) to avoid discrimination.

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[4] Not the real class names

All groups were required to complete a printed pre-topic test before and a post-topic test after each cycle. The tests consisted of past exam questions and tested the students on the topics they would be taught during the intervention.

All classes were enrolled into their individual Google classroom beforehand which facilitated accurate allocation of work to the various groups (students are normally set work and resources shared through Google classrooms at School X). All students were familiar with Google classroom hence it was the preferred choice of online platform for the research and for setting homework.

For the first cycle, students from the experimental groups were set homework in two parts on Google classroom. The first task was to complete a ten question MCQ (made using Google forms) based on the learning objectives from the lessons that week. Ten questions were set as this was quick to complete yet an appropriate range of questions could be asked to ascertain understanding. The questions were constructed using Blooms taxonomy guidelines (explained below). Students would complete the quiz independently out of school hours. The quiz was automatically scored, and immediate feedback given on the answers. The students would receive a score out of ten which they were asked to note down and proceed to the second task. I could also access all the individual scores which enabled me to monitor student progress and understanding of the lessons.
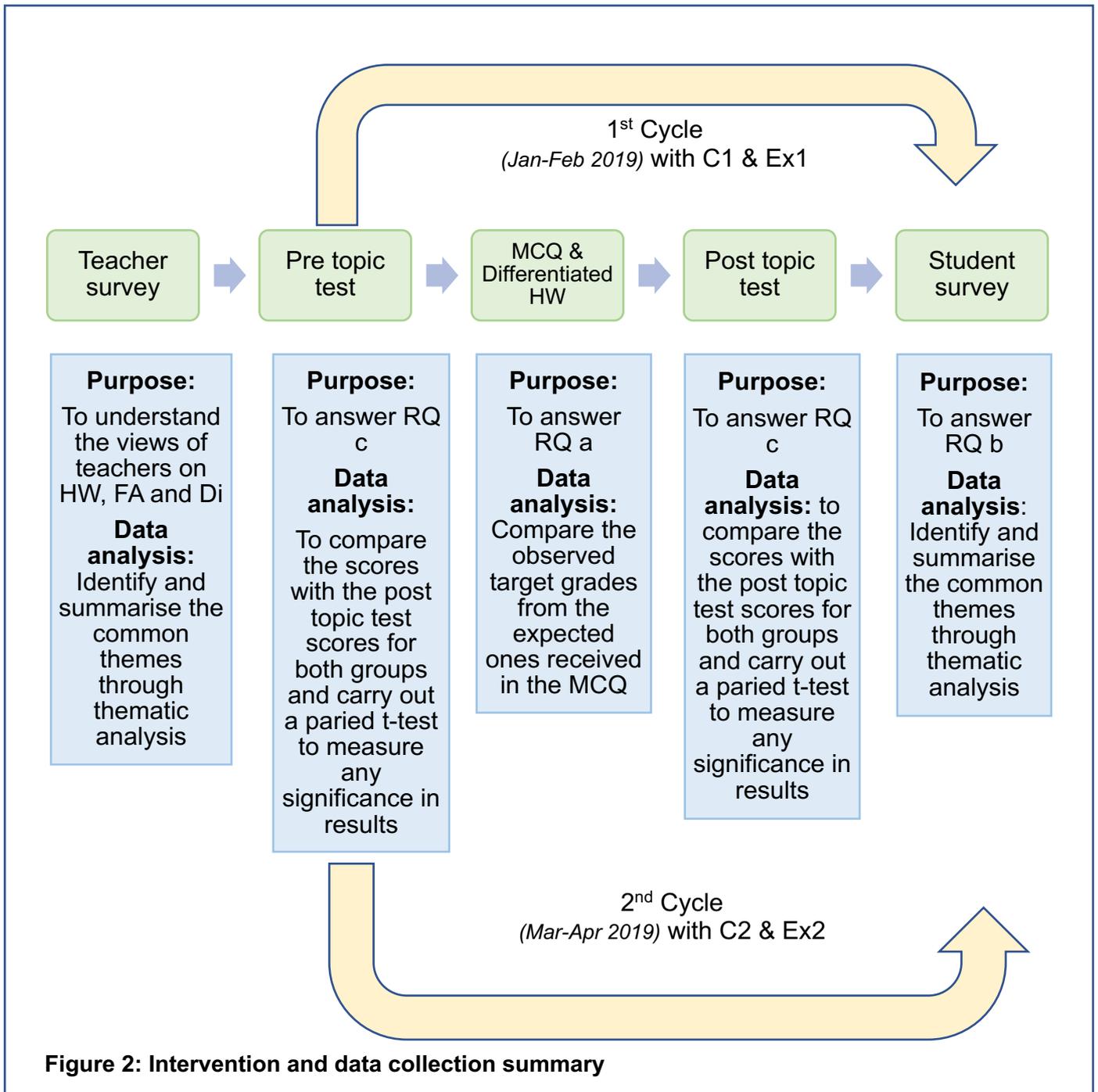
Depending on the MCQ score (0-3, 4-7, 8-10 marks), students were asked to complete one of three homework tasks. These were differentiated according to below target, on target, and above target for the respective scores. This meant that the homework was differentiated to the needs of the student established from the

MCQ score implemented as a formative assessment tool. Homework could be submitted in person or on the online platform and the experimental students were able to access all three levels of homework should they wished to do so. However, only one was required for submission to decrease the burden of work upon students. All homework totalled to the same amount of marks and required similar completion times and effort to avoid students from deliberately scoring a lower score in the MCQ with the misconception that it would be less demanding in time and effort. Homework was then self / peer marked or corrected by me and feedback given in class or when homework was returned. The experiment groups were requested to complete a post intervention survey using Goggle forms at the end of the cycle. This generated a total of sixty-four responses.

The control groups were set only one type of homework; exactly the same one as those who scored 4-7 marks. This was done to ensure that control groups received similar homework to the experimental groups which added to the legitimacy of the research.

The whole intervention was repeated with the C2 and Ex2 for the second cycle. Figure 2 below summarises the trajectory of the data collection for the experimental groups.

Figure 2: Intervention and data collection summary

Multiple Choice Quiz (MCQ)

I liked how quick they were to complete, and I feel like my score represented my understanding of the topic well (Student A)

FA is the cornerstone of Di. It supports teachers to identify students' existing knowledge and provide effective and immediate feedback as the learners makes progress (Bell and Cowie, 2001, Black and Wiliam, 1998,,).
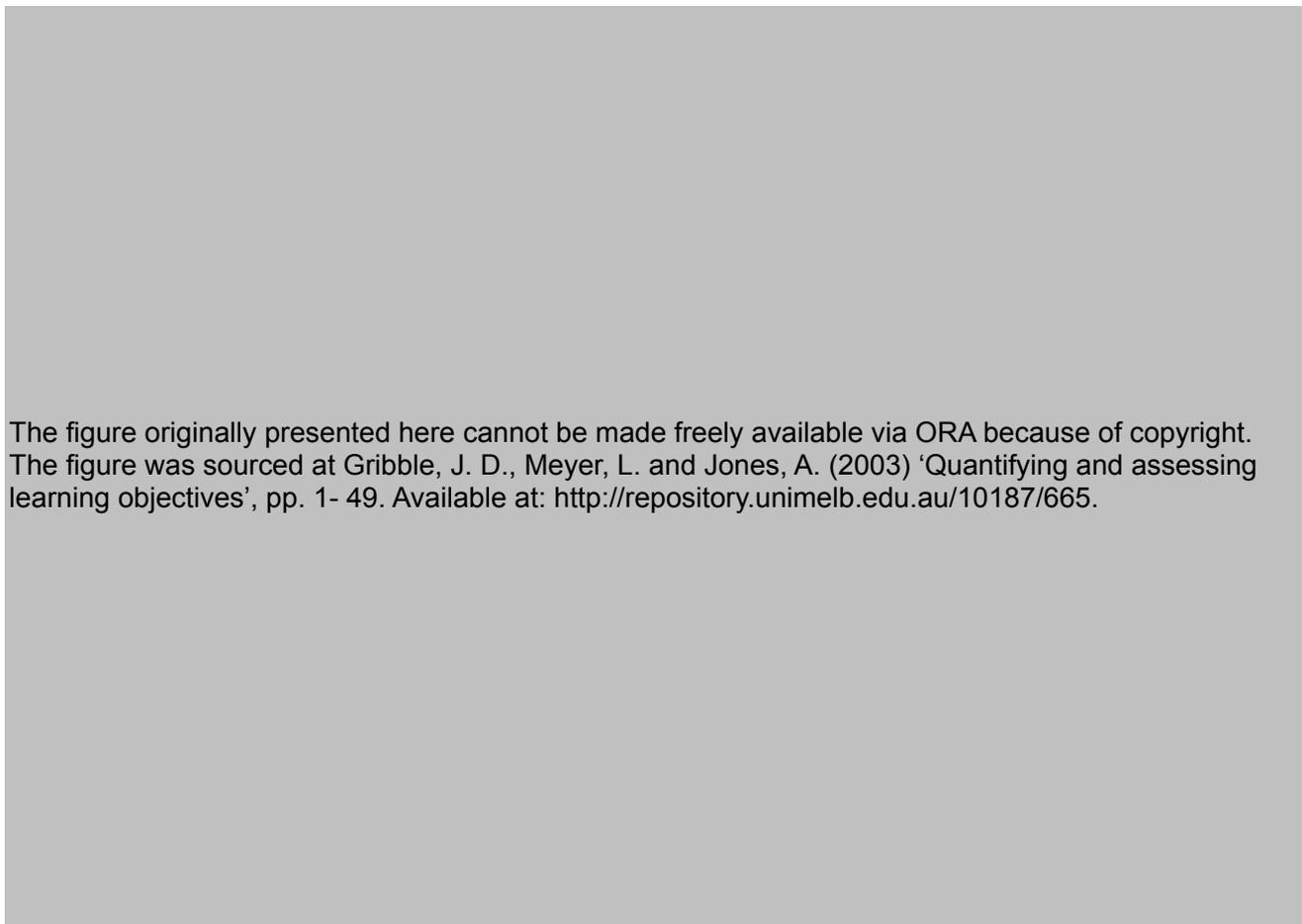
MCQ's that are coherent with educational outcomes can be used to efficiently assess parts of student-performance and can provide timely feedback, contributing to the process of self-learning (Brady, 2005). Other advantages of MCQs are that they provide automatic feedback and scoring reducing the marking load. Additionally, marker-bias is eliminated as a well-designed question could only have one correct answer. Brady (2005) and O'Dwyer (2012) suggested that MCQs also gave the possibility of recycling questions.

However, in my experience, MCQs are frequently associated with assessing lower order understanding like recalling of certain facts. Therefore, careful drafting of questions is warranted to assess higher order cognition for example creative thinking and problem solving. This can be challenging as it is laborious to develop and requires expertise to design well. There is also the chance that questions can be solved correctly by guesswork (Brady, 2005, O'Dwyer, 2012). MCQs are very good at assessing factual knowledge, whereas SBAs (single best answers) are better used to assess thinking and higher-level understanding (Brady, 2005).

To exhibit thorough mastery of a topic, every student should be able to answer a combination of recall and developmental type questions (Kim et al., 2012). Kim et al. (2012) suggests designing questions that incorporate Bloom's taxonomy categories into MCQs to encourage critical thinking. Bloom (1956) provided descriptive verbs

that showed the learning outcomes expected at various levels. A summary of the six

levels of learning and associated descriptive verbs is shown in Table 4.

I used these verbs as a guide to create the MCQs for the first part of my intervention

in an attempt to differentiate the students according to their learning levels. Students

are more likely to attempt and successfully complete homework matching their ability

level (Polloway, Foley, and Epstein, 1992, George, 2018).

The quizzes were produced on Google forms. Research suggests that students'

value how Google Classroom makes accessing course material easily and allows

dynamic interaction with the content (Heggart and Yoo, 2018). The students also

each completed the quiz independently as they knew I was monitoring their progress

and submission time automatically. For these reasons, Google Classroom/ Forms was the preferred choice of online platform for this intervention.

The second part of the intervention required creating assignments that met the five hallmarks of effective homework in order to make it meaningful to both students and parents; purpose, efficiency, ownership, competence, and aesthetic appeal (Vatterot, 2018). Advise from colleagues, ideas from teaching books (Czerniawski (2013), Griffith and Burns, 2014) and personal experience helped produce these. They included giving students the same task with the flexibility to attempt it from different directions and targeted questioning to name but a few. An example can be seen in Appendix B.

Student and Teacher survey

Qualitative data collection was in carried out using surveys. Student surveys would help gain an insight into their opinions of the intervention on their learning and identify the pros and cons (Cohen et al., 2018). Qualitative analysis of the teacher's survey would determine the sophistication of teachers' understanding of differentiation, formative assessment and homework.

The surveys consisted of open-ended questions and Likert analyses. Open ended questions were chosen in order to collect a rich pool of genuine thoughts rather than limitation by a predetermined set of possible answer choices (Brace, 2008).

However, it is worth pointing out the limitations of this type of qualitative data collection as suggested by Brace (2008). Firstly, open-ended questions are

challenging to decipher. Secondly, written responses must be classified to ascertain opinion. Thirdly, they are more time consuming and laborious which may discourage participants from completing them fully, resulting in an incomplete set of data. This can be a question the validity of the research (Gall et al., 1996). To address this problem, participants were reminded about the importance of the study and asked to complete a concise survey using an online platform.

Evans and Mathur (2005) outline various strengths and weaknesses for using online surveys for data collection (p.197)

Some strengths are;

1. Flexibility: they can be conducted in several formats.

2. Speed and timeliness: Quick to send a survey out and collect the data.

3. Convenience: Respondents can answer at a convenient time for themselves

4. Ease of data entry and analysis: Some online programs allow automatic tabulation and analysis of data.

5. Question diversity: A variety of questions and responses formats can be used.

6. Ease of follow-up: Follow-up reminders can be sent anywhere in the world.

7. Required completion of answers: The surveys can be constructed to persuade the respondent to answer a question before advancing to the next question or completing the survey in a particular order intended by the researcher.

Some weaknesses of using online surveys include; participants lack of online familiarity and expertise, ambiguous responding directions, being impersonal, privacy concerns and low response rates.

Likert surveys have the ability to provide a range of ordered responses for each question which can be tallied to produce quantitative data (Likert, 1932). This assists the investigator to evaluate the degree of opinion and how they change over time (Mangal and Mangal, 2013). Likert scales usually have five, seven or nine options. A 5 -point Likert-type scale was used in this research to encourage response rate and quality whilst reducing participants frustration for having to choose from too many options (Babakus and Mangold 1992). Nevertheless, perplexity can arise when a neutral, non-directional option such as 'sometimes' or 'unsure' is available which may affect the reliability of the results (Babakus and Mangold 1992).

Thematic analysis was firstly utilised to identify patterns or themes within qualitative data (Maguire and Delahunt, 2017). This is because unlike other qualitative methodologies, it is not bound to a specific epistemological or theoretical perception increasing the flexibility in data analysis.

A six-phase framework proposed by Braun & Clarke (2006) was utilised to analyse the qualitative data;

Step 1: Become familiar with the data

Step 2: Generate initial codes

Step 3: Search for themes

Step 4: Review themes

Step 5: Define themes

Step 6: Write-up.

(Maguire and Delahunt, 2017, p.4)

The process of enumeration then used to transcribe and code the survey responses. This is where categories and the frequencies of codes, terms or ideas are counted enabling statistical analysis (Cohen, Manion and Keith, 2007). A researcher's

sensitivity grows with repeated and prolonged exposure to the data sets (Corbin and Strauss, 2007), Therefore, each set of was meticulously scoured to uncover the properties and dimensions of each theme. This coding process was subjective, and examples have been provided in the Appendix C. Some of the themes identified in the data analysis like engagement, student ownership of learning and choice were also those identified in the study of *Using Technology to Facilitate Differentiated High School Science Instruction* by Maeng (2016). This adds a level of validity to my system of coding as these themes were also identified by other researchers.

Pre and post topic test scores before and after intervention

Quantitative data collection was in carried out using summative topic test scores. As Black and Wiliam (2003) suggested that summative assessments can be utilised in a formative way if the data are analysed to provide information that can enable teachers to modify their instructional practice to improve student learning. The results also provide students with a firm benchmark towards improvement helping them develop a plan of action to close any gaps in learning (Hoover and Abrams, 2013)

A total of 47 Year 10 and 39 Year 12 students were enrolled in the classes. To ensure clarity of data analysis, only 39 Year 10 and 21 Year 12 topic tests scores were included in this study (a response rate of 82% and 54% respectively). This is because not all students completed both pre and post topic tests due to music lessons, school trips and absences.

The test scores were then transformed into percentages to facilitate analysis as the sample sizes were similar. The tests were constructed using Exampro[5] and questions were matched to the topics taught during each cycle.

The use of past paper questions is often used as a revision aid in preparation for exams. It facilitates consolidation of knowledge and practise of specific skills essential for the examination (Wade, 2016). The greatest learning benefits come from unassisted retrieval of knowledge by an individual known as the testing effect (Agarwal, Bain and Chamberlain, 2012, Roediger and Butler, 2011). Hence, this method of quantitative data analysis was chosen to gauge whether the intervention had influenced the academic achievement of the students or not.

Although, such past paper questions can be used to diagnose conceptual understanding, the questions themselves are not focussed on one particular concept. They intend to test a wider range of knowledge, understanding and skills in a context the student may be unfamiliar with. This may cloud the conceptual diagnosis (Wade, 2016)

A paired t-test was used to describe any statistical evidence between the mean values of the pre and post topic test scores and establish its significance. This test compares two means typically at two different times, from the same related groups (Cohen, 2018). It assumes the data is continuous, the differences between the

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[5] Exampro is an online resource from AQA comprising of past GCSE and A-level questions, mapped to the current specifications.

groups has a normal probability distribution and that the sample of pairs is a simple random sample from its population.

All calculations were completed using two online programs called Statistics Kingdom and Social Science Statistics[6] to cross check calculations. The pre-topic tests for both experimental and control groups were not returned to the students until after the post topic tests were done. This was to avoid students from learning the answers which would affect the validity of the results.

Ethical considerations

Several steps were taken to ensure compliance with ethical practice for research (BERA, 2018) to be approved by Oxford University's Central University Research Ethics Committee (CUREC) (see Appendix D). These have been summarised under the guidelines outlined by BERA (2018)

Consent: Written permission for the research was obtained from the school's headteacher (Appendix E). The participants' voluntary informed consent was acquired before commencing the study (Appendix F).

Transparency: Information sheets were provided to participants and teachers outlining the study's purpose (Appendix G). When requesting survey responses, honesty and criticism of the intervention were emphasised and encouraged.

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[6] http://www.statskingdom.com/160MeanT2pair.html
https://www.socscistatistics.com/tests/ttestdependent/default2.aspx

Right to withdraw: Clarification was given to participants that they could withdraw from the research at any or no reason, and at any time, without consequence.

Incentives: One of the key purposes of this research was to develop homework which was tailored to student learning needs. As such, student voice was a crucial portion of the research process. Therefore, the process of data collection was constructed to make it constructive to the students and include them as participants as opposed to subjects of the research. No incentives that would impinge on the free decision of the participants to participate were offered as a result.

Harm arising from participation in research: Ethical research design and implementation aim to both put participants at their comfort and avoid making excessive demands on them. Hence the decision of not making those who missed the topic tests re do them was made as this would have to be done outside of lesson times which would be an extra burden on the students.

Researchers should take steps to minimise the effects of research designs that advantage or are perceived to advantage one group of participants over others. For example, in an experimental design (including a randomised control study), the intervention made available to one group, while being unavailable to the control or comparison group, may be viewed as desirable. In mitigation, for example, an intervention emerging as effective can typically be offered to control groups after the end of a trial. (BERA,2018 p.20)

This research involved experimental and control groups. In their literature review, Black and Wiliam's (1998) cite that inclusion of control groups in research is vital to analyse the use of self-assessment methods. However, this method can be viewed as immoral as it would provide different classes with an inconsistent experience. Furthermore, as the research literature has highlighted the positive influence of

homework, differentiation and formative assessment on student achievement, I would likely risk disadvantaging some of my classes. Hence the intervention was intentionally planned so that classes could be both part of the experimental and control groups to gain the benefits of valid data from using control groups, but also allowing all students to experience the benefits of the intervention.

Privacy and data storage: All data collected was treated confidentially. Anonymity in the research writeup was ensured through the use of pseudonyms for participant names. Electronic data were encrypted and stored on a password protected account, and hardcopies were filed in a locked, secure environment. The final project will be submitted on the secure University website as a pdf format.

Chapter 4

Findings and discussion

Multiple Choice Quiz (MCQ)

There were a total of 47 Year 10 and 39 Year 12 students across the four classes. To ensure clarity of data analysis and track the influence of the intervention accurately on individual students, only 39 Year 10 and 21 Year 12 MCQ scores were included in this study (a response rate of 82% and 54% respectively). This is because not all students completed both pre and post topic tests due to music lessons, school trips and absences.

Students in each cycle completed three MCQs followed by differentiated homework matched to the MCQ scores. The ten question quizzes were created on Google forms in line with the learning objectives of the lessons taught that week and using Blooms taxonomy verbs to guide the differentiation of questions. The end of year target grades of these students ranged from 7-9. These targets were predicted using the student's past summative assessment performance and eleven plus scores (for the Year 10s) and GCSE and ALIS[7] scores (for the Year 12s). The scores from the quizzes were converted into grades in line with the 9-1 grade system with consultation from colleagues to ease analysis (table 5).

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[7] **ALIS** is a target setting system that calculates subject specific predictors for A level subjects based on a student's GCSE average point score.

Year 10 grade	Year 12 grade	MCQ score (10)	MCQ grade
9	A*	>9	9
8	A	8	8
7	B	7	7
6	C	6	6
5	D	5	5
4	E	4	4
3	U	3	3

Table 5: Grade system used to convert MCQ scores

The scores from each MCQ were compared to the students target grade. It was expected that students who have a higher end of year target grade would always perform better in their MCQ. However, results from the MCQ scores of the Ex1 show otherwise (Figure 3 & 4). Similar results were obtained for the Ex2 (Appendix H). Students who had a higher target grade did not necessarily achieve the higher target grade in all the experimental groups and classes.

This reflects the literature described in my part 2 on gifted achievers. In a regular class test, a gifted underachiever would usually score highly or shows potential to do so. However, when observed by teachers or in summative assessments, this same student achieves below target grades (Reis and McCoach, 2000). These are the especially gifted students who will complete school by achieving high average grades which are actually not true reflections of their academic potential. This is due to unrecognition for their vibrant learning abilities in the different subjects. As Holman (2007) explained that on one day a gifted and talented student would need

remediation and there would be a less able student who would have understood the content, or vice versa. Hence the results of the first part of the intervention repeats the importance of formative assessment in recognising these students and regularly putting in place tailored homework interventions that would benefit individual students.
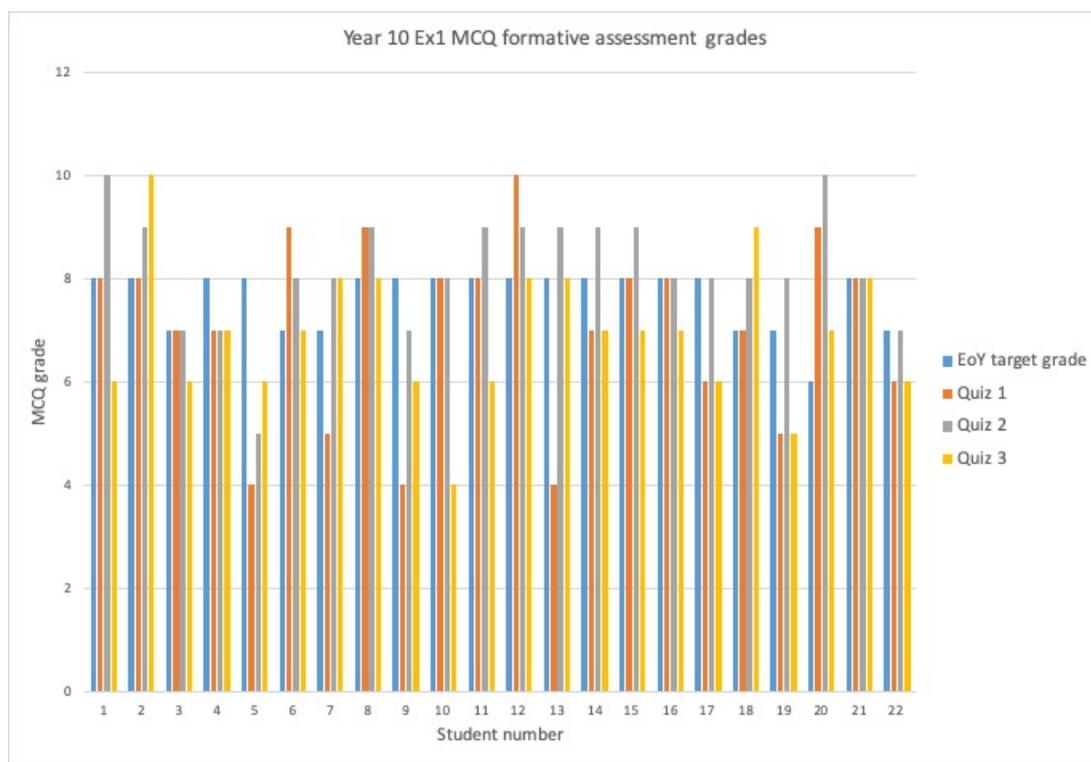

Figure 3: Year 10 Ex1 MCQ formative assessment grades

Figure 4: Year 12 Ex1 MCQ formative assessment grades

Teacher survey

A survey was sent to all the teaching staff at School X via email at the end of the winter term (Appendix I). Nineteen responses were received. Results from the survey indicate that teachers are quite confident on the concept of formative assessment and strategies to employ it successfully in class. The most common ones included the use of mini whiteboards, exit questions, questioning, self and peer assessment, oral and written feedback and assessing student work. 84.3% of teachers felt they use formative assessment quite effectively in the classroom in the Likert survey (Figure 5).

Do you feel you use formative assessment well in the classroom

19 responses

- ● All the time
- ● Most of the time
- ● Sometimes
- ● Hardly
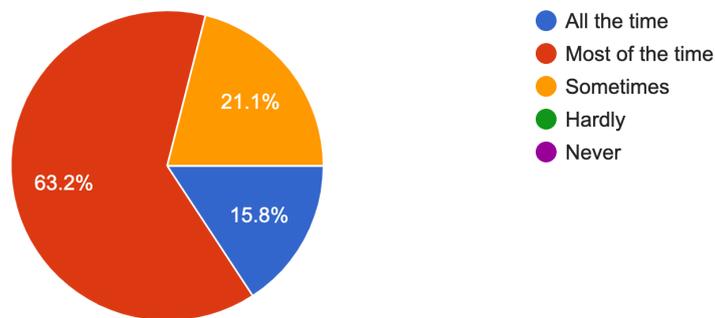- ● Never

21.1%

63.2%

15.8%

Figure 5: Use of formative assessment by teachers at School X.

However, the teachers do not seem as confident about differentiation despite being aware of what it is. When asked "how do you provide differentiated instruction?" teachers mentioned a common approach of differing levels of teacher support. This could be done by giving instructions to all students with a choice of tasks followed by specific feedback to individuals who needed it, through questioning and scaffolding tasks.

> *Whole class teaching followed by one-to-one support. Directed different starting points. Varied tasks dependent on progress made/ individual needs* (Teacher B, School X)

Despite this awareness of differentiation techniques, almost half the teachers surveyed reported they only sometimes provided differentiated instruction in the classroom, with 15.8% admitting rare use (Figure 6).

Do you feel you provide differentiated instruction well in the classroom?
19 responses

- All the time
- Most of the time
- Sometimes
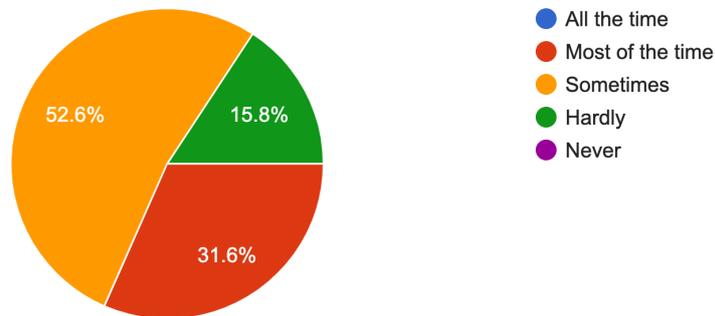- Hardly
- Never

52.6%
15.8%
31.6%

Figure 6: Use of differentiated instruction by teachers at School X.

There are various interpretations of what constitutes differentiated instruction among teachers (Bearne, 2004). My survey revealed that although teachers largely could not mention all aspects of differentiated instruction, they did grasp the concept and recognised some methods of application. They clearly appreciate that it is tailoring teaching to the individual student learning styles. It is also clear that most of the differentiation in their teaching was in materials and delivery with no reference to its use within evaluation. This questions how much teachers actually know about differentiated instruction practices, similar to findings by Bearne (2004) and Grafi-Sharabi (2009). This warrants a need for professional development to link the gap in understanding and implementation of differentiated instruction (Logan, 2011). As seen in the survey, teachers did not allow for differentiation on a regular basis 'revealing their lack of understanding about the elements of the approach and lack of knowledge about how to implement differentiated instruction' (Grafi-Sharabi, 2009, p. 122).

Teachers at School X identified the four main barriers to implementing differentiated instruction in the classroom; identification of students, time constraints, resources and inspiration.

Lange (2009) also identified obstacles to appropriate teacher implementation of differentiation strategies. Firstly, it is challenging for teachers to fairly and impartially grade for large numbers of students working on different instructions and assessments. Secondly, there are large number of students for each teacher to learn preferences for (Lange, 2009). This is resonated in Watkin's (2013) research who also identified difficulties in gaining understanding of all the individual students to differentiate the assessments efficiently. Thirdly, there is a lack of sufficient planning time to create and process resources of all students (Lange, 2009). Teachers feel pressured to cover the content, and time limitations might lead to creating superficial lessons instead of meaningful and differentiated lessons (King-Sears, 2007). Mastropieri et al. (2006) also recognized this pressure to cover the material for high-stakes tests and time constraints amplified stress in teachers.

> *….time, numbers of students in the classroom, having to progress through the curriculum at a particular rate in order to get through the material*
> *(*Teacher C, School X)

This limitation of time can cause even more anxiety if the students are inexperienced with the differentiated instruction strategies. 'Time can be a real strain and sometimes being really creative with it. If your students are not familiar with that process, it can take a long time' (Watkins, 2013, p.143).

Another difficulty in executing differentiation strategies revealed in the survey is the lack of resources for implementation and inadequacies of professional development in the area. This is similar to the findings of Tomlinson (2014) and Kiley (2011). This could be solved with more resource sharing and collaboration. Teachers value shared training, learning groups, mentoring, and collegiality as methods of professional development (Umphrey, 2010).

> *Collaborative teacher learning is key to advancing school change and improving student learning and offers quantifiable evidence of student achievement gains reaped when teachers were able to learn from accomplished peers and develop collective expertise*
>
> (Umphrey, 2010, p. 8-9)

Lastly, conversations with teachers revealed that the value of any intervention was determined by student results. Teachers in the research conducted by Kiley (2011) clearly specified that they value what they recognize is effective in improving student achievement and would continue effective practise and discontinue methods that do not result in student progress. Hence, a teacher's desire to offer an intervention to students (in this case differentiated homework informed by formative assessment) was the foremost motivator (Schroeder-Davis, 2009). Nothing can be a bigger motivation than knowing all your efforts as a teacher will be rewarded with student growth and progress.

Student survey

Of the 86 surveys distributed via email, 64 were completed and returned (74%). The following questions were graded using a 5-point Likert scale.

1. Homework helps me learn the concepts we are studying in biology

2. I have some choice in selecting the type of homework in my other subjects

3. I would like to have some choice in selecting the type of homework I have to do for my class

4. My subject teachers usually give me options for completing any assignment or project

5. The quiz followed by the differentiated homework will help me achieve better results in my tests

The open-ended questions were;

1. How did you find the quizzes? What was good about them, what could be better? Were the questions appropriate?

2. How did you find getting a choice in homework set according to your needs? Did you understand the content better? Did you feel it helped you?

It is clear that students value homework. A significant 92.2 % of students believe (strongly agree or agree) that homework helps them learn concepts studied in biology (Figure 7).

Homework helps me learn the concepts we are studying in biology
64 responses

- ● Strongly disagree
- ● Disagree
- ● Neutral
- ● Agree
- ● Strongly agree

25%

67.2%

Figure 7: Student survey on homework at School X

However, 90.6% students report not getting much choice in the type of homework they do and 78.2% would like to have some choice (Appendix J). However, in my opinion, these students need to be trained to choose the correct task to fully benefit from the homework.

So how did the students find the intervention where they did get choice in homework tailored to their learning needs? Results of the open-ended questions on MCQ and differentiated homework from the student survey are explained below.

MCQ quiz

There are many studies conducted at different levels that establish that formative assessment significantly increases the academic achievement of students (Black & Wiliam, 1998; Mcglynn and Kelly, 2017; Ontiveros, 2017; Ozan and Kıncal, 2018)

79.7% students surveyed also believed that the quiz followed by differentiated homework would help them achieve better results in their tests. Although these students are not experts in this field, they are at that age where they are aware of what will work for them or not academically.

Data analysis of my survey revealed six main themes for success of the intervention; identification of lack of understanding, consolidation, stretch learning, immediate feedback, quick to complete and engagement.

When researching with high school chemistry teachers concerning and their use formative assessments, Wilson (2010) observed teachers used homework tasks as formative assessments to assess student learning levels to provide feedback and develop student learning. Students with above average, average, or below average potential in the subject showed increased motivation by marked formative assessments than by unmarked assessments (Wilson, 2010). Chemistry students with less academic potential can conquer the weakness through hard work and be successful. Likewise, students with greater academic potential can perform poorly on tasks due to a lack of effort. Therefore, feedback from formative assessment helps students stay on track and increase probabilities to achieve learning goals. The

formative assessment facilitated self-awareness that some concepts originally thought to be understood were not (Wilson et al., 2011). The students in the survey also shared the same sentiments. The results of the formative assessment also allowed me as their teacher to monitor their understanding of the topics and provide further support.

> *The quizzes helped to see what I actually remembered from the lesson vs what I THOUGHT I remembered. I think it was a very good technique in setting up quizzes that could be accessed on google classrooms. I found this very useful because I would know where I was going wrong* (Student B)

These self-control skills require students to dynamically utilise their cognitive skills, work towards reaching their learning goals, seek for help and ultimately take accountability for their own learning (Ozan and Kıncal, 2018). Self-reflection enables the student to access several memory banks from different sections of the brain which strengthens those neural pathways for future learning (Willis, 2009). Students start to question the cogency of their base knowledge and reconstruct by discovery the new knowledge as the learning progresses (Watkins, 2013). This facilitates effective consolidation of work taught in the lessons too. Essentially, the quiz in the intervention itself helped the students recap their classroom understanding.

> *The quizzes were really good, they were quick to complete, and the questions helped to summarise my knowledge and recap the work done in lesson, I think this helped me to remember the content much more easily* (Student C)

According to Vygotskys (1978) Zone of Proximal Development, there is a difference between what a student currently does intellectually and where they could be with the help of a "teacher" to realise their full potential. To facilitate this deeper thinking, the construction of rich questions is vital. Teachers can employ higher level

questioning strategies using Bloom's taxonomy to help students to gauge their own level of understanding (Herlofsky, 2010). As explained above, the MCQs were constructed with a range of questions utilising verbs from Blooms Taxonomy for this purpose.

The questions were appropriate and similar to what we did in lesson
(Student D)

Regular feedback from teachers can really push a student to reach their full potential. Feedback from formative assessment enlightens students on when they are on the right track and when to make amendments to their practices and learning to rectify mistakes (Watkins, 2013). Consequently, the MCQs were designed to provide this automatic feedback.

I think the quizzes were great and being able to have them marked instantly made it quick and efficient for us to see what knowledge we were lacking
(Student E)

Er, I found it really helpful that when we get something wrong, the answers were there for us, explained (Student F)

As highlighted in Maeng's (2017) research, these technology-enhanced formative assessments give immediate specific feedback to students about their specific strengths and weaknesses in the content studied. However, accessibility is an important prerequisite for the success of such systems. Students will not readily use a learning platform that is perceived to be awkward or arduous to use (Heggart and Yoo, 2018). Extra care was taken to ensure that the MCQs were convenient and quick to complete.

> *I like how quick they were to complete, and I feel like my score represented my understanding of the topic well* (Student G)

> *They were good because they didn't take much time to fill but they also covered a lot of detail* (Student H)

The final theme revealed in the surveys was that of engagement. In my experience, if a student feels they are making progress, then they will be more motivated to put extra effort into their work. As a matter of fact, one student confessed that they revised their work before attempting the quizzes to give themselves the best chance of scoring highly in them! The use of a computerised formative assessment tool facilitated this. Hwang and Chang (2011) concluded in a similar experimental study in Taiwan that portable formative assessment learning tool significantly increased the interest and mind-sets of secondary school students toward learning.

> *I enjoyed the quizzes as it ensured my general knowledge of the topic was good* (Student I)

> *They were enjoyable. I found it useful to just solidify my knowledge of topics and identify areas I struggled with the most. It helped make my revision more specific* (Student J)

It is evident from the responses received that MCQs are an effective and convenient way to formatively assess student subject knowledge. However, three areas of improvement were suggested by the students; accurately matching quiz questions to learning objectives, improve phrasing and technical issues.

Every effort was made to shape the MCQs to include a variety of questions based on the lesson objectives of the lessons taught that week. However, students sometimes felt otherwise.

I thought the quizzes were quite good at assessing what I knew from the lesson, although there were a few questions that I don't think were taught (Student J)

I think the questions were good as revision from the previous lesson, however there were sometimes questions on them that we hadn't covered in lesson, so I didn't know how to answer them (Student K)

As mentioned above, the importance of critical thinking skills is to obtain remedial knowledge. A student may possess these critical thinking skills, but not have basic knowledge of several topics and therefore not select the correct answer for questions requiring analysis, synthesis, or evaluation (Kim et al., 2012). Moreover critical-thinking skills are linked with higher domains of Bloom's taxonomy. Therefore, the student may think the some of the MCQs covered areas they had not been taught in class, when actually the level of question required the student to utilise a different skill they were inept in.

Another explanation could simply be the wording of the questions.

Some of the questions were difficult/weirdly worded but they were a good recall (Student L)

There are usually two types of questions; selected-response items and constructed response items (Osterlind, 1998). Selected-response items may include 'binary-choice items, matching items and multiple-choice items' (Popham, 2003, p. 72). They enable rapid coverage of large amounts of content and are easy to mark. However, as Popham (2003) notes, binary-choice items are imperfect as they promote simple memorisation particularly for poorly designed questions. This can also provide unprepared students the chance to guess and gain credit for things they didn't know if the guess was correct (Butler, 2018)

Sometimes the questions were phrased in ways I didn't understand but I then just decided to guess which I think is bad because many I got right despite not knowing the correct answers (Student M)

Therefore, the accurate construction of the MCQs is essential in gaining full benefit from it.

A final area of improvement was on technical issues. These were rectified as I gained more confidence over time with Google classroom and quizzes.

I think some of the questions had two answers, but the formatting only allowed us to select one (Student N)

Differentiated HW

Once the students had completed the MCQs, they were directed to a certain homework task depending on their score. Lots of positive feedback was also received on this differentiated homework. These included;

- Efficient learning encouraged

- Suitable pace

- Student ownership of learning and stretch it

- Choice

- Better use of time

- Monitor progress

- Ask for support

- Enjoyable and encourages completion

An overwhelming majority of students expressed that the biggest strength of the

intervention was how it was tailored to their needs and understanding. This reflects

the research by Wilson et al. (2011) where students reported that differentiated tasks

enabled them to identify their strengths and weaknesses particularly in their

knowledge of course material and prepare for final exams. As the literature review

revealed, when work is consistently too challenging or too easy, students do not

develop greater knowledge, understanding, or skill (Sousa & Tomlinson, 2011;

Tomlinson, 2014).

> *I really loved this homework system and I think getting set homework that was set according to my needs was very helpful because it allowed me to work on the things I didn't understand first rather than throwing me into something I didn't understand* (Student O)

Therefore, the best practices to stimulate higher level cognitive thinking in gifted

students include pre-evaluation of knowledge and potential, matching classwork to

student enthusiasm, and providing appropriately challenging tasks (Scot et al.,

2009). Sufficient acquirement of knowledge is required prior to applying and

evaluating critical thinking skills (Kim et al., 2012) Students get discouraged from

completing homework if they are not developmentally prepared to complete the task

and do not comprehend the assignment (Minke et al., 2017). This could lead to

misunderstandings and frustration.

> *I personally really liked having the different homework tasks because sometimes when I don't understand something, and I'm given a difficult homework then I just get more confused* (Student P)

Teachers can differentiate process by using cooperative grouping strategies through

adjusting the pacing of classwork (Gardaren and Whittaker, 2006). When the student

is uninhibited in the learning processes, they tend to take ownership of their own

learning and therefore make better progress. By placing the student in the driver's

seat for learning decisions, he/she takes on liability for learning, is more motivated,

and is prepared to study at increased achievement levels (Watkins, 2013). A similar

study showed that students who were offered differentiated instruction stated they

absorbed material to a deeper level (Dosch and Zidon, 2013).

> *I think that it was beneficial because it helped me learn at a more suitable pace* (Student Q)
>
> *I felt that the homework helped me as it allowed me to develop a greater understanding of the topic and gave me an opportunity to apply my knowledge to questions. I particularly liked how the homework was set according to my needs as it meant that it wasn't too easy or extremely hard; I could answer the questions after a bit of thinking* (Student R)
>
> *I found them useful because as well as testing my knowledge, I also acquired new knowledge from the questions I did not always know the answers to* (Student S)

Indeed, when students become conscious of how multiple-choice questions are

being compiled, they learn to distil irrelevant information and concentrate on learning

how to differentiate with more accuracy on what is required of them. The process

shifts from merely just selecting a correct answer (Wilson et al., 2011) and could

eliminate the drawback of guessing as discussed above.

In addition to these findings, students appreciated how accessing all the material on

one platform was easy to do. They had the flexibility to access and attempt all the

homework tasks and quizzes whenever they wished to. Students in research by

Heggart and Yoo (2018) expressed similar sentiments in that they valued how

Google Classroom made accessibility to all the material that was required for the

course easier. This freed more time to focus on improving weaknesses.

Having time to recap/revise what needed to rather than stuff I didn't need to. I had the flexibility to get to task in my own time. I could take as much time as I need on the task (Student submission, Heggart and Yoo, 2018, p.147)

It really helped. Sometimes, having time allocated time to just go over stuff that I don't understand really helps, and having questions that stretch me when I get something is also nice. I hope that other teachers adapt this method of setting homework (Student T)

A combination of accessibility and flexibility allowed students to monitor their progress too. Ensuring that students scrutinise their own progress through analysis of formative assessments is essential in successfully using formative assessment (Tomlinson, Moon and B. Imbeau, 2015).

The differentiated homework gave me the opportunity to start from a lower level task and build my way up which made me feel like I was making progress in the topic and helped me gain a better grasp of the information (Student U)

One student further explained that this awareness of self-progress encouraged them to seek support earlier in the course.

I believe it was very helpful for me as I was able to receive more help on my homework on the topics I struggled with. Similarly, I was able to complete a more challenging homework for the topics I understand well (Student V)

One of the reasons students do not complete homework is because it is difficult (Minke et al., 2017). This can cause frustration and demotivation. When students are engaged in their tasks, intrinsic motivation is aroused (Deci et al., 2001, Vansteenkiste, Lens, and Deci, 2006). Trautwein and Koeller (2003) also caution that if students do not feel that homework is intrinsically motivating, they are more likely to not complete it or complete it to poor standard. Thus, tapping into students' interests through differentiated instruction is important.

> *It was good to get homework tailored to my ability and meant I wasn't immediately going or reject or forget the work* (Student W)

> *….sometimes homework's are too easy (so there's no point in doing them) or too difficult (which takes too much time and can be disheartening), but with this system these problems are eradicated* (Student X)

As revealed in the surveys, differentiated homework was valued by the students. However, suggestions for improvement were given.

Some students did not notice much variation in the three types of homework.

> *I feel like the differences in the content could be more varied so for the harder ones they could be more challenging and extended* (Student Y)

I concur with the suggestion as students achieve higher grades when they complete homework that has a purpose of extension (Trautwein, 2007; Rosário et al., 2018). In Maeng's (2017) findings, all of Diane's (participant teacher is the study) students worked toward the same lesson objectives, while accessing and processing the content in different ways. Perhaps I could employ more instructional scaffolding where the teacher breaks up a theory or skill into its distinct steps while providing students the support necessary at each step (Bennett, 2019). The purpose of scaffolding is similar to that of differentiation in aspiring to improve student learning and understanding.

Pre and post topic test scores before and after intervention

Students completed a short summative assessment made up of past exam questions, on the topic taught during the intervention. The test was completed during lesson time before the start of the intervention cycle and the same test given at the end. Scores were statistically compared using a paired t-test.

In both year groups, the students performed better in their post topic tests compared to their pre topic tests (53% and 42% percentage increase in scores for Year 10 and 12 respectively) (Table 6). However, there was no significant difference in scores between the experimental and control group, suggesting that improvement in scores could be credited to learning the content during the lessons rather than any influence from the intervention.

`	Year 10	Experiment n:39	Year 10	Control n:39
Pre-test %	Post-test %	Pre-test %	Post-test %
43	· · 69	48	69

Year 12	Experiment n:21	Year 12	Control n:21
Pre-test %	Post-test %	Pre-test %	Post-test %
32	· · 47	34	47

Table 6: Comparison of raw pre and post topic test scores of the Year 10 and 12 for the experimental and control groups

To further investigate any statistical evidence, a paired t-test was calculated to compare the pre and post topic test scores for the experimental and control groups in Year 10 and 12. The null hypothesis (H_0) is that the mean difference between paired observations is zero. This suggests that the means of the two groups must be equal.

Since p-value is less than the t value for the Year 10 pre-test scores for the control and experiment classes, H0 is rejected. Thus, the difference between the average of experiment minus control is big enough to be statistically significant at $p < 0.05$ (Table 7). Hence the Year 10 experiment group performed better in their pre-test compared to the control group. My explanation for this could be that they were motivated to give their best effort in the test as they were chosen to experience the intervention and felt responsible as participants to do well. The control groups perhaps did not feel the need to do so.

However, for the rest of the measures (Year 10 post-test, Year 12 pre and post-test), the p-value is greater than the t-value therefore H_0 is accepted. In other words, the average of experiment minus control group test scores is not big enough to be statistically significant at $p < 0.05$. Hence the experiment groups did not perform better in their pre and post-tests compared to the control groups (Table 7)

	Measure	Group	N	Mean of scores	SD of scores	p value	t value
Year 10	Pre-test	Control	39	13	4.0	0.0057	2.9284
		Experiment	39	11	3.2		
	Post-test	Control	39	18	4.1	0.9043	0.1211
		Experiment	39	17	5.1		
Year 12	Pre-test	Control	21	8	3.5	0.7633	0.3053
		Experiment	21	7	2.8		
	Post-test	Control	21	11	3.7	0.8919	0.1376
		Experiment	21	11	3.0		

Table 7: Paired t-test results comparing the pre and post topic test scores for the experimental and control groups in Year 10 and 12

	Measure	Group	N	Mean of scores	SD of scores	p value	t value
Year 10	Control	Pre-test	39	13	4.0	2.4044	8.5194
		Post-test	39	18	4.1		
	Experiment	Pre-test	39	11	3.2	4.3685	9.9115
		Post-test	39	18	5.1		
Year 12	Control	Pre-test	21	8	3.5	0.0000	5.5318
		Post-test	21	11	3.7		
	Experiment	Pre-test	21	7	2.8	0.00146	3.6881
		Post-test	21	11	3.0		

Table 8: Paired t-test results comparing the experimental and control groups in Year 10 and 12 and their performance in pre and post topic test.

However, the difference between the average of the post-test and pre test scores is big enough to be statistically significant at $p < 0.05$ (Table 8). The p-value is less than the t-value, therefore H_0 is rejected. The average of post test scores minus the pre test scores for the control and experimental population is considered not to be equal to zero. Therefore, the intervention did have a small positive effect. Deunk et

al. (2018) also confirmed a slight overall positive result on students' academic performance with differentiation.

My observation as a biology teacher is that questions on different topics demand varying skills, intellectual understanding and problem-solving aptitude. This means that one topic may regularly require lower demand than another topic, resulting in the discrepancy between grades given in the test in the two cycles despite using standard boundaries.

There are a variety of issues that might affect the reliability of these test results, for example, 'the time of day, the time of the school year, the temperature in the test room, the perceived importance of the test, the degree of formality of the test situation, examination nerves, the amount of guessing of answers by the students (the calculation of standard error which the test demonstrates feature here), the way that the test is administered, the way that the test is marked, the degree of closure or openness of test items' (Cohen, Manion and Keith, 2007 p159).

It should also be noted that the experimental students had only completed three differentiated pieces of homework in each cycle. This may not be a long time for the intervention to make a substantial effect.

In the following chapter, evidence of collaboration, the summary of findings is discussed, and recommendations made for further studies.

Collaboration

Firstly, teachers and senior leadership team were asked for their opinions on differentiation, formative assessment and homework before implementing the intervention. The intention here was to construct a more complete picture from the qualitative data, of possible mechanisms contributing to the quantitative data. It was also to keep them involved throughout the research process.

Secondly, emerging results from the research were shared with participating teachers mainly from the biology and chemistry department during an INSET session at the start of the summer term (Appendix K). The discussions from this has also developed the department's awareness of the philosophy supporting the intervention. The intervention has brought differentiation and formative assessment particularly in homework to the foreground of the practice within the department and despite the unsurprisingly differing opinions on its effectiveness and its integration into daily practise, I believe my colleagues now have increasing levels of confidence in the application of it. In fact, the intervention is now part of the department's development policy as a teaching and learning target (see Appendix K).

Thirdly, the project was shared at a poster conference at the University of Oxford in June 2019 which generated useful discussion and interest.

Lastly, quizzes and homework's produced for the intervention were shared with colleagues in the department which encouraged them try the intervention straight away with their classes. This encouraged them to produce resources too which added to the pool of excellent teaching aids for the department.

Summary of findings

The questions that guided my research have been addressed and answered in my research study.

Research Question 1 *Can formative assessment be conveniently used to differentiate classroom learning?*

It is evident from the research above that formative assessment enables teachers to monitor individual student progress and adjust instruction quickly. However, producing such effective formative assessment resources entails time and expertise. The MCQs were produced on an online platform using questioning techniques guided by Blooms Taxonomy verbs. This method proved to be quite convenient and efficient in accessing the subject content understanding of the students and keeping track of their individual progress.

Different students learn new concepts in different ways. Just because they are gifted and expected to always achieve high grades does not necessarily mean they do. The formative assessment feedback from the MCQs facilitated recognition of these students and allow adjustments to be made to ensure each student, regardless of ability accessed the subject content to their best ability. Feedback from this formative assessment gives time before summative assessments, allowing for amendments by both teachers and students and avoid unpleasant surprises of underachievement too late in the year (Watkins, 2013). Therefore, formative assessment can be conveniently used to differentiate classroom learning.

Research question 2 *Can a formative assessment be used to guide and set differentiated homework?*

Abundant research supports the value of differentiating instruction (based on feedback from formative assessment) to students' individual levels. The surveys revealed that teachers are confident with the concept of formative assessment and efficiently use it in the classroom. However, they not so sure about employing differentiation strategies despite being aware of the different techniques. The barriers they face include identification of students, time constraints, resources and inspiration.

The students surveyed also appreciate the importance and benefits of homework and believe that the MCQ followed by differentiated homework would help them achieve better results in summative tests. Several reasons were acknowledged for the success of the formative assessments; identification of lack of understanding, consolidation, stretch learning, immediate feedback, quick to complete and engagement. The students embraced the differentiated homework which followed because it ultimately was tailored to their needs and understanding. It encouraged efficient learning, learning at a suitable pace, enabled student ownership of learning and stretch it, provide choice and flexibility, permitted better use of time, monitored progress, encouraged seeking support, is enjoyable therefore inspires completion. The implication of these results is that formative assessment can be used to differentiated homework.

Research question 3 *Does differentiated homework influence academic performance?*

Summative assessments like the pre and post topic tests attempted to measure the quantity and quality of what a student learned in a given time period.

Overall, the students achieved better scores in their post than pre topic tests. The paired t-test results revealed that the Year 10 experiment groups scored better only in their pre topic tests. There was no difference in the rest of the scores for the other experimental and control groups. Even though the data disclose no significant difference in achievement between the two groups, it is critical to point out that giving students differentiated homework did not prejudice or hinder academic achievement either. Analysis of the experimental group test scores identified students who really benefitted from differentiated homework. Interestingly, it was the students who appear to struggle the most in biology who seemed to have the largest differences in pre and post topic test scores. Overall, the intervention increased the intrinsic motivation of the students that would eventually increase the academic performance too in my opinion.

Chapter 5

Conclusions and Implications

Homework has been a topic of controversy amongst educators for a long time. Review of the literature has outlined the benefits and downsides. My main aim when assigning homework was to develop an intervention that would encourage student independence without adding unnecessary burden on them or myself. Therefore, designing the concept of differentiating homework informed by formative assessment to reinforce areas of weakness. The intention being to shift the traditional belief of marking homework just for accuracy and completion. Rather, the formative assessment score indicating proficiency or need for review. An overwhelming favourable response was received when students were asked if we should continue this new homework concept in the future. They admitted reduced struggle to complete the homework tasks as they were tailored to their existing grasp. This research has influenced my practice extensively. I am more aware of the importance of tailoring my teaching. It has also allowed me to reflect on several things that will inform my future practice.

Just as preparation of teaching resources takes time, creating differentiated homework tasks does the same. I chose not to put extra pressure on myself to create all these resources by myself and all at once. I collaborated with my colleagues and adapted the already extensive bank of resources at school. Even though it takes more time initially to create the homework tasks and rubrics; once they are made, it is very easy and quick to score.

As mentioned above, marking 86 pieces of homework a week would be untenable. Therefore, it was essential to shift my perspective to view homework as an opportunity for students to master subject matter at their own pace, rather than something that needed to be constantly graded. The students soon recognised that giving me their best effort irrespective of the grade was constructive to them as well.

For formative assessment to be effective, consistent and individualised feedback is more beneficial than a grade (Brookhart, 2008). Therefore, regular verbal (during classroom discussions) and specific written feedback (using the private comment feature on Google Classroom) on student work was given. This encouraged my students revisit and review their work rather than simply look for a score and encouraged them to communicate with me to develop further.

> *The grade 'trumps' the comment" and "comments have the best chance of being* read *as descriptive if they are not accompanied by a grade*
> (Brookhart, 2008, p.8)

An unexpected breakthrough encountered during the research involved my own attitude toward assessing homework. As many teachers, I generally find marking to be uninteresting and tiring. I found myself looking forward to observing what homework tasks the students ended up completing and was often surprised at what some of the students were able to accomplish.

Finally, in an age where technology is confidently used, such personalised interventions can be conveniently and easily delivered to encourage independent student work. They can ease managing work submission, providing feedback and marking student work.

Limitations of practise and research

A few limitations were experienced whilst conducting the research. Firstly, it was very time consuming to produce quizzes matching Blooms taxonomy verbs and relating these quizzes to the differentiated homework. It was anticipated to produce these quizzes beforehand. However, it was difficult to gauge where I would reach with my teaching each week. In future, I would make a bank of these resources during school holidays when I have a little more time and select tasks accordingly for each week.

It was also time consuming to keep a track of students who had submitted their homework as both control and experimental groups decided to present work in different ways. Some sent it via Google Classroom, others printed the work and handed it in. In future, I would only accept one platform for handing in completed assignments.

Secondly, earlier in the research, conversation with participants revealed that students assumed that scoring highly in the quiz would mean they would be asked to complete the challenging tasks which would be too much work and vice versa. However, as the time progressed, students realised this was false.

Thirdly, I also noticed similar responses in the summative topic tests of students suggesting some copying going on which would have decreased the reliability of their scores. I would ensure that the students were sat under exam conditions in future. Many students were unable to complete all four topic tests due to

commitments outlined above. Although these variables are difficult to control, extra effort should be made to conduct tests during school times when these disruptions would be minimal.

Finally, school contexts differ widely from school to school. Interventions may be successful in some and not in others (Moon et al., 2003). This study was conducted in a highly selective all girls grammar school. Generalization of findings to other schools and settings cannot be made. In addition, the study is limited to one major county in south Birmingham. Generalizations to other schools outside this area may require further study.

Evaluation of collaboration

If I was to repeat this intervention, I would recruit more teachers to try out intervention for longer period of time. Perhaps the timing of introducing this intervention would be towards the end of the summer term, so teachers can contemplate on it over summer and have the chance to produce resources and put into place actions for the start of the new academic year.

I would try and enlighten them on the online formative assessment tools and differentiation strategies by providing video examples and other resources. I would organise opportunities for teachers to share their techniques and resources too and collaborate ideas.

Implications for future practice and research

Research for this project revealed lots of literature in the U.S. and not much in the U.K. which warrants more research in the U.K.

There is also a lot of research literature concerning differentiated instruction and formative assessment. However not much on their use and effectiveness in homework and toward increased student achievement gains. This could be a further area to explore.

There are also more articles containing anecdotes and examples from teachers and not much from students. Future research could focus on the student perspectives and influence of such interventions on their performance.

Moreover, this study was conducted with students from Year 10 and 12 classes; thus, it is important to study the impact of differentiated homework informed by formative assessment at other school levels and over a longer period of time, then perhaps compare the results with the current study. It will be interesting to see if other classes demonstrate an increase in academic achievement by the end of the school year. The data from the research groups can now serve as a baseline for comparison, whereas the preliminary study lacked this information.

Concluding remarks

Engagement in this study has invigorated me to undertake an in-depth reflection into how to improve my professional practice on developing meaningful homework through formative assessment and differentiation. I am now regularly integrating differentiation and formative assessment strategies not only in homework but also in my daily classroom teaching. However, this study also emphasises that differentiating tasks alone may not increase the student achievement. This has inspired me to explore additional ways of developing tasks that promote critical thinking and deeper learning, and where every student is encouraged to participate and take responsibility for their own learning and progress.

Ofsted has recommended the following guidance (to be implemented from September 2019) in the new education inspection framework of May 2019

Teachers and leaders use assessment well, for example to help learners embed and use knowledge fluently or to check understanding and inform teaching. Leaders understand the limitations of assessment and do not use it in a way that creates unnecessary burdens for staff or learners (Ofsted, 2019, p.10)

I hope that this small albeit significant study will shed some light on strategies to achieve this and encourage educators to differentiate homework informed by formative assessment.

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Appendix A: Teacher Survey Questions

1. Your name
2. Subject(s) you teach
3. Are you a full or part time teacher?
4. Year groups you teach

Questions about differentiation
1. What do you understand by the term 'differentiated instruction'?
2. Do you feel you provide differentiated instruction well in the classroom?

   All of the time, Most of the time, Sometimes, Hardly, Never

3. If yes, how do you provide differentiated instruction? Please mention at least two strategies you employ in the classroom.
4. If not, what are the barriers you face?
5. Do you feel providing differentiated instruction can improve students' academic performance?
   Yes definitely, I am not sure, Not at all

Questions about homework
1. How often do you set homework? Please choose ONE that most applies to you.
   - I set it religiously according to the homework timetable and prepare specific homework tasks
   - I only set it when I feel it is needed which could be every lesson or once a while.
   - There is no fixed homework. I decide during the lesson what is needed to complete at home.
   - I should really plan the homework more effectively.
2. What sort of homework do you tend to usually set? Please choose TWO which most apply to you.
   - Test papers/ Exam questions
   - Worksheets
   - Reading
   - Watching online videos to consolidate work or learn new concepts
   - Essay writing/ Experiment write ups
   - Finishing off work that should have been completed in class
   - Working from the textbook

Questions about formative assessment

1. Do you feel you use formative assessment well in the classroom?
   All of the time, Most of the time, Sometimes, Hardly, Never
2. If yes, how do you carry out formative assessment in the classroom? Please mention at least two strategies you employ in the classroom.
3. If not, what are the barriers you face?
4. Would you have any objection to using differentiated instruction as an adjunct to setting homework?
   Yes, Maybe, No

Appendix B: Example of homework task

Due 14 Jan

11/01/2019- Part two: Main homework

⋮

[redacted] 10 Jan

If you scored 0-3- Revise the topic of blood using the BBC bitesize website link given below. Then attempt the multiple choice test at the end.
If you scored 4-7- Complete the exam questions attached. Please email the answers to me.
If you scored 8-10- Complete the exam questions attached and read up on blood groups. You may want to try the multiple choice quiz on it if you're keen!

Blood - Revision 1 - GCSE Bi... https://www.bbc.com/bitesize/g...	Blood Exam Qs.docx Word
GCSE Biology: Blood groups https://moodle.beverleyhigh.net/...	Practice Quiz for ABO blood... https://www2.palomar.edu/anthr...

Class comments

Due 28 Jan

Insect & Fish Gas exchange main homework   100 points ⋮

[redacted] 23 Jan

If you scored 0-3, go through the Powerpoint attached to revise the topic again and then attempt the worksheet labelled 0-3
If you scored 4-7, complete the sheet labelled 4-7
If you scored 8-10, complete the sheet labelled 8-10

Please submit work on Goggle classroom and you will receive the feedback online too.

8-10 Fish and insect gas exc... Word	4-7 Fish and insect gas exch... Word
0-3 Fish & insect gas exchan... Word	Gas exchange in insects and... PowerPoint

Class comments

Appendix C: Coding for qualitative data

How did you find the quizzes? What was good about them, what could be better? Were the questions appropriat...

Last edit was on 19 August

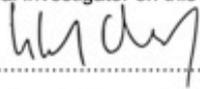| Open-ended question	Technical	Identify areas with lack of understanding	Consolidate	Improve: Longer style questions	Things hadnt learnt on quiz	Stretched learning/ Good range	Improve: Add more challenging questions	Quick to complete	Recap work done in class	Improve: Larger range of questions	Improve: Wording	Immediate feedback	Enjoyment
How did you find the quizzes? What was good about them,													
Total respondents who answered X	5	29	9	2	14	14	2	8	12	4	5	3	2
% of respondents who answered X	5%	27%	8%	2%	13%	13%	2%	7%	11%	4%	5%	3%	2%
In completing multiple choice questions, I found that I was u	1												
I found the quizzes really helpful in terms of identifying the a reas wher		1	1	1									
the quizzes were good. the questions were at a good level. I However there were things that we didn't					1								
I think the questions were good and covered the different ar eas of each topic													
I found the quizzes easy , I liked that I had to stretch myself to find the answer , this made me learn the content						1	1						
i thought the quizzes were good, and all of the questions we re appropriate													
I felt like they really helped review my knowledge and expan d it, and the questio		1	1										
The questions were appropriate and I feel as though they er nsured I ha		1								1			
The quizzes were really good, they were quick to complete a and the questions he			1					1	1				

100

Appendix D: CUREC approval

SECTION E: Signatures (The SSH IDREC Secretariat accepts either option below. If you have a <u>DREC</u>, check which signature option it prefers.)

- **Option 1**: 'Electronic signatures', i.e. email confirmations from a University of Oxford email address, can be accepted. Separate emails should come from each of the relevant signatories as outlined below, indicating acceptance of the relevant responsibilities. **Pasted images of signatures <u>cannot</u> be accepted in the sections below.**
- **Option 2**: Handwritten (wet-ink) signatures. Please scan them and the rest of the checklist pages to create a single PDF document and email through.

Please ensure this checklist is signed by:

For staff research:	For student research:
1. <u>Principal investigator</u>	1. <u>Principal investigator</u> (project supervisor)
2. Head of Department (or nominee)	2. Head of Department (or nominee)
	3. Student researcher

---

1. Principal investigator signature/supervisor signature (if student research)

I understand my responsibilities as **principal investigator** as outlined in the CUREC glossary and guidance on the CUREC website.

I declare that the answers above accurately describe the research as presently designed, and that a new checklist will be submitted should the research design change in a way which would alter any of the above responses so as to require completion of CUREC 2 (involving full scrutiny by an IDREC). I will inform the relevant IDREC if I cease to be the principal investigator on this project and supply the name and contact details of my successor if appropriate.

Signature: ....

Print name (block capitals): Sibel Erduran   Date: November 4, 2018

2. Departmental endorsement signature

I have read the research project application named above. On the basis of the information available to me, I:

(I) consider the principal investigator to be aware of her/his ethical responsibilities in regard to this research;
(ii) consider that any ethical issues raised have been satisfactorily resolved or are covered by relevant professional guidelines and/or CUREC approved procedures, and that it is appropriate for the research to proceed (noting the principal investigator's obligation to report should the design of the research change in a way which would alter any of the above responses so as to require completion of a CUREC 2 full application);
(iii) am satisfied that: the proposed project design and scientific methodology is sound; the project has been/will be subject to appropriate **peer review**; and is likely to contribute to existing knowledge and/or to the education and training of the researcher(s) and that it is in the **public interest**.

Signed by Head of Department or nominee (example nominees for student research include the Director of Graduate Studies/ Director of Undergraduate Studies):
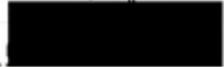
Signature:
....

Print name (block capitals):   Date: ....
....

3. Student signature (if student research)

I understand the questions and answers that have been entered above describing the research, and I will ensure that my practice in this research complies with these answers, subject to any modifications made by the principal investigator properly authorised by the CUREC system.

Signed by student: ████████████
....

Appendix E: Headteachers approval

**How does differentiation in homework informed by formative assessment
influence students' academic performance?**
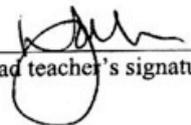
University of Oxford, Department of Education

Birmingham B14 7

We do not wish to participate in this project.

We would like to find out more about this project.

We would like to take part in this project.

_____
Head teacher's signature

Please return this form to me.

Thank you for your help.

Appendix F: Participant consent form

MSc Learning & Teaching
Prof. Sibel Erduran
Department of Education
University of Oxford
15 Norham Gardens
Oxford, OX2 6PY
Tel: 01865-274019

UNIVERSITY OF OXFORD

DEPARTMENT OF EDUCATION

PARTICIPANT CONSENT FORM

How does differentiation in homework informed by formative assessment influence students' academic performance?

Purpose of Study: To develop an intervention that will target teaching and learning to individual students in order to improve academic achievement. To encourage differentiation in the classroom on regular basis and identify students who may need extra support earlier.

Please initial each box

1	I confirm that I have read and understand the information for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without any adverse consequences or academic penalty.	☐
3	I understand that research data collected during the study may be looked at by designated individuals from the University of Oxford where it is relevant to my taking part in this study. I give permission for these individuals to access my data.	☐
4	I understand that this project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee.	☐
5	I understand who will have access to the personal data provided, how the data will be stored and what will happen to the data at the end of the project.	☐
6	I understand how this research will be written up and published.	☐
7	I understand how to raise a concern or make a complaint.	☐
8	I consent to being audio and video recorded	☐
9	I understand how audio recordings / videos will be used in research outputs	☐
10	I give permission to be quoted directly in the research publication against my name	☐
11	I agree to take part in the study	☐

_____   dd / mm / yyyy   _____
Name of Participant   Date   Signature

_____   dd / mm / yyyy   _____
Name of person taking consent   Date   Signature

Appendix G: Participant research information sheet (1 page of 4)

MSc Learning & Teaching
Prof. Sibel Erduran
Department of Education
University of Oxford
15 Norham Gardens
Oxford, OX2 6PY
Tel: 01865-274019

How does differentiation in homework informed by formative assessment influence students' academic performance?

PARTICIPANT INFORMATION SHEET

1. *What is the purpose of this research?*

Formative assessment is really the cornerstone for differentiated instruction. It is linking students from the question of "where am I?" to "what do I need to do to move forward?". As such, I would like to carry out a short formative assessment of your subject knowledge of a particular lesson. This will be done through the use of a short quiz designed around the learning objectives of the lesson. Depending on the quiz score, you will complete homework designed for your particular need. This will be marked, and feedback given. It is hoped that this way you will take control of your own learning and hence help improve your understanding and academic performance.

2. *Why have I been invited to take part?*

You have been invited because you are taught by me and are working towards your GCSE (Year 10) or A-level (Year 12).

3. *Do I have to take part?*

No. You can ask questions about the research before deciding whether or not to participate. If you do agree to participate, you may withdraw yourself from the study at any time, without giving a reason, by advising the researchers of this decision.

4. *What will happen to me if I take part in the research?*

If you are happy to take part in the research, you will be asked to complete the quizzes and homework using an online assessment tool called Go formative. This can be accessed on any electronic device. You will be asked to create your own unique username and password which you will need to store safely to refer to on a regular basis. All information and results will be confidential and only viewed by myself.

You will then complete the tasks and submit them through Go formative. Feedback will be provided here too.
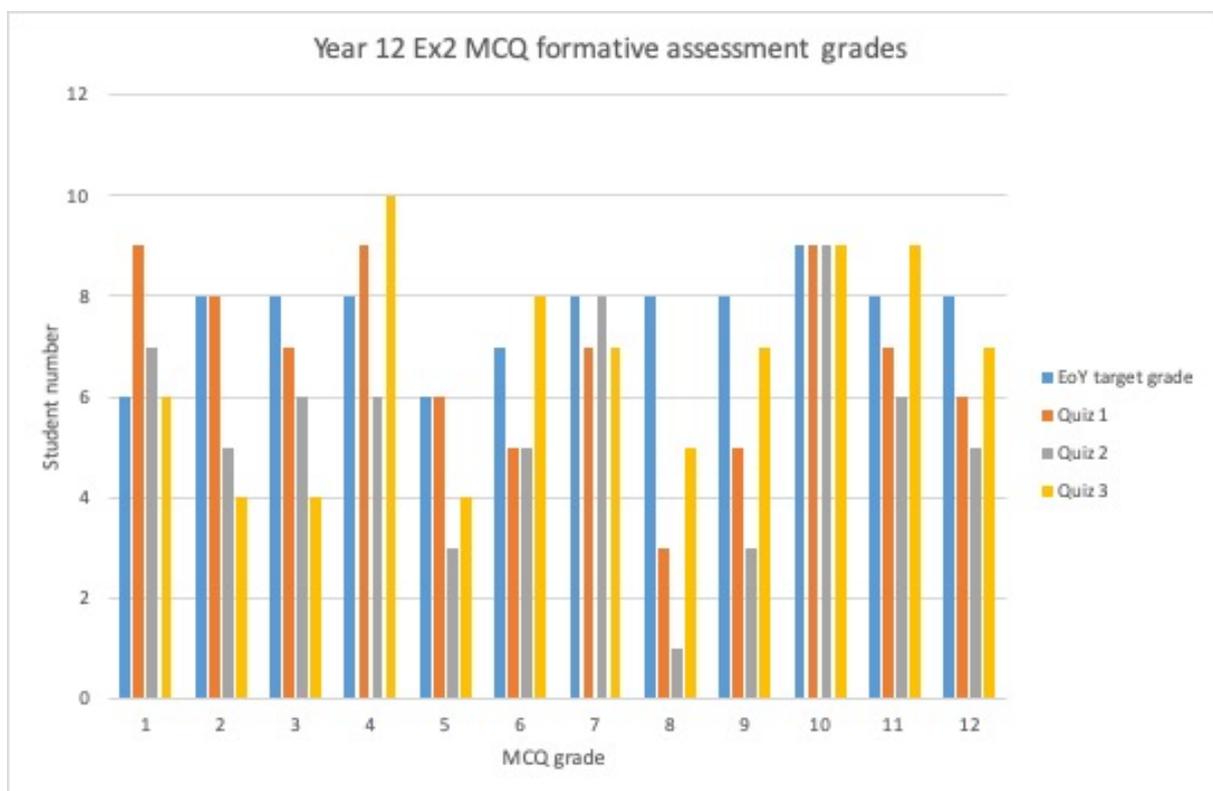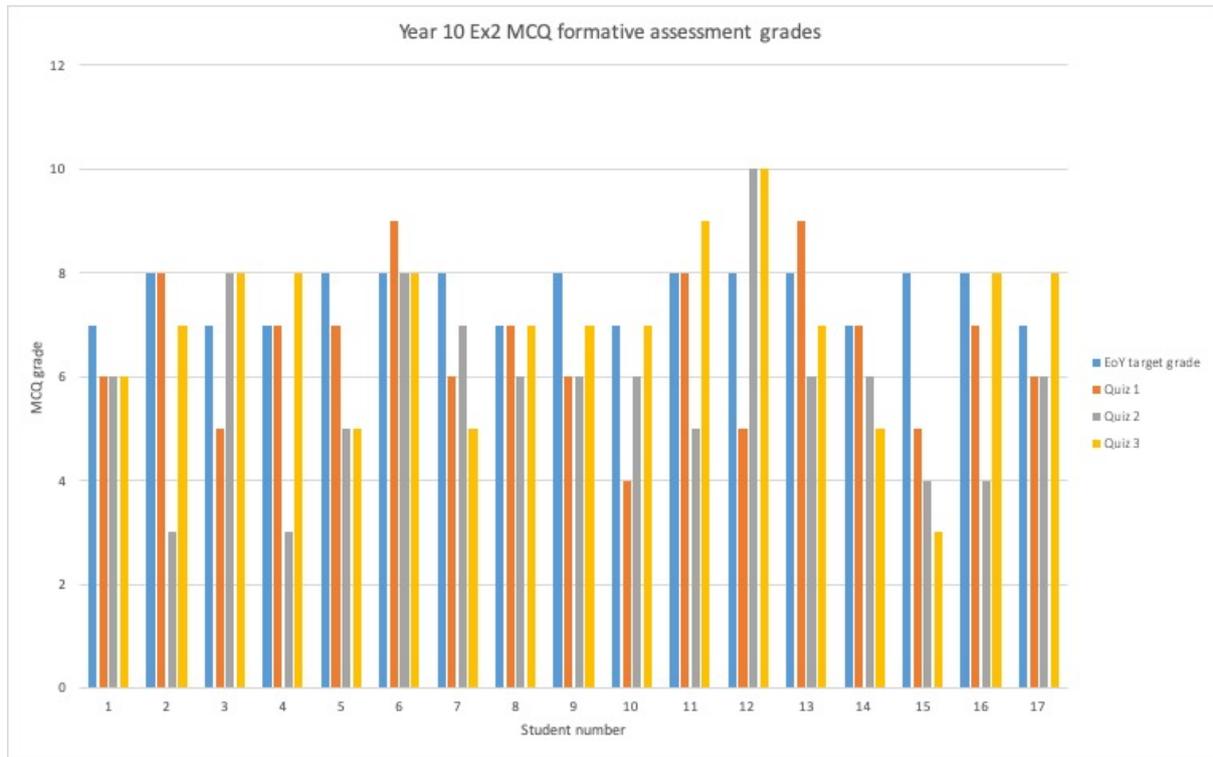
This should take approximately thirty minutes; the time allocated for your daily homework set.

If you are still happy to take part, you will then be asked to sign a consent form. This could be paper or online based. I may ask a few of you for an informal interview on your views of this intervention. These interviews may be audio taped for future reference. Your identity will be kept anonymous.

5. *Are there any potential risks in taking part?*
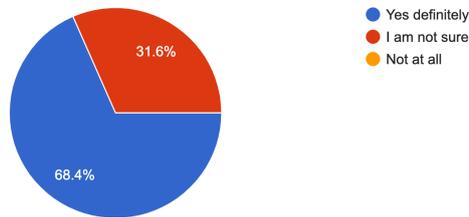
There are no risks involved.
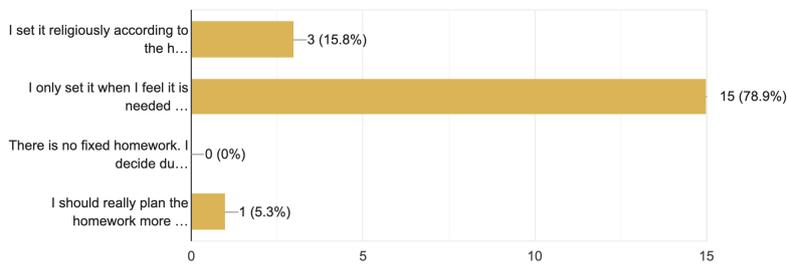
Appendix H: MCQ quiz scores for Ex2

Year 10 Ex2 MCQ formative assessment grades

Year 12 Ex2 MCQ formative assessment grades

Appendix I: Teacher survey

Do you feel providing differentiated instruction can improve students' academic performance?
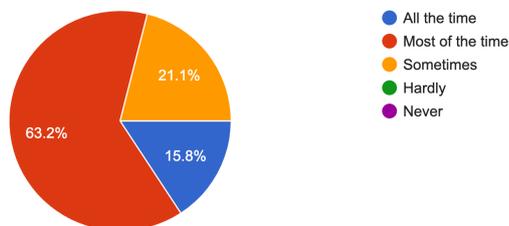
19 responses

- Yes definitely
- I am not sure
- Not at all

31.6%

68.4%

How often do you set homework? Please choose ONE that most applies to you.

19 responses

I set it religiously according to the h…	3 (15.8%)
I only set it when I feel it is needed …	15 (78.9%)
There is no fixed homework. I decide du…	0 (0%)
I should really plan the homework more …	1 (5.3%)

Do you feel you use formative assessment well in the classroom

19 responses

- All the time
- Most of the time
- Sometimes
- Hardly
- Never

21.1%

63.2%

15.8%

Would you have any objection to using differentiated instruction as an adjunct to setting homework?

19 responses

Yes	1 (5.3%)
Maybe	7 (36.8%)
No	12 (63.2%)

Appendix J: Students views on choice of homework

I have some choice in selecting the type of homework in my other subjects
64 responses

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

32.8%

57.8%

I would like to have some choice in selecting the type of homework I have to do for my class
64 responses

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

18.8%

59.4%

15.6%

Appendix K: Use of intervention in department plan and INSET session

| 2 | Trial TGE's system for giving students homework choice in Year 10. | • Set up online quizzes for Year 10 topics
• Use Google Classroom to make different homework resources available: Kerboodle, Seneca, Zig Zag resources, exam questions
• Ask willing volunteers to trial system in Term 1 and feedback to department.
• Review Yr10 weekly homeworks and adjust as necessary | | | |

X: Subject Leaders: Dept. Planning and evaluation documents: Proformas