Encouraging a collaborative learning environment: Introducing peer assessment in to the Mathematics classroom

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Encouraging a collaborative learning environment: Introducing peer assessment in to the Mathematics classroom

Abstract

The aim of this investigation was to address the stigma of failure amongst my students by building a collaborative classroom. In order to do this a peer assessment initiative was introduced with the intention of allowing students greater exposure to one another's work. Hence encouraging work based discussion and the view that mistakes are a fundamental part of learning.

The literature review reports that peer assessment can encourage a sense of community in the classroom. It can also allow students to experience higher levels of ownership for their progress and responsibility for the learning of others. All benefits fitting with the aims of this study. Drawbacks reported include the student's struggle with being an objective marker and their feelings of discomfort when it comes to being critical of a peer's work. Students may also lack the experience needed to mark sufficiently accurately.

Four classes were involved in this study. Two year 8 (Y8) and two year 12 (Y12) classes. Students were put in to groups of four and marked one piece of work per week within their small groups. Time was given in lessons for students to discuss feedback with their partner. As the initiative progressed students moved out of their groups of four and could find themselves being paired with anyone from their class in order to allow for whole class collaboration. Interviews and questionnaires were conducted as means of data collection. The initial questionnaire was completed before the peer assessment initiative was rolled out. There was a response rate of 75% for both initial and final questionnaires. All data was collected anonymously

Y8 students were found to have benefited more than Y12 from the peer assessment initiative. Y8 enjoyed the added responsibility provided, the initiative encouraged them to be more collaborative and in some cases reduced their anxieties around asking others for help. Y12 felt that there was nothing to be learnt from marking their peers work and they stated that they continued to feel uncomfortable exposing their work to peers for marking. Y12's motivation to engage in the peer assessment was low throughout. Both year groups did claim benefit from greater exposure to one another's work and this, in many cases, encouraged a richer communication between them. However, the level of impact was variable between individual students.

Within the timeframe of this study it was not concluded that students overall experienced an increased willingness to ask for help in front of others, make public mistakes or take risks as a result of peer assessment. It was concluded that peer assessment does seem to have had some impact on Y8's feelings of autonomy and responsibility for the progress of others but little impact was found for Y12. In addition, it was concluded that the stigma of failure was not sufficiently addressed for either year group. However, I believe that peer assessment shows potential as a positive learning tool and I suggest that there may be benefits to be gained if introduced over a longer period of time. Therefore, I do intend to continue to use peer assessment as a learning tool for the lower school (key stage 3) next academic year. As will my colleague who collaborated with me on this initiative.

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1. **Introduction**

I work in an incredibly high attaining environment. The attentiveness, drive and achievements of the students are to be admired, and in general, these students experience a consistently efficacious relationship with academic success. It came as a surprise therefore when, in my first few weeks of teaching at this particular school, I received an email from a parent describing her daughter's distress at being the 'worst in the class' and 'terrible at the subject'. I reassured the parent and student in question, who consistently produced impeccable work, that her view of her ability was not an accurate reflection of reality in my view. As it turns out the theme of this initial email is not unusual at this school and I have since become accustomed to providing reassurance to individual students on a regular basis. It has occurred to me that in general, my students rarely admit they are stuck or ask for further clarification in the classroom. Individuals have, however, been known to turn up at my office door at other times, such as at break and lunch. Often these students seek further clarification which could have been addressed in the lesson. It seems that outstanding grades does not equate to an infallible or robust confidence as one might expect. In fact, I have come to expect quite the opposite from my students.

I would suspect that, not unlike many teenage learners, my students have developed a stigma around, not only failure, but around making mistakes or asking for further clarification in front of others. I also wonder whether this stigma is even more pronounced amongst high achieving students such as those whom I currently teach. These students regularly experience not only their own success but success is rife amongst their peers, teachers and parents. Success is all around them and very much, in their eyes, expected of them. Hence it is not surprising that they should develop a 'fear of failure'.

Such a realization has lead me to reflect on my classroom and whether it is in fact an ideal environment for risk taking, experimentation and questioning. My aim therefore is to address the stigma of failure amongst my students by building a collaborative classroom which supports the development of confidence and trust for one another.

My initial investigations, including a review of the literature, discussions with colleagues and reflection of my own experiences lead me to conclude that in order to achieve a collaborative classroom the following objectives are valuable for the students: Increasing their levels of communication regarding academic progress, increasing their exposure of one another's work, increasing their feelings of autonomy in the classroom and hence addressing their stigma around making mistakes. In my search for an initiative that would tick all of the boxes described here I came across the idea of peer assessment when reading through lesson observation notes from my NQT year. I recalled observing a lesson in which students split in to working groups in order to swap work completed in the lesson and suggest areas of improvement to one another. Students appeared to be rather rehearsed in this activity and seemed to enjoy the responsibility they were given. Students were forthcoming when it came to discussing their difficulties. Levels of communication and collaboration were high. After engaging in further reading I decided to settle on the use of a *peer assessment* initiative for this study.

I propose that the introduction of regular peer assessment will increase levels of classroom collaboration. Through greater exposure to one another's work students will

become more involved in the progress of the group as a whole, learning to recognise peers as a valuable learning resource rather than as a competitor. I hope that peer assessment will encourage richer communication which will work to empower the students in my classroom to learn from one another, to take risks and to ask for help without stigma.

Our work is assessed continuously throughout our lives. Students should expect not only to be assessed by their peers at school but also at University, in the workplace and beyond. I believe it is likely that students will find themselves being called upon not only to be assessed but also to act as assessor at times. Learning how to provide feedback, reflect on the opinions of others and deal with scrutiny, whether positive or negative, at school can, in my opinion, only be of benefit to one's future social and professional interactions.

I recognise that peer assessment within a secondary school can be uncomfortable. It can be uncomfortable for the student; self-conscious of their interference with the complex social dynamics of a typical classroom. And it can be uncomfortable for the teacher; opening up the potential for peer conflict and erroneous or biased feedback. I will therefore be mindful of such drawbacks during my study and take advice from the literature on how to efficiently set up a peer assessment initiative which maximises benefit for students and addresses their concerns. See section 2.4 *How to set up a peer assessment initiative in the classroom*.

2. Literature Review

2.1.1 The Role of Peer Assessment

Topping (2009) describes peer assessment as "an arrangement for learners to consider and specify the level, value, or quality of a product or performance of other equal-status learners." (Topping, 2009, p1). Peer assessment, allows for learning and assessment to happen simultaneously (Falchikov 1995) and engages students in roles of both assessor and assessee (Lan Li, 2017). Students are active participators and they are subconsciously required to reflect and question. Divaharan & Lourdusamy (2003) conducted a qualitative study in which peer assessment was embedded into a module taken by student teachers at the National Institute of Education, Singapore. The aim was to provide student teachers with the opportunity to take greater responsibility for their progress and hence develop a better understanding of learning skills which could be passed on to students in their classrooms. Divaharan & Lourdusamy (2003) found that student teachers viewed peer assessment to be a rewarding and interesting experience which provided them with greater feelings of classroom autonomy. It was also reported that students felt more able to be critical of themselves and their peers whilst developing interpersonal skills. Findings from the study supported the view that peer assessment can enhance classroom collaboration as participants reported feeling more able to stay focused on the common goal of the group.

It has also been reported that providing students with the experience of assessing themselves and crucially evaluating the work of others can better prepare them for the expectations of society. Such will help them to become self-directed learners. (Hanrahan & Isaacs, 2001)

Peer assessment has been widely documented in the literature in recent years. Below I will outline some of the findings relevant to this study. Research questions were developed as a result of the literature review and from a reflection of my own experiences.

2.1.2 Assessment and feedback:

'…….if we wish to discover the truth about an educational system, we must first look to its assessment procedures' (Rowntree, D 1987, p.1).

Academics such as Hattie & Timperley (2007) and Gibbs and Simpson (2004) report feedback as one of the most powerful influencers in education. In fact, if we consider distance learning, this relies almost entirely on frequent submission and feedback. For some courses, for example, like those provided by the Open University, feedback may be the only form of contact to be experienced between student and course tutor. Face to face teaching is not relied upon, or even viewed as necessary, for this type of learning. (Gibbs and Simpson, 2004)

In the school setting marking is a commonly used form of feedback. Policies are often provided by schools to ensure that marking is being completed on a regular basis. Marking, as I am sure is the case for many teachers, contributes to a significant proportion of my workload. As conflicting priorities present themselves I find at times the feedback I provide becomes less regular and more rushed. It is also a common complaint of my colleagues that they are unable to provide regular feedback to students within a timescale that they feel will have reasonable impact. I question to what extent the time spent on marking equates to real benefit for the student. The study by Maclellen (2001) surveyed 130 students about their perceptions concerning teacher assessment. 50% of students reported that feedback does not allow for discussion and 30% did not believe that feedback helps them. The study implies that as teachers are under more and more time pressure, feedback is becoming less detailed and less personal.

It is here that peer assessment can play an important role. If we consider a typical UK classroom there will most likely be present one teacher responsible for the assessment of many students. Students, being greater in number, have the potential to give feedback more readily and regularly than the teacher. In turn, the peer assessor experiences benefits such as being exposed to other approaches and examples. However, I would argue that feedback provided by a student is unlikely to always be as accurate or reliable as feedback provided by an experienced teacher hence undermining its reliability. Despite this Gibbs and Simpson (2004) claim that immediate feedback from a non-expert peer has a greater positive effect on learning than expert feedback provided late.

A study by Forbes & Spence (1991) agrees with this claim reporting that when lecturers on an engineering course at Strathclyde University stopped marking student worksheets due to time constraints the number of students completing the worksheets decreased. The sheets in question did not contribute to the final grade so students were not incentivised to complete them if not submitting for marking. This resulted in lower results being achieved overall. Regular peer-assessment was then introduced to assess the worksheets. Students again began to complete the sheets and results improved. Students valued the regularity of the feedback and recognised the potential of peer

assessment for helping them to achieve their overall end goal (Forbes & Spence, 1991). From the findings of this study I would add that the benefits of peer assessment described appear to come from: the timeliness of the feedback that peer assessment provides and the added accountability of knowing that a submission of work is awaited by a peer assessor. I argue that the benefit does not necessarily come from the quality of the feedback provided and there is no evidence of this in the aforementioned study. Therefore, I argue that the benefits of peer assessment really only come in to play if the peer assessment is used in addition to teacher assessment and not in place of it.

The practice of not writing grades or scores on regular marked work is the norm in my current school. With the aim of encouraging students to focus their attention entirely on the teacher comment rather than on a potentially demotivating grade. Grades encourage comparison between students, not fitting with a collaborative environment (Black and William, 1998). This is however assuming that the student gets as far as actually digesting the comments provided. Some studies report that students often do not understand their feedback or even read it in the first place (Lea & Street, 1998). Feedback is less valuable to students when it does not give clear instruction on how to improve, when it is discouraging and de motivating, when there is no follow up to check that students have taken on board and digested the feedback and when it comes too late (Gibbs and Simpson, 2004). Therefore, it should be noted any peer assessment initiative will need to be set up carefully. Students will need to be advised on the most effective ways in which to provide feedback and any time set aside for follow up discussion with assessor is beneficial. Additionally, peer assessment should be accompanied with monitoring and checking from an 'expert' such as a teacher (Falchikov, 2001).

We can conclude from this section that peer assessment, if set up correctly, can save time for teachers whilst also providing more regular, timely and individualized feedback to students (Topping, 2009). However, I note that feedback provided by a student is unlikely to always be as accurate or reliable as feedback provided by an experienced teacher. Despite this Gibbs and Simpson (2004) maintain that timely feedback should be a priority and rate its value highly. Therefore, I will aim to provide students with a balance of feedback provided by both their peers and the teacher. Peer assessment will not completely replace traditional teacher assessment for this study.

2.1.3 Collaboration and ownership

Although young peoples' lives have clearly changed in many ways, schooling continues to be based upon conceptions of childhood that regard young people as dependent and incapable (Flutter and Rudduck 2004, p133)

As indicated in my part 2 assessment students should be given the chance to use intuition at every opportunity (Boaler, 2016). Not only this but they should be encouraged to question and have their opinions valued. Empowering them to take control of their progress. Students are more likely to enjoy learning when they feel involved (Ames & Archer, 1988). Peer assessment directly involves students in learning. It gives them a sense of ownership and autonomy (Pope, 2001).

Peer assessment is fitting with a constructivist approach to teaching (Gueldenzoph & May, 2002). An approach developed by Vygotsky (1962). The constructivist classroom would train its students to be responsible for their own learning. Their understanding

would be expected to be shaped from what is already known and what has already been experienced. The teacher acts as facilitator only and learning is a social experience (Gueldenzoph & May, 2002). Knowledge is acquired through interaction with others where each participant can contribute a unique experience. During peer assessment activities, students evaluate their own understanding whilst considering the ideas of their peers. Collaborative interactions occur and an environment for participation and sharing is established (Gueldenzoph & May, 2002).

In a study conducted by Callahan (2007) participants were observed to be engaging in more classroom interaction with one another as a result of peer assessment. These senior school students contributed more to discussions and reported feeling more comfortable when exposing their work to peer critique. They also reported feeling more able to share their misconceptions with one-another and more likely to seek help from peers (Callahan, 2007). A study by Pope (2001) concluded that peer assessment participants reported feelings of group cohesion, loyalty and belonging as a result of the experience. Additionally, Flutter and Rudduck (2004) argued, that to some extent education results in students being too directed and this does not prepare them well for society. Peer assessment and a constructivist approach encourages students to explain their thoughts with others and compare ideas. Students are constantly active, given responsibility and control. There are no passive learners and hence motivation should be increased (Gueldenzoph & May, 2002).

2.1.4 Responsibility for the learning of others

Topping and Ehly (2001) describe peer assessment as representing ".. a collection of intervention strategies that view students as catalysts in their own growth and development, as well as contributors to the lives of their classmates.." (Topping and Ehly, 2001, p1). Topping (1998) also refers to a study by Williams (1995) which offers an example of this working in practice. Here peer assessment was used for oral presentations by students (undergraduates of nursing). After the peer assessment exercise students reported that their learning was enhanced by the experience. They felt a higher level of trust for their peers which they believed would be of benefit to their professional careers. The students involved in this study were at university level, however Yurdabakan, (2010) argues that peer assessment can be introduced at a young age in order to develop such skills.

Callahan's (2007) study (as mentioned above) was based on a constructivist theory of learning which involved school aged participants. This qualitative action research study examined students' perceptions of how peer assessment affects their attitudes toward science. The study found that the peer assessment initiative resulted in students reporting increased feelings of duty to ensure that peers received adequate feedback and a greater sense of responsibility for the progress of the group as a whole. Students felt they could better identify with their peers and made more effort to explain information to one another. It was concluded that the interactions resulting from peer assessment encouraged participation by all (Callahan, 2007).

By encouraging opportunities for peer assessment and discussion students can learn to be responsible for the progress of those who they are learning with (Gettinger and Seibert, 2008). Which in turn can naturally encourage a community culture in the classroom, one which supports teamwork and shared responsibility, rather than comparison. Topping (1998) agrees that introducing peer assessment in to the classroom

can increase interactivity between peers allowing them to bond and to experience empathy for one another. However, some may experience discomfort when it comes to criticising a peer's work and this should not be over looked. The reluctance to be negative may, for some, undermine the quality of feedback provided as the student assessor seeks to focus on the positives only. It is worth considering that some students will find the act of judging the performance of their peers very awkward (Divaharan & Lourdusamy, 2003).

I conclude from this section that peer assessment encourages communication in the classroom. It can improve collaborative working and improve student attitudes and confidence in seeking and asking for help and also in helping others (Topping 2009). It can encourage a sense of community where students experience ownership over their own progress and greater responsibility for the progress of others (Callahan, 2007). However, it should be noted that the quality of feedback provided by a student assessor becomes less reliable if the assessor is unwilling to provide honest criticism. This, I would suspect is not unlikely to occur amongst school age assessors who may prioritise their social relationships over an accurate assessment. This complication of social dynamics is discussed further in the following section.

2.1.5 Social dynamics of the classroom

I noted in my part 2 assignment that the teacher's opinion of their student's academic ability can have an impact on the student's own perceived ability. However, it is not only teachers who can have this impact. Cole (2001) states that the appraisals of peers are far more powerful when it comes to changing the student's perception of their ability than that of their teacher. An explanation is offered by Topping (1998) who points out that the student's peer group are a consistent presence during a very influential time in their lives. Hence peers will experience more frequent and meaningful interactions with each other than they will with their teachers. In fact, for some teenage students there will be no-one more influential than their peers (Topping, 1998).

The importance that students place on how they are perceived by each other is something which I have become more conscious of since taking on a greater pastoral responsibility in school. I have come to learn that the social dynamics of the classroom can, in some cases, be a real inhibitor to learning. It therefore needs to be considered that the increased interactions between peers resulting from peer assessment may not only result in potential benefits. It may also be the case that the existing relationships and power struggles within the classroom may undermine the reliability of peer assessments. According to Topping (1998) students may be worried about offending their peers with their assessment feedback. Or feel uncomfortable providing any feedback at all to certain individuals with whom they view to have a more powerful 'social stance'.

Hanrahan & Isaacs (2001) conduced a qualitative study which focused on the opinions of third year undergraduate students engaging in self and peer assessment. Themes were then summarised from individual student comments. In line with the findings of Abson (1994) and Dochy et al (1999) stated above, these undergraduate students in question commented on their difficulty to be objective. They especially felt uncomfortable critiquing the work of others whom they deemed to be more able than themselves. They indicated their reluctance to mark a fellow student down. As expected students felt uncomfortable having others read their work, however they did comment that this

increased their motivation to hand in good quality work and they appreciated being able to see the quality of work produced by their peers (Hanrahan & Isaacs, 2001).

Dochy et al (1999) highlight additional difficulties of peer assessment which can go as far as to include a student's lack of ability to be tactful, gender and racial differences. Additionally, the student's perceptions of one another's honesty, if negative, can eradicate the benefits of the peer assessment activity. Student's may not accept peer feedback as always accurate. Or they may not wish to accept responsibility for assessing their peers work. It is therefore necessary for the teacher to assess whether the peer assessment will be reliable for the group of students in question.

According to some findings, it seems that students can be trusted more to accurately assess each other over themselves. Stefani (1994) conclude from their study that peer assessment is more reliable than self-assessment. Particularly amongst more able students who tend to mark themselves down. This finding agrees with my own experiences of teaching. In general, I have found that able female students are prone to playing down their achievements. A study by Saavedra and Kwun (1993) agrees finding that the most able students did not produce particularly reliable self-assessments. However, they were mostly very perceptive when it came to peer assessment.

A study conducted by Yurdabakan, (2010) involved 46 students aged 9-10 with the objective of analysing the effect of gender on response to peer assessment. It was concluded that girls, are more accurate at assessing their peers than boys. Although both genders were biased to some extent and scored their own gender higher than the opposite gender. The boys were the most inaccurate when scoring other boys and it suggested that boys struggle to be objective when rating their friends. It was concluded that training is recommended to reduce unconscious bias amongst young assessors. Dancer and Dancer (1992) agree that friendship will affect the reliability of peer assessment especially in younger students. It is clear that before any peer assessment activity is to be introduced adequate training will be required. Also, groupings should be chosen carefully considering the social dynamics of the classroom (Topping, 1998). In the case of my school, conversation with form teachers, would provide the most informed decision on groupings. Additionally, potential unconscious bias is an essential element to look out for.

I conclude that when it comes to teenage students their peers are highly influential and this should not be taken for granted when setting up a peer assessment initiative. It is possible that the complicated social dynamics of a classroom may undermine the reliability of feedback provided if students are concerned about offending one another. One should also consider the issue of the student's perceptions of their peer assessors honesty or ability to assess accurately. On the other hand, Chen and Lou (2004) argue that peer assessment provides greater insight into aspects of performance than teacher assessment can as peers are in close and regular contact and are more familiar with one another. Regardless, it is important for the teacher to be mindful of the social dynamics in their classroom, to oversee feedback discussions and to choose groupings carefully, intervening where necessary. In addition to this I will also ensure that students feel able to discuss their concerns surrounding peer assessment with each another and a teacher if necessary. Fitting for my study, it is argued in the literature, that peer assessment may be suited to able female students like those in my school. Such students tend to mark themselves down when it comes to self-assessment but appear to be very perceptive

when it comes to peer assessment (Stefani, 1994, Saavedra and Kwun, 1993). As the aim of this study is to encourage students to become more comfortable with sharing their mistakes with one another I will certainly need to be mindful of the social dynamics of the classroom throughout.

2.1.6 Other reported benefits of peer assessment

My personal experiences are also fitting with the findings of Gibbs and Simpson (2008) being that students will aim to concentrate their efforts where they are most needed at the time. Students are prone to working disproportionately hard for end of year examinations for example. Regular peer assessment could help to even-out the time spent on study. Frequent assessments and feedback throughout the year distribute study time more evenly and avoid topics not covered by the final assessment from being completely ignored, hence broadening the students learning experience (Gibbs & Simpson, 2008). Students can learn from the misconceptions of others.

Hanrahan & Isaacs (2001) found in their study that students commented on peer assessment providing them with a better understanding of their own mistakes and it made them more aware of the marking criteria which would be used to assess their own work. Other interesting themes emerged such as students expressing an awareness of their lack of experience and confidence with assessing one another and this resulted in their increased empathy for their usual assessors (in this case their university tutors).

One would expect that work being assessed by a relatively inexperienced peer rather than a teacher will ultimately result in the quality of peer feedback being less accurate and therefore less valuable. Cole (1991) argues that the authoritative nature of feedback coming from a teacher results in it being more highly respected by students. Alternatively, Yang et al (2006) found that peer feedback resulted in students paying more attention to their marked work. This may be because they wanted to 'check' their peers marking. Interestingly Cho et al (2010) concluded that students found both teacher and peer feedback to be equally useful when they were unaware of their assessor.

Peer assessment can also help students to develop skills of negotiation and the ability to accept and reflect upon criticism (Riley, 1995).

2.2 Conclusions

Overall, I regard the literature to review peer assessment in a mostly positive light. It provides students with the opportunity to receive regular and timely feedback potentially more readily than can be provided by a teacher (Forbes & Spence, 1991). Peer assessment also directly involves students in learning. It gives them a sense of ownership and autonomy which is fitting with a constructivist approach to learning (Vygotsky, 1962). Not only this but peer assessment encourages students to learn to be responsible for the progress of those whom they are learning with (Gettinger and Seibert, 2008). The increased interactivity between peers allows them to bond and to experience empathy for one another (Topping, 1998). Students may feel that they can better identify with their peers encouraging participation by all (Callahan, 2007). This suggests that feelings of competitiveness may be reduced and students may experience greater levels of trust for one another as reported in the study by Williams (1995). It is argued that peer assessment can improve collaborative working and improve student attitudes and confidence in seeking and asking for help and also in helping others (Topping 2009). It

can encourage a sense of community in the classroom allowing students to experience higher levels of ownership and communication. All benefits fitting with the aims of my study.

However, one must note drawbacks and the conditions on which a peer assessment initiative should be founded as described in the literature. Firstly, we learn that it is not sufficient to provide any form of feedback. Feedback needs to be effective, of the type which is encouraging and with instruction on how to improve and move forward. Peer assessment will therefore be of most value when time for discussion between assessor and assessee is provided in the lessons. The teacher should monitor the feedback and leave open room for questions and further clarification (Gibbs and Simpson, 2004). Monitoring will also be of benefit as it is argued that the increased interactions between peers resulting from peer assessment may not only result in potential benefits. Existing relationships and power struggles within the classroom may undermine the reliability of peer assessments. As students place high value of these social dynamics and on particular friendships. We may expect that students should typically find it hard to be objective or provide negative feedback. Or it may be the case that students simply do not have the experience or skills to mark sufficiently accurately. A balance between peer and teacher assessment will be found and peer assessment will not replace normal teacher assessment. Additionally, it should be noted that female students tend to produce more accurate peer assessments than they do self-assessments (Saavedra and Kwun, 1993). Finally, groupings should be chosen carefully with a consideration for the social dynamics of the classroom (Topping, 1998). In the case of my school, conversation with form teachers, would provide the most informed decision on groupings.

2.3 Research questions

The following research questions emerged as a result of the literature review:

- RQ1: Does peer assessment increase a student's feelings of autonomy in the classroom, including a shared sense of responsibility for themselves and others?
- RQ2: To what extent does the introduction of regular peer assessment encourage students to feel comfortable with discussing their areas of weakness with one another?

In light of the development of these research questions I decided to consult the literature again focusing on the logistics of setting up a peer assessment initiative based on the documentation of completed studies. My aim was to both address the research questions and to also provide the most benefit to students. There was a lot of advice to be found in the literature on what to consider when setting up a peer assessment initiative which maximises outcome. I summarised the considerations which I believe to be most relevant to this study in to five main themes. The five themes, which are discussed in more detail in the next section, consist of the following: Aligning expectations, motivation, grouping, anonymity and structuring feedback.

2.4 How do set up a peer assessment initiative in the classroom:

2.4.1 Aligning expectations

The literature states the importance of clarifying the objectives of peer assessment for both assessor and assessee (Topping, 1998, Falchikov & Goldfinc, 2000, Gueldenzoph & May, 2002). This will align the expectations of student and teacher. Chen and Lou (2004) support this view finding that if students do not understand the purpose of peer assessment or value its benefits then they will fail to act as meaningful assessors. They suggest that teachers discuss the uses of peer assessment with students as a first priority.

Further Topping (1998) reminds us that the teacher should consider the cultural differences amongst students. Some students will accept peer assessment as a valid form of assessment more readily than others and all will need to be given time to get used to a new and potentially unfamiliar initiative. Peer assessment should be introduced slowly with teacher lead feedback, evaluation and discussion available at each stage (Hanrahan & Isaac, 2001). The process should be monitored by the teacher and further coaching provided if necessary to realign goals and expectations (Topping, 1998). This could go as far as allowing students to be involved in not only the assessment of each other's work but to also be involved in the designing of the assessment criteria (Gueldenzoph & May, 2002). A study by Stefani's (1994) reported that learning gains were achieved from doing just this. They advise that the more insight into the assessment criteria the student assessor has the better. Finally Topping (1998) reminds teachers that steps should be taken to avoid plagiarism and copying and to reduce misconceptions being missed by the assessor.

2.4.2 Motivation

For peer assessment to be effective students need to willingly provide quality feedback to one another, this requires effort and motivation. Friedman et al (2008) state that in line with expectancy theory, as described by Vroom (1964), the effort that a pupil will put into an activity is based on their analysis of how personally valuable the outcome will be to them and how likely they are to achieve this outcome. Students will only fully engage meaningfully in the peer assessment if they can envisage real results from their efforts. If students do not view peer assessment to be beneficial or fair, their motivation to engage with it will be lower (Friedman et al, 2008).

Chen and Lou (2004) and Friedman et al (2010) talk of the benefits of introducing assessor accountability to increase motivation. Students should be held accountable for the ratings they give fellow students and for the quality and accuracy of their peer assessing. They advise teachers to demonstrate to students how the feedback they provide will be used and to stress its value. Hanrahan & Isaacs (2001) agree finding in their study that students view peer assessment to be meaningless if their assessments are not used. Friedman et al (2010) also suggest that teachers use peer assessed results in their own assessments of student's progress as a way to value student marker accountability. In my own school a balance will need to be found between making assessors feel valued without making them feel too nervous about their level of accountability. It is possible that some student assessors will air too far on side of caution and mark with too much leniency when the stakes are high (Topping and Ehly 2001).

2.4.3 Grouping

According to the literature, arranging students in to *small* project groups for a peer assessment activity provides a good outcome (Friedman et al, 2010 and Falchikov &

Goldfinc, 2000). It is stressed that group size should be kept small to ensure all are accountable and where possible include skill diversity and minimise cliques and friendship groups. A view supported by Topping (1998) who advises that peer assessors should be grouped carefully as to minimise social clashes and to maximise trust. Allowing the group members to set group goals will increase accountability and responsibility for progress of the group as a whole. Topping & Ehly (2001) suggest that students should be arranged into pairs or groups of equal ability so students can work at a similar pace towards a shared goal. The teacher should be aware of the possibility of a "pooling of ignorance." being formed within similar ability groupings (Topping and Ehly, 2001. P120).

It is also argued that work should be marked by one peer at a time rather than multiple peer markers being used in an attempt to increase accuracy. Falchikov & Goldfinc (2000) conducted a study which investigated the correlation between student's marks provided by peers and their teachers. Interestingly they found no benefit from multiple peers marking the same work. In fact, the more peers allocated to a single piece of work the more discrepancy between marks allocated. It was suggested that large group marking may result in less effort being invested by students. Assessors are aware that the work will be marked multiple times and can safely shift responsibility to someone else (Falchikov & Goldfinc, 2000)

Teachers should observe how the group dynamics change throughout the process. Gueldenzoph & May (2002) advise teachers to be present and to ensure that all students participate equally. Allowing for regular formative assessment from peers, rather than summative assessment, will allow students to act upon feedback and make improvements.

2.4.4 Peer assessing with anonymity

Peer assessment requires peers to be critical and honest. As discussed above various factors such as friendship and self-esteem could easily compromise the validity of the feedback. A study by Lan Li (2017) investigated the role of anonymity in peer assessment. The findings were in line with their hypothesis that anonymity reduces peer pressure and increases engagement with the peer assessment activity resulting in a more meaningful experience for the student. Hence academic performance was improved when compared with a control group.

It was recognised that anonymity is not always possible or desirable between assessor and assessee as they may wish to identify each other for feedback communication purposes. Lan Li (2017) concluded in their study that when it is not viable to maintain an anonymous environment training can work to overcome the negative impacts of having the assessor and assessee identities revealed to each other. For example, students in this study undertook training on how to deal with peer pressure resulting from the study. Students were also given opportunity to discuss concerns with one another.

I decided to reject anonymity within the peer assessment initiative for my study when it comes to peer assessor and assesse being able to identify each other. This means that students will know who within the class is assessing their work and will also know who's work they are assessing. I believe that anonymity would be incompatible with the goals

of increasing levels of collaboration and reducing the stigma around making mistakes in front of others. I will however encourage sensitivity and a sense of responsibility toward the progress of others. Anonymity may also restrict the level of accountability required to provide motivation for engaging duly with the initiative (Chen and Lou, 2004 & Friedman et al, 2010). Anonymity will be maintained however for data collection purposes. All questionnaire responses will remain anonymous.

2.4.5 Structuring feedback

Hanrahan & Isaac (2001) found that students lacked confidence in their own ability to assess each other. These students requested feedback on their 'assessing'. Students should be shown how to provide the type of feedback which is of the kind that can be acted upon. For example, there is less to learn from corrective and graded marking compared to marking which provides opportunity for corrections and suggested improvements (Hanrahan & Isaac, 2001). Therefore, collaborative and open-ended feedback is likely to be of most benefit.

To ensure that students get the most out of the initiative it is important that peer assessors are educated on the most useful form of feedback to provide. For example, feedback should be encouraging and informative (Gibbs and Simpson, 2004). The student should be 'guided' and the feedback should make them feel hopeful for improvement. It is argued that grade only marking should be avoided as it can tap into one's ego and put success level on a measurable scale which allows comparison with others. If a student is looking for encouragement and only receives corrections or a grade they are unlikely to be motivated (Gibbs and Simpson, 2004). Crooks (1988) and Jackson (1995) agree and find in their studies that when grade and comments are provided together students pay far more attention to the grade than the comments despite the comments holding the valuable information.

Gielen & Wever (2015) conducted a study on the ideal level of structure to provide student assessors in terms of how to present their feedback. The study concluded that providing assessors with a few guiding questions encourages assessors to elaborate on their feedback significantly when compared with those not provided with any structured feedback template. This also increased the student assessor's willingness to provide negative as well as positive feedback. It is important for students to be able to provide their peers with constructive negative feedback and as stated above this may be a difficult for some. Gielen & Wever (2015) conclude that a structured peer feedback template is a successful intervention which can guide students in providing negative feedback such as 'areas to improve'. However, Gielen & Wever (2015) caution 'over-scripting' as too much structure may limit assessor creativity and freedom in their feedback. Structuring the peer feedback template by adding a few guiding questions is of most benefit in terms of drawing out quality and honest feedback from assessors (Gielen & Wever, 2015).

Gielen et al (2010) went further and suggested the use of a posteriori reply form. The form is used to allow students to reflect upon feedback received and write a comment. It created a dialog between assessee and assessor. The aim is to encourage more mindful reflection on comments by the assessee as there were prompts in the forms which allowed for open ended response. However, Gielen (2010) suggests that the benefits of such a form become more apparent in the longer term. The time restriction on my study may limit the potential of a posteriori reply form, instead I will encourage the reflection

of feedback through a more informal method such as lesson time discussion. Although I will give some guidance to students regarding the format that their feedback should take, (for example informative comments and no grades). I intend for students to be very much involved in setting the 'criteria' themselves. My aim is to allow students to be as involved as possible.

Summary of actions I will take as a result of learning from the literature review

- I will align the expectations of the student assessors by discussing the benefits of peer assessment and outlining the importance of their role. Chen and Lou (2004) found that if students do not understand the purpose of peer evaluation or value its benefits then they will fail to act as meaningful assessors.

- I will support motivation for engaging in peer assessment by again discussing the importance of their role. Chen and Lou (2004) and Friedman et al (2010) also talk of the benefits of introducing assessor accountability to increase motivation. I will therefore be present throughout the process to oversee the marking and feedback discussions.

- I will be mindful of social dynamics when grouping students for a peer assessment task. Groups will be kept small with students being places with others of similar ability.

- It is argued that anonymity can encourage students to be more critical and honest, reducing peer pressure and increasing engagement (Lan Li, 2017). However, anonymity is not always achievable in the classroom. I will not offer anonymity for peer assessors as I believe it would be incompatible with the goals of collaboration. This means that students will know who within the class is assessing their work and will also know who's work they are assessing. I will instead ensure that students are given the opportunity to discuss their concerns with one another throughout the process and open communication will be encouraged. Anonymity will be maintained however for data collection purposes. All questionnaire responses will remain anonymous.

- Basic feedback templates will be provided in order to structure feedback. However, these will be very basic to prevent over scripting and to allow maximum autonomy for students (Gielen & Wever, 2015).

Hanrahan & Isaac (2001) found that students lacked confidence in their own ability to assess each other. Training is recommended. However, time restrictions on this study do not allow for any in-depth training to take place. Therefore, I will encourage feedback which can be monitored and followed by discussion. Giving students a forum on which to voice their concerns may reduce pre-empted issues such as peer pressure (Lan Li, 2017, Hanrahan & Isaac, 2001).

3. Methodology

In this section I will describe the methodology that I have employed and its rational for my research project. I begin by introducing the school and its students (the participants). I will then discuss ethical considerations followed by a timeline of events and a

description of the collaborative aspects of the study. Finally, I will discuss how data was analysed, the data collection tools used and their contribution to the investigation of the research questions.

RQ1: Does peer assessment increase a student's feelings of autonomy in the classroom, including a shared sense of responsibility for themselves and others?

RQ2: To what extent does the introduction of regular peer assessment encourage students to feel comfortable with discussing their areas of weakness with one another?

3.1 Overview

As described above this study arose from some recognised need. The need for the students in my classroom to work more collaboratively and sit more comfortably with failure. With the aim of reducing their feelings of anxiety around mistakes and similarly for asking for help in front of peers. The single sex school for female students is highly selective. The learners involved in this study can be described as high achieving and there is an expectation (which comes from their parents, teachers and themselves) that they will excel. This research involves the introduction of regular structured peer assessment in to four classrooms within this school. The structure of the intervention is described in more detail in the following sections.

3.2 Participants

The participants of this study are a mixture of students from year 12 (Y12) and year 8 (Y8). Although all students in the school are generally high attaining the participants in both year groups come with a range of mathematical experiences and confidence however the participants in Y8 are from a middle ability set (one class taught by myself and one taught by a colleague). Both Y12 classes are taught by myself and are not taught in ability sets. My reasons for choosing these particular year groups is twofold. I had noticed that the students in my Y8 and Y12 class were particularly resistant to exposing their misconceptions to one another and I felt it would be interesting to involve participants who were quite far apart in age whilst avoiding any classes approaching public examination. From my previous experience, I expected younger classes would be more open and amenable to the introduction of a new initiative than older year groups.

3.3 Ethical considerations

The research methods I have used in this study, questionnaires, interviews and recordings require a degree of invasion in to the privacy of others. Therefore, in this section I include a consideration of the ethical implications.

True anonymity and consent is a major factor in my study. Although steps were taken to avoid such outcomes it is possible that my status as a teacher could have resulted in students feeling pressured to take part in the study or to give a particular response to a question. As it is true that "questionnaires will always be an intrusion into the life of the respondent" (Cohan et al, 2011, p377), through their use of a participant's personal time or the nature of the questions asked. This argument could be applied to an even greater extent to the interview process. Therefore, I ensured that all students taking part were aware that they were doing so voluntarily, that they could withdraw at any time and that their responses would be completely anonymous. Interviews were conducted in pairs to make students feel more comfortable.

Alongside the considerations described I sought and received BERA approval through CUREC and the University of Oxford. My research was deemed to be low risk, Head teacher consent was received and further parental consent was not required. I ensured that the nature of the questions asked to students were appropriately focused on answering the research questions. The aim of the project was to inform future practice which would benefit students in the long term and I could not foresee any negative impact. All data collected from questionnaires and interviews was kept anonymous and destroyed after the project was completed and written up. Questionnaires were completed anonymously. The questionnaire did not record participant names.

3.4 Collaboration

It was important that my initiative was collaborative in order to provide the opportunity for learning for others and to gain valuable input from others.

1. One other member of staff engaged fully with the research process by administering initial and final questionnaires to her own Y8 class. She then followed the same peer assessment initiative as was introduced to my classes. This teacher introduced her peer assessment initiative within the same timeframe as me and consistency with this was maintained as far as possible. This collaboration with a colleague meant that we could reflect on the process together throughout.
2. The intervention was discussed with the rest of the department. The initial discussion took place in one of the department meetings within the early stages of the implementation of the initiative. There were follow up discussions with colleagues during the initiative. After completion, the analysed data was discussed. As I am a new member of staff at the school (in my first year) the initial conversations with the department allowed me to gain greater insight in to 'need' from the perspectives of the other teachers. Collaboration and sharing of good practice is imbedded in to the culture of the school and expertise and advice from colleagues was welcomed. My research questions were then edited as a result of these meetings. This was important as the intervention needed to be relevant and useful for my school in particular.
3. I summarised results, findings and implications and produced a presentation which was delivered to my own colleagues and is due to be delivered to NQT staff at a local academy. The presentation along with a question and answer session was welcomed by the school.

3.5 Initiative timeline

Before initiating any peer assessment activity, the process was discussed in detail with each participating class as is advised in the literature (Lan Li, 2017, Hanrahan & Isaac, 2001). To increase levels of motivation the objectives of peer assessment were discussed in advance with the potential benefits to students highlighted. Hanrahan & Isaac (2001) found that students lacked confidence in their own ability to assess each other and training is recommended. However, time restrictions did not allow for any in-depth training to take place. Therefore, students were given space and time in lessons for discussion between assessor and assessee. Feedback was monitored by the teacher and followed with discussion. Providing a forum on which students could voice their concerns helped to address issues such as peer pressure.

Nov	Initial questionnaires administered to all participants
Nov/Dec	Meeting with colleague to discuss findings from initial questionnaires
Jan	Classroom based peer assessment activities introduced to all four classes (students put in to groups of 4)
Feb/March	Peer assessment activities move to a more comprehensive homework task (groups of 4)
March/April	Peer assessment continues (groups of two on rotation)
May/June	Interviews with students take place
May/June	Final questionnaires administered
June	Meeting with colleague for discussion and analysis of data

A timeline of events (figure 1):

Each participating class engaged in a peer assessment activity at least once every week. This schedule was decided upon with consideration of the scheme of work and homework timetable as set by the school. Soon a regular routine was developed and the students knew when to expect a peer assessment activity. It should be noted that the peer assessment was in addition to, and not in replace of, traditional teacher assessment. Books were still collected and marked by the teacher once a week as normal and end of topic tests continued to be marked by the teacher and recorded in the normal way. This follows advice from the literature which aims to reduce any impact of unreliable peer assessment.

Following a discussion and analysis of findings from the initial questionnaires my colleague and I drew up a timescale for the initiative (see figure 1). We decided it would make sense to put students in to groups of four based on where they were presently sitting in the classroom. Seating plans were already carefully thought out by the teacher and we wished to minimise disruption to the normal workings of the classroom. For more comprehensive peer assessment activities (introduced later) students were provided with a feedback template in which to organise their feedback to one another (see appendix). The use of such a template was recommended in the literature (Gielen & Wever, 2015).

We introduced the first peer assessment activity with all participating classes within the same week. This followed a class discussion where students were encouraged to come up with pros and cons of engaging in peer assessment there was also discussion on the importance of providing accurate feedback and the ways in which the assessor could explain their 'marking' to assessee. The aim of these initial discussions was to increase levels of motivation for participation in the class as recommended by Friedman et al (2008) & Friedman et al (2010) and also to address any of the student's initial concerns about peer assessment. The first activity consisted of a straightforward exercise of marking a peer's classwork and providing a short comment. Following this, students were then asked to mark their neighbour's work at the end of lessons on a regular basis, rotating to a new assessee from their groups of four. As students became more used to marking each other's work they developed their confidence in doing so, and marking tasks were set as a weekly homework activity. This activity meant marking in more depth and leaving short written feedback. Corrections and comments were required but no grades as is fitting with the schools marking policy. Feedback templates were provided as a guide (see appendix). Students could use any resource they wished to mark peers work (mark schemes, research, school maths clinics) and were often guided on how to do so. If

they were faced with a problem which they could not correct they were required to leave it blank and highlight it to be discussed in the following lesson during the discussion time provided. The aim was not to assess the students marking skills. Students were however expected to verbally provide constructive criticism and feedback to the assessee at the start of the next lesson. Transition points, for example moving from a class based peer assessment task to the peer assessed homework task, were kept in sync for all classes where possible. This was to ensure that all received a comparable experience.

After the Easter break peer assessment continued but students were not confined to their assigned groups of four. Instead students could find themselves paired with a different partner from their class each week. As advised by the literature student pairings were organised mindfully. The aim of changing groups was to familiarise students with having their work marked by anyone in class and hence build a collaborative classroom.

Interviews and questionnaires were conducted as means of data collection. In addition to this, as recommended by Edwards et al (1999), I kept a reflective diary throughout the process. This, they argue, can provide a major database for an action research project. This diary helped me to organise my thoughts and findings whilst strengthening the legitimacy of my analysis and conclusions. Any significant observations are included in my discussion section.

3.6 Data collection methods

I considered carefully which data methods would be the most effective in answering my research questions. I eventually settled on a qualitatively-based quantitative scale as championed by Nastasi & Schensul (2005). My study therefore mostly focused on qualitative data collection but with an element of quantitative data collected in the form of a Likert scale questionnaire. Nastasi & Schensul (2005) argue that an analysis can be enhanced by such cross-checking of data sources.

3.6.1 The questionnaires

The initial questionnaires intended to gain a snapshot of student views as a whole as they stood at the start of the process. Final questionnaires allowed me to collect student views as they stood after engaging with the initiative. Initial and final questionnaire responses were then compared. The use of a questionnaire allowed me to maximise the number of responses collected in a short space of time. The level of anonymity provided by a questionnaire was also desirable giving my students confidence to respond freely and honestly. Questionnaires also have the appeal of being easy and quick to analyse and they build a picture which can be expanded upon during interview (Wilkinson and Birmingham, 2003). I took steps to overcome the drawbacks of using a questionnaire as a data collection method. Being that I gave students plenty of time to complete them and I followed-up responses with interview. Questionnaires can limit the length and depth of responses to the questions and there was a time-consuming aspect to the development and piloting phase.

When designing the questionnaires, I consulted Cohan et al's Guide for Questionnaire Construction (Cohan et al 2011, p369). In particular, I carefully considered each question's relevance to the study, question ordering and wording choice. I used questions from the study by McGarr and Clifford (2013) as an initial base from which to develop the questions on and each question was written with consideration to the

research questions (see appendix). I also considered advice from Edwards et al (1999) and chose to use an 'attitude scale' for each question, using Edwards preferred format; the Likert scale. This meant that all questions consisted of statements which the students responded to by selecting whether they strongly disagreed, disagreed, were uncertain, agreed or strongly agreed. This form of data collection has the advantage of being simple and provides fairly reliable indicators of behaviour. However, one should be aware that responses can be influenced by the context in which the questions are presented. Therefore, I was highly conscious of context and potential influence when writing the questions. Wilkinson and Birmingham (2003) suggest that a mid-range option should not be used in a Likert question, to avoid 'questionnaire drift' and over use of this neutral and 'safe' option. However, I decided not to deny students this option in my questionnaire and instead I used the opportunity to flag misunderstood questions or highlight areas which may need further discussion in interview. The interview provided opportunity to investigate further if the option 'uncertain' was deemed to be used excessively. Additionally, I ensured that all questions were closed and kept short for ease of reading (Bell, 2005). The initial questionnaire consisted of 13 questions. The final questionnaire consisted of 13 questions. Questions were chosen carefully and each refers one of the research questions. For both questionnaires Q1-6 were intended to address RQ1 and Q7-13 were intended to address RQ2. See appendix for questionnaire questions.

I made sure that the questionnaires were easy for students to access through a link sent to their school email accounts. I reminded students (both verbally, and in writing on the questionnaire itself) that completion was not compulsory. To increase numbers of participants I designed a lesson in the school computer rooms to give students the opportunity to complete their questionnaires. This was the case for all of my participating classes for both initial and final questionnaires. Students were able to complete the questionnaire at any point during the lesson whilst working as normal. The freedom provided as to when they could complete the questionnaire meant that those who had chosen not to participate were disguised.

In total, the initial questionnaire was submitted to 43 Y8 and 20 Y12 students. 29 Y8 and 18 Y12 submitted responses. It provided me with a dataset which was easy to analyse for a large sample size. The final questionnaire was submitted to the same students again 29 Y8 and 18 Y12 students submitted responses.

3.6.2 The interview

Interviews can be beneficial to research as they allow for observation on a multisensory level and there is some room for spontaneity on the part of the interviewer (Edwards 2003). An interview allows one to hear the language and concerns of the participant. Cohan et al (2011) states that "the interview is not simply concerned with collecting data about life, it is part of life itself. Its human embeddedness is inescapable" (Cohan et al 2011 p409).

In this study, the aim of the interview was to gain more depth to the student's responses provided in the questionnaire. Therefore, it made sense to write the interview questions after a review of the initial questionnaire results and after some observation of the peer assessment initiative to ensure that they were completely relevant. However, as questionnaire responses were anonymous there was no way of making direct comparisons between interview and questionnaire responses for individual students and participants for interview were chosen randomly. Interview questions were designed to

allow for an unstructured and unprompted response from students. I aimed for the interview to flow like a conversation which I hoped would reveal true reflections. I followed Cohan et al's Guidelines for the Conduct of Interviews (Cohen et al, 2011, p425) when designing the interview questions. This meant that questions were carefully deliberated to ensure that they were not repetitive or leading and did not include participant attitudes or opinions. They were written in a clear format to reduce the chance of participate misinterpretation. Questions were of a fixed format where each participant was asked the same questions in the same order.

The aim of constructing the interview in this way was to restrict the possibility of interview bias creeping in (Cohen et al, 2011). I arranged for two of my Y12 students and two of my Y8 students to be interviewed. Additionally, I also interviewed two Y8 students for the class which is taught by my colleague. Meaning 6 students were interviewed in total (two from each class). Volunteers were selected randomly. Interviews were sound recorded and I assured students that the interviewer would be the only person to listen to the recordings which would then be destroyed after use. The interviews were conducted in pairs during lunchtimes and took between 5-10 minutes. I kept them short for convenience to students. Pairs were used partly due to time constraints and partly to make students feel at ease. This worked well as students were, in some cases, inclined to agree or disagree with each other's responses sparking a revealing discussion.

Despite the time-consuming nature of the interview process, I found it on a whole to be positive. However, there were some considerations. Walform (2001) and Walform (2005) reminds us that an interview is a social encounter not just a means of data collection. Therefore, true anonymity is difficult and students may struggle to articulate responses and reveal true feelings to their teachers. In an attempt to reduce these issues, I referred to Cohen's 'Attributes of Ethnographers as interviewers' (2001). This being that I ensured I had built a rapport with interviewed students, I displayed genuine interest in their response. I was conscious of the necessity to not influence interview responses hence I made every effort to avoid leading questions. However, I tried to keep the interview format as informal as possible allowing students to speak freely. Again, students were able to voluntarily opt in or out of the interview stage. As with the questionnaires, students were assured that everything they said would be kept anonymous.

3.7 Data analysis

I analysed the data shortly after the initial questionnaire results came in. I was then able to reflect on the planned research process with a colleague. This also allowed for the second round of data collection to be more informed. As a Likert scale style of questioning was used for the questionnaires I was able to allocate numbers to responses to make analysis easier. All questions consisted of statements which students responded to by selecting whether they strongly disagreed (1), disagreed (2), were uncertain (3), agreed (4) or strongly agreed (5) and numbers were assigned to each response as stated. The numbers were then used to make comparisons between responses for initial and final questionnaires and to summarise findings. For example, a mean value of the numbered responses could be calculated to get an average response to a particular question for all participants or for participants within a particular class. A higher mean value (closer to 5) indicates a more positive response (agreement). This made comparison between initial and final questionnaires easier and hence allowed for a clearer picture in order to assess impact. All percentages used are rounded to the nearest percentage point. Responses for questionnaires were anonymous so there were no

comparisons made between responses for initial and final questionnaires for a particular student. The student's class, however, could be identified. Interviews were audio recorded and notes were taken. Relevant and interesting responses are included in the findings section.

4. Findings

4.1 Questionnaires

The aim of the initial questionnaire was to gage the views of students as they stood before any peer assessment activity took place. My colleague and I discussed the results of the initial questionnaire before commencing any peer assessment initiative. Of the 63 pupils asked to complete the questionnaire 47 did so giving a response rate of 75%. The same 63 students were given the final questionnaire and there was a response rate of 75%. As all results from both questionnaires were collected anonymously we cannot assume that the same 47 students completed both questionnaires in all cases. However, as questionnaires were only administered to participants of the peer assessment initiative all results are considered relevant. The results of initial and final questionnaires along with the interview are summarised below. When referring to a question from the questionnaires in this section I have indicated which question I am referring to by stating its number in a bracket. For example (Q9I) is reference to question 9 from initial questionnaire and (Q9F) is reference to question 9 from final questionnaire. When discussing findings, I have separated questions from the questionnaires in to two groups depending on which research question they are intended to address. Questions 1-6 are intended to address RQ1 and Q7-13 are intended to address RQ2. However, it should be noted that students were presented with Q1-13 together and in order. As expected, from my observations of the process and the outcomes of the interviews, Y8 reported significantly more positively on their experience of peer assessment than Y12.

4.1.1 RQ1 Does peer assessment increase a student's feeling of autonomy in the classroom, including a shared responsibility for themselves and others?

Here I discuss the responses to the questions from the questionnaire which relate to RQ1. These questions are listed in figure 2 along with mean values of responses for both year groups. As stated earlier a higher mean value (5 being the highest) indicates a stronger agreement with the statement. All percentages are rounded to the nearest unit.

	Mean values			Mean values	
Initial questionnaire	UIV	VII	Final questionnaire	UIV	VII
Q1 I like to share my knowledge with others in class	3.59	3.83	Q1F Since engaging in peer assessment I am now more likely to offer help to others	3.30	3.00
Q2I I am aware of the progress and achievements of others in my class	3.03	2.94	Q2F Since engaging in peer assessment I now have more awareness of the progress of others in my class	3.21	3.11
Q3I Seeing examples of other students' work is helpful for my own progress	2.90	3.17	Q3F Seeing examples of other student's work during peer assessment was useful for my own progress	3.31	3.28
Q4I I often communicate with others in my class regarding my work (not just my close friends)	3.34	3.61	Q4F Since engaging in peer assessment I feel that the class communicates more as a whole and is more collaborative	3.52	2.61
Q5I I often engage in discussion with peers on how we can both improve our work	2.93	3.17	Q5F Since engaging in peer assessment I feel less reliant on the teacher for feedback	3.52	3.28
Q6I feel in competition with my peers regarding my school work and grades	2.97	3.89	Q6F Since engaging in peer assessment I feel I have more responsibilty and control in the classroom	3.38	2.67

Figure 2 A table to show a comparison of mean value responses to questionnaires for both Y8 and Y12 – these questions were considered to address RQ1 and comparable questions are aligned.

Firstly, the initial questionnaires showed that the majority of students in both year groups like to share their knowledge with others in their class (Q1I). 62% of Y8 and 78% of Y12 participants responded either by agreeing or strongly agreeing with the statement. I viewed this as signifying a positive start to the investigation as the student's willingness to communicate in this way may enable discussions during peer assessment.

Both year groups shared a similar view of (Q2I) with 34% of Y8 agreeing that they are aware of the progress and achievements of others in their class. 33% agreed with the statement in Y12. I did not consider this number to be particularly high indicating that there was work to be done here. From the remaining 67% of Y8 participants a significant number (38%) answered 'uncertain' to this question. I would argue that a response of 'uncertain' here is an indicator that the student does not have a good understanding of their peers' progress. When compared with results from the final questionnaire this revealed that 52% of Y8 participants agreed that their awareness of the progress of others has increased since participating in the peer assessment activity (Q2F) and 31% disagreed. This is compared with the 44% of Y12 participants who agreed and 44% who disagreed. Although this result does not appear to be strikingly positive I noted that mean values have in fact increased for both year groups when compared with results obtained from the comparative question (Q2I) asked in the initial questionnaire (see figure 2).

Results to (Q4I) and (Q5I) of the initial questionnaire were interesting with responses not aligning as I would have expected. Of the 62% of Y8 students who had agreed (or strongly agreed) that they often communicate with peers regarding their work (Q4I), five disagreed that they often engage in discussion with one another on how work can be improved (Q5I). From the 72% of Y12 who agreed with Q4I, three also disagreed that they often engage in discussion with one another on how work can be improved (Q5I). This indicates that, before the initiative, when discussions regarding classwork were taking place amongst peers they did not always lead to a conclusion of how progress and improvement could be made. In particular as was the case for younger students. It appears that at this initial stage there was scope then for such conversations to be more productive. When asked in the final questionnaire if peer assessment had made them more likely to offer help to others (Q1F) the result was slightly more positive for Y8 with 52% agreeing with the statement compared to 44% of Y12 participants who agreed with the statement.

In the interview (which is discussed in more detail below) both Y12 respondents revealed that they would be more likely to help out others as a result of peer assessment because doing so is a natural outcome of the process. Three out of four of the Y8 participants also responding positively to this question in interview. When this result is combined with the result obtained in the final questionnaire (as discussed above) it is difficult to come to any definite conclusions on whether this year group experienced an increased inclination to work collaboratively here and help each other out. It appears to have been the case for some but not for others.

These results may be explained somewhat by Y12's feelings of competition with their peers as was revealed in the initial questionnaire. Surprisingly there was found to be an overwhelming difference in response to the question 'I feel in competition with my peers regarding my school work and grades' (Q6I) between both year groups. In Y12 67% of participants stated that they do feel in competition and 0.06% stating that they do not. The response from Y8 was less substantial with 45% of Y8 stating that they do feel in

competition and 38% stating that they do not. It appears that there is an age specific impact here, possibly due to Y12 experiencing growing pressures of competing for university places and looming public examinations.

Both groups were more likely to agree in their response to (Q3I) with 41% of Y8 and 50% of Y12 stating that seeing examples of other student's work is helpful for their own progress. This view seems to have been maintained as the final questionnaire revealed that 62% of Y8 participants agreed and 28% disagreed that seeing examples of their peers' work is helpful for their own progress (Q3F). 56% of Y12 participants also agreed and 28% disagreed. In fact, these results are more positive than those produced by the initial questionnaire for both Y8 and Y12 (Q3I). The mean for Y8 and Y12 being 2.9 and 3.17 respectively for Q3I of the initial questionnaires and 3.31 and 3.28 for Q3F of the final questionnaires. Hence peer assessment appears to have had a small but positive effect here.

The final questionnaire also revealed that both Y8 and Y12 reported that peer assessment had reduced their reliance on the teacher (Q5F). 62% of Y8 and 56% of Y12 either agreed or strongly agreed with the statement. A positive result for peer assessment. Finally, there was also a positive response from Y8 in the final questionnaire for Q6F with 59% stating that peer assessment increases their feelings of responsibility and control in the classroom compared with only 28% from Y12. The picture was similar regarding classroom communication and collaboration (Q4F) with 66% of Y8 agreeing that peer assessment had a positive effect here along with 33% of agreeing Y12 participants.

In response to RQ1 peer assessment does seem to have had some effect on Y8's feelings of autonomy and responsibility for the progress of others. Students in Y8 indicated somewhat that they now have a greater awareness of the progress of others, they are more likely to help others, they have less reliance on the teacher and they experience greater classroom collaboration and feelings of autonomy. For Y12 however the picture is less clear and they report fewer positive outcomes. These results are discussed in more detail in the discussion section.

4.1.2 RQ2 To what extent does the introduction of regular peer assessment encourage students to feel comfortable with discussing their areas of weakness with one another?

	Mean values			Mean values	
Initial questionnaire	UIV	VII	Final questionnaire	UIV	VII
Q7I I do not like others in class to know if I am finding a topic difficult	3.38	3.50	Q7F Since engaging in peer assessment I am now more likely to ask others for help if I am stuck	3.31	2.67
Q8I I try to avoid making mistakes in front of classmates	4.10	3.83	Q8F Since engaging in peer assessment I worry less about making mistakes in front of classmates	2.62	2.44
Q9I I feel just as comfortable with having my work marked by my peers as by my teacher	3.24	2.28	Q9F I feel just as comfortable with having my work marked by my peers as by my teacher	3.52	2.61
Q10I I do not feel comfortable with others knowing my grades or level of progress	3.14	3.33	Q10F Since engaging in peer assessment I feel more comfortable with others knowing my grades or level of progress	3.14	2.50
Q11I I feel comfortable with handing my work to my peers for correcting and comments	3.38	2.72	Q11F Since engaging in peer assessment I now feel more comfortable with handing my work to my peers for correcting and comments	3.59	3.11
Q12I I believe I can learn something from marking my classmates' work	3.45	2.39	Q12F I believe I can learn something from marking my peers work	3.62	2.56
Q13I If I was to mark my classmates' work I would feel uncomfortable giving criticism	2.76	3.61			
			Q13F I would like to continue engaging in regular peer assessment	3.38	2.28

Figure 3 A table to show a comparison of mean value responses to questionnaires for both Y8 and Y12 – these questions were considered to address RQ2 and comparable questions are aligned.

Here I discuss the responses to the questions from the questionnaire which relate to RQ2. These questions are listed in figure 3 along with mean values of responses for both year groups.

In summary, these questions gave me the impression that students feel more comfortable keeping details of their mathematical struggle to themselves. This result was expected given my previous observation of the students. For example, there was clear agreement amongst participants for the question in the initial questionnaire 'I try to avoid making mistakes in front of classmates (Q8I) with only 10% of students in Y8 and 17% of students in Y12 disagreeing with this statement (three students from each year group).

The majority of students also agreed with (Q7I). With 59% of Y8 and 50% of Y12 not feeling comfortable with others knowing if they are finding a topic difficult. This finding supports the view that there is a stigma within the class around making mistakes or needing further clarification at the outset of the initiative and these results come as expected. When asked in the final questionnaire if since engaging in peer assessment they are now more likely to ask others for help (Q7F) only 33% of Y12 participants agreed with 59% of Y8 agreeing. An analysis of comparative questions from the final questionnaires shows that peer assessment is not overly effective in encouraging students to feel comfortable with discussing their areas of weakness with one another (RQ2). However, the common theme remains in that younger pupils responded more positively to the initiative than Y12. A notable 72% of Y12 participants stated that peer assessment had not increased their confidence when it comes to making mistakes in front of peers (Q8F), compared with 55% of Y8 participants who also felt this way.

Q10F from the final questionnaire produced similar results with 61% of Y12 and 41% of Y8 disagreeing (or strongly disagreeing) that the initiative had made them feel more comfortable with others knowing their grades or level of progress. However, this result should be considered with the response to Q11F where Y8 participants report that since engaging in peer assessment they feel **more** comfortable handing their work to their peers for corrections and comments (Q11F) with 28% disagreeing and 66% agreeing with this statement. Compared with 39% of Y12 participants disagreeing and 50% agreeing. This shows a positive improvement for Y8 participants but not for Y12 when compared with responses collected in the initial questionnaires. Initial questionnaires indicated that a significant number of students were somewhat nervous about having their work critiqued by peers. 38% of Y8 students and 44% of Y12 students disagreed that they would feel comfortable handing their work to a peer for assessment (Q11I).

45% of Y8 and only 11% of Y12 agreed that they would feel just as comfortable handing their work to a peer for assessment as to a teacher (Q9I). There is some initial scepticism here of the value of peer assessment over teacher assessment. This appears to be even more true for older students. For the comparable question in the final questionnaire there was still a strong response from Y12 in favour of handing their work to their teacher for correction over their peers. There was however some noticeable improvement for Y8 here in light of the peer assessment. 59% of Y8 agreed that they feel just as comfortable handing their work to peers rather than a teacher (Q9F) compared to 17% of Y12 participants who agreed. This is a positive difference of only 1 student for Y12 when compared with the initial questionnaire. Comparable means for Y8 are 3.24 (initial questionnaire) and 3.52 (final questionnaire).

As expected a significant number of students, 38% for Y8 and 61% of Y12, stated that they would feel uncomfortable providing critique of a peers' work (Q13I), a finding fitting with the literature as described above (Abson, 1994).

24% of Y8 students and 50% of Y12 students disagreed that there is something to be learnt from assessing a peers' work (Q12I). These figures imply that peer assessment is to be viewed in a negative light by some and this was expected given my observation that there are some students who are not inclined to view mistakes as a learning process but rather as a weakness. I noted at this point that there would be some who would approach the peer assessment tasks with apprehension or pessimism so again discussion time was important. When comparing the result with a comparative question in the final questionnaire (Q12F) it appears that Y8 participants found the experience of peer assessment more rewarding than Y12. 66% of Y8 participants stated there is something to be learnt from marking a peers' work and 21% disagreed. This is compared with 33% of Y12 participants who agreed and 50% who disagreed. This result comes at a slight increase from positive responses presented by both year groups in the initial questionnaires (Q12I). Although there is some indication that peer assessment has had a positive effect here the improvement is small but significant as we can see from the mean values of 3.45 (Y8) and 2.39 (Y12) for the initial questionnaire (Q12I) and 3.62 (Y8) and 2.56 (Y12) for the final questionnaire (Q12F).

Finally, 62% of Y8 participants stated that they would like to continue to assess their peers work (Q13F) and 28% disagreed. Only 4 participants from Y12 (22%) stated that they would like to continue to peer assess and 12 (67%) stated that they wouldn't. Again, we can see that attitudes towards peer assessment differ significantly between students in Y8 and Y12.

In response to research question 2 the final questionnaire results do not appear to indicate significantly that the introduction of regular peer assessment encourages students to feel comfortable with discussing their areas of weakness with one another. This appears to be particularly true for Y12 participants. It appears that there is no conclusive evidence to agree with RQ2 and claim that the introduction of regular peer assessment encourages students to feel comfortable with discussing their areas of weakness with one another. However, Y8 do report more positive benefits than Y12. Two students in Y8 described peer assessment as 'fun' in interview whilst the majority reported in questionnaires that there is something to be learnt from the process and that they would like it to continue. Results are discussed further in the following sections.

4.2 My observations

I kept an observation diary throughout the process. Within this observation diary recorded anything which I viewed to be significant for my study, mostly observations worthy of note arose from class discussions. My most significant observations are summarised as follows:

- Y12 students doubt their own ability to peer assess accurately resulting in significant doubt about the reliability of the task
- Y12 students feel that assessment is the role of the teacher and fail to see the benefit of their own participation.
- Despite leading discussions regarding the relevance and benefits of peer assessment, the motivation in the Y12 group seemed to be fairly low throughout

- Some Y8 students view their bonds between each other such as popularity, dominance and threat of ridicule as more important than fully engaging with the task.
- With both year groups, it was noted that as students are not experts, their confidence when delivering feedback was low. However, I did notice a general increase in confidence over time as the initiative progressed.
- Y12 students were observed to communicate with one another more readily than is the norm in a typical lesson. This appeared to be sparked by the requirement to providing feedback to their peers
- Y8 students became more and more active in the learning process as the initiative progressed, they listened to one another's feedback and became less reliant on the teacher
- The participating colleague reported observing the following positive outcomes for Y8 pupils in her class: Their levels of communication regarding academic progress increased as did their exposure of one another's work and they expressed enjoyment at being given extra responsibility.

4.3 Interviews

The aim of the interviews was to reveal as much as possible of the student's true reflections of the peer assessment initiative. Therefore, although questions were fixed I tried to keep the style conversational and asked additional questions where I felt intrigued by a student's response. In the analysis which follows I have included quotes which I found interesting and relevant to the discussion.

Interviewees are coded as follows: Y12 participants 1 and 2 as Y12-1 and Y12-2. Y8 participants 1-4 as Y8-1, Y8-2, Y8-3, Y8-4. Y12-1 and Y12-2 were interviewed together as were Y8-1 and Y8-2, then Y8-3 and Y8-4.

I started with a conversation opener asking students how they had felt the introduction of peer assessment was working out for them. Responses varied but the majority were passive or positive at this stage. More was revealed by the specific questions which followed. Questions were set up to gauge student views on how peer assessment had changed their confidence or behaviours in some way. Questions 2-6 were designed to specifically address RQ1 where 7-10 specifically address RQ2.

4.3.1 RQ1 Does peer assessment increase a student's feelings of autonomy in the classroom, including a shared sense of responsibility for themselves and others?

I asked the question 'Since the introduction of regular peer assessment do you now feel more willing to ask others for help if you get stuck'. Here Y8 responded more positively than Y12 who stated that peer assessment had no impact here.

Y12-2 *"I don't think so because I would ask my friend anyway if I was stuck and I don't think the peer assessment has changed that. I would still be more likely to ask my friend than whoever was marking my work"*

However, in response to (Q3) both year groups reported feeling more empowered to help out others if they knew they were stuck.

Y12-1 *"actually I suppose I have been helping more people since I have been marking their work…. because we all just seem to talk about it more"*
Y12-2 *"yes, because it makes you more aware if someone is stuck and you can help each other"*

Three out of four Y8 students agreed

Y8-2 *"I liked helping other people, I used to just help my friends but now I am marking someone else's work I like being able to help them also"*

Students were then asked if they feel less reliant on the teacher since undertaking regular peer assessment (Q4) and both year groups responded reasonably favourably. However, it was noted that both year groups would prefer to ask a classmate for help over a teacher in the first instance as possibly this is the easiest and most comfortable option.

Y12-1*"It is just easier to ask my neighbour, they are right next to me… I would still ask the teacher if we both got really stuck though"*

Y8-2 *"Erm..I think it has stopped me asking for help as much yes"*
Y8-3 *"….my friends and I like to help each other and it is good to try and work things out for yourself before you ask a teacher"*
Y8-4 *"Yeah you would only ask a teacher if you get really really stuck because you should try and work it out for yourself first"*

Students did report that peer assessment had encouraged them to communicate more as a whole (Q5) arguing that this is a pre-requisite of giving feedback

Y12-2 *"I suppose it [peer assessment] has made me discuss the work with people in my class who I would not naturally discuss work with as I would usually discuss my work with my friends who I sit next to….but I think that will not continue when the peer assessment stops"*
Y12-2 *"I think you just end up having a few more conversations about your work with each other because you have to pass on the feedback"*

Y8-1 *"I thought it was good having a go at giving feedback to people who are not my normal friends"*
Y8-2 *"Yeah it makes you feel like the teacher!"*

4.3.2. RQ2 *To what extent does the introduction of regular peer assessment encourage students to feel comfortable with discussing their areas of weakness with one another?*

In an attempt to investigate RQ2 I began by asking interview participants questions about the links between peer assessment and their confidence with sharing mistakes and exposing work to peer critique (Q6) and (Q7). Y8 participants reported more positive experiences than Y12 in both instances. Y12 participants claimed that the experience of peer assessment had not changed their confidence levels and they still felt uncomfortable sharing their work with others for marking. Three out of four Y8 participants reported otherwise.

Y12-1 *"I will never feel comfortable showing other people my work, unless they are my friends, because I don't want others to judge me or think I am not doing well."*
Y12-2 *"Yes I agree and sometimes though I don't even want my friends to know my mark if I get a bad grade…. I feel fine if I don't always get high marks but I if I am the worst in the class at something I would not want the rest of the class to know"*

Y8-3 *"I don't really mind if others mark my work. You just get used to it."*
Y8-4 *"I think it is good if others in my class know I am stuck because then they can help me…. and the other day I helped someone and now we can work together more"*
Y8-3 *"Yeah but if you are the only one who does not understand I would not want other people to know"*

Students were then asked to talk about any benefits (Q8) and drawbacks (Q9) that they experienced from engaging in the peer assessment initiative. Both year groups did report the positive effects of having work marked more regularly, however Y12 were less convinced that this was a benefit of peer assessment in particular as this benefit could also be achieved through self-assessment in their opinion.

Y12-2 *"I liked having my work marked quickly as I could address any issues straight away, it is helpful to get feedback straight away… but I would prefer to just mark it myself actually as I can follow my own working better than someone else. I don't see the benefit of having someone else who is not a teacher mark it over marking it myself"*

Y8-4 *"I liked that you got the answers straight away so you always knew how you were doing"*

Both age groups also reported the benefit of being able to see examples of other students work. And they enjoyed the experience of being able to offer feedback to one another and help each other out.

Y8-1 *"Positives are I thought it was fun marking someone's work and explaining it to them and also I liked that I could see other people's work in the class"*
Y8-2 *"Yes it helps me so much when I can see examples of other people's work and see how everyone is doing"*

When it came to drawbacks Y12 were more vocal reporting their irritation at spending time at home correcting someone else's work rather than their own.

12-1 *"I am quite busy with homework and I would rather spend the time focusing on areas where I need to improve rather than marking someone's work"*
12-2 *"Yeah because if I don't understand how to do something, marking someone's work will not help me"*

There were also some comments on the accuracy of a peers marking

12-2 *"There is a risk that the person marking your work does not know the answer or does not know the most useful feedback to give"*

Y8 did not relate to the same issues as Y12 and instead reported more logistical drawbacks

Y8-4 *"When their work was messy I found it hard to mark it"*
Y8-3 *"If they had forgotten their work or book that day you didn't have any homework to mark so it wasn't really fair"*

Finally, when asked if they would recommend that the peer assessment initiative continues, again Y8 responded more favourably than Y12.

Y12-2 *"I think it can be good in some ways but I still would prefer the teacher to mark the work, I don't feel I have learnt very much from it"*
12-2 *"I would prefer a teacher to mark my work as I can get very useful feedback that I know is definitely correct"*

Y8-3 *"I would quite like to keep doing it. I think it is fun"*
Y8-1 *"I still don't like other people to see my work but I don't mind marking theirs. I do like that my work is marked straight away"*
Y8-2 *"I quite like it because you can help other people"*

5. Discussion

5.1 RQ1 Does peer assessment increase a student's feelings of autonomy in the classroom, including a shared sense of responsibility for themselves and others?

5.1.1 Feelings of autonomy

Responses from questionnaires and interview indicate that Y12 do not feel that their classroom has become more collaborative as a result of peer assessment. However, I would argue from my own observations that these students did, as a whole, communicate more often and there was notably more outward discussion around work. The increase in discussion was, in fact, picked up on by Y12 in interview but they believed that this was temporary and did not go on to describe their classroom as becoming more collaborative specifically. Results were more positive for Y8 with an increase in levels of collaboration being observed and reported. Questionnaires revealed that peer assessment had some impact on student's awareness of the progress and achievements of their peers. With mean results increasing for both year groups after engaging with the initiative. This result is expected as students naturally become more aware of the performance of others through increased exposure to their work.

It was interesting to discover that some students do not feel confident asking the teacher for help. Comments in interview suggest that some students view this as a last resort after trying to work things out for themselves and after speaking to a friend. This may be due to the student's tendency to avoid the stigma of being the one to ask for help in front of others or it may be due to them having been given praise in the past for working things out themselves. It may also be the case that this result is exclusive to a high achieving environment like that of this participating school but that is beyond the realms of this study. Some students reported that peer assessment reduced their reliance on the teacher even further. As they became more familiar with receiving feedback from those around them and using peers as a learning resource. I believe that this finding indicates increased feelings of autonomy were achieved on some level as students reported becoming more independent. A finding which is in line with Pope (2001) who states that peer assessment gives students a sense of ownership and independence. However, it

should be noted that this impact was mostly felt by Y8 and not reported as particularly significant for Y12.

As stated previously it seemed that Y12 struggled to identify any significant benefit of peer assessment. They valued teacher feedback and kept their cards close to their chest when it came to sharing their work with the wider group. Possibly their competitive edge as identified by the initial questionnaires is having an impact here. The picture is largely different for the younger students. Y8 found the experience mostly positive and reported increased levels of communication in interview. In general, they seized the responsibility of peer assessment with enthusiasm. These students appeared to enjoy working with those who they would not normally and experienced increased feelings of empowerment. From my observation of Y8 I started to see what could be described as the foundations of a constructivist classroom emerge (Gueldenzoph & May, 2002). They appeared to be becoming more and more active in the learning process, listening to one another's feedback and becoming less reliant on the teacher, all were observed to participate fully.

5.1.2 Responsibility for helping others

Ames (1988) states that students like to feel involved and this view is fitting with the findings of my study. Results indicated that students from both year groups like, to some extent, to share their knowledge with others in their class and in particular, younger students enjoyed the added responsibility that came with engaging in peer assessment. After the study Y8 students reported an increased willingness to communicate more as a whole through a heightened sense of empowerment to offer help to others. A result which is fitting with the findings from Callahan (2007) who state that student interactions increased as a result of peer assessment. Y12 on the other hand did not report a significantly positive result in the final questionnaire but did confirm in interview becoming more 'aware' if someone else needed help.

The literature finds that peer assessment can increase feelings of responsibility for the progress of others and increase levels of group cohesion (Yurdabakan, 2010, Gettinger and Seibert, 2008, Topping, 1998). In my study, peer assessment was found to do just this but for younger students only. Y8 reported being more likely to offer help to others if needed responding positively in both questionnaire and interview. In interview Y8 went on to talk of their enjoyment of the increased responsibility which comes from providing feedback to others and they appeared to be experiencing greater empathy for one another.

The impact was lesser for Y12 according to questionnaire results, however interestingly, both Y12 respondents contradicted these results in interview claiming that helping others is a prerequisite of peer assessment. They talked of an increase in conversation coming about as a result of peer assessment and the structure it provides being necessary for such level of conversation to continue. I contemplate whether this result does in fact show that peer assessment has lead these students to acquire the good habit of readily volunteering to help others. Or is this increased inclination to help others simply an unavoidable prerequisite of peer assessment which will be abandoned when the initiative is relaxed? I would argue that peer assessment will need to be maintained in order to have a lasting effect on collaboration for Y12. As considered above there may be a case of bad timing here as Y12's looming examinations add to their eagerness to get on

with their own learning. This may distract from their willingness to engage in collaborative experimentation. In this particular school students do put pressure on themselves to achieve highly and take their studies particularly seriously in the sixth form. It is difficult to come to any definite conclusions on whether Y12 experienced any lasting disposition to work collaboratively here and help each other out. It appears to have been the case for some but not for others. I would however state that Y8 did enjoy greater levels of collaboration during the initiative.

Therefore, I conclude from my observations and from an analysis of the literature that the response to research question 1 is different for both groups. Feelings of autonomy and a shared sense of responsibility for the progress of themselves and others is evidence amongst the younger year group only. Also, importantly, such benefits are recognised by the younger students to the extent that they can communicate them in interview. Y12 fail to recognise or report any benefit of peer assessment for a collaborative classroom. These findings are not fitting with findings from the literature review where studies on older students of college and university level, reported increased levels of classroom interaction and group cohesion (Gueldenzoph & May, 2002, Callahan, 2007).

5.2 *RQ2 To what extent does the introduction of regular peer assessment encourage students to feel comfortable with discussing their areas of weakness with one another?*

There was a consistent theme running throughout this investigation being that students do not feel completely comfortable with sharing their work with one another or exposing their mistakes and weaknesses. A stigma around making mistakes and needing further clarification is apparent. With most the feeling is so intrinsic the peer assessment was found to have little impact. Again, this is most significantly the case for older pupils and there were some positive benefits being noted by younger pupils. Y8, for example, reported that peer assessment had made them feel more comfortable with handing their work to one another for assessment. Possibly due to, as one student described in interview, becoming more used to doing so. The lack of impact on Y12 could be due to the highly competitive environment in which the participants of the study experience at school, with Y12 having had the longest experience of such an environment. However, this is my own hypothesis based on my experiences of working at the school. It would be interesting to investigate whether outcomes are the same in different school environments.

Findings suggest that students fail to recognise the value of peer assessment when compared to teacher assessment. With students stating that they do not feel as comfortable having work marked by peers as by their teachers. This finding was mostly true for Y12 in the initial questionnaire and improved only slightly for the younger year group after they had experienced peer assessment. This finding is predicted by Cole (1991) who states that the authoritative nature of teacher feedback means that it comes with more respect from students. A comment from Y12 in interview confirmed that some feel that the benefits of peer assessment are diluted by the secondary marking skills of peers compared to that of the teacher. This result may also be a consequence of the student's anxiety of exposing academic weakness to one another as highlighted earlier. Both year groups stated conclusively that peer assessment had not resulted in them worrying less about making mistakes in front of peers despite becoming more used to having their work marked by them. Again, the stigma with making mistakes applies. I

conclude that the timescale of this study is likely to be too short for any real impact on these already deeply embedded beliefs and attitudes.

A notable outcome of peer assessment stated in the literature is the timely nature of the feedback provided, timely feedback being of great benefit to outcomes (Forbes & Spence, 1991). Interestingly both year groups also reported in interview benefits of timely feedback as a result of peer assessment. Y12 however commented that self-assessment could come with greater or equal benefits. Here I might agree with Y12 in the context of a high achieving environment. I would suspect that the most conscientious students would spend time marking their own work accurately without misuse of a mark scheme. However, it is argued in the literature that even highly able students such as those involved in the study can fail to be as perceptive when it comes to self-assessment compared with peer assessment. Kwun (1993) and Stefani (1994) find that the most able students do not produce particularly reliable self-assessments and can tend to be overly self-critical. Indicating that peer assessment may have the upper hand for a high achieving environment after all.

Interestingly, as stated above, peer assessment was found to have increased the student's likelihood to offer help to others if needed but had not significantly increased their likelihood to ask others for help. This result was particularly true for Y12 who stated that, despite the peer assessment initiative, their inclination to ask others for help still remains with friends and close neighbours only. This area was then explored further in interview. Y12 students indicated that if they feel comfortable enough to ask one another for help they will do so regardless of a peer assessment. Peer assessment has had little impact here. The discomfort experienced by both year groups with asking others for help resonates with themes from the literature. Hanrahan & Isaacs (2001) is but one example of another study where students felt uncomfortable having peers read their work. However, it could be argued that some level of discomfort may be worth greater benefits as there is learning potential in reviewing work produced by others (Hanrahan & Isaacs, 2001). This was found to be the case in my study as mean values increase from initial to final questionnaire for both year groups in response to the question 'seeing examples of other student's work is helpful for my own progress'.

In response to research question two I conclude that the introduction of regular peer assessment had little significant impact on encouraging students to feel comfortable with discussing their areas of weakness with one another. A finding contradicted by Callahan (2007). However, as stated above the timescale for this study is rather short. There may be some potential for greater positive outcomes given an exposure to regular and structured peer assessment over a longer time period. As Y8 were found to be more readily discussing positive benefits as a result of the study I would hypothesis that peer assessment could have the most positive impact if introduced with younger, rather than older students.

5.3 Conclusions

Overall Y8 students appear to have benefited more than Y12 from the peer assessment initiative. They reported it to have been 'fun', they enjoyed the responsibility of marking peers work, it encouraged them to be more collaborative and in some cases reduced their anxieties around asking others for help. They indicated that they would like to continue to engage in some form of peer assessment moving forward and recognized the benefits of doing so. Y12 did not report experiencing such benefits, overall, they viewed

the experience in a rather negative light and stated that they would not like it to continue. They did not feel that there was anything to be learnt from marking their peers work and they stated that they continued to feel uncomfortable exposing their work to peers for marking. Y12's motivation to engage in the peer assessment was low. Low motivation to engage is a consequence, as Friedman (2008) states, of failing to recognise the benefit in the task and a lack of belief that positive results can be achieved. Possibly Y12, being older, are more 'set in their ways' and less easy to influence. They have been in the school system longer, they are feeling the pressure of looming public examinations and the competitiveness of the wider working world. Or possibly, as Chen & Lou (2004) and Friedman et al (2010) suggest, greater motivation can be encouraged by the teacher through a more convincing demonstration of how valuable the feedback provided by peer assessor will be for the assessee over time.

Y8, on the other hand, are younger and as it seems, more willing to give things a go. Possibly the experience of being given extra classroom responsibility is seen as a novelty, they get to play teacher. Relating back to the findings of Chen & Lou (2004) and Friedman et al (2010) it is possible that, for Y8, the motivation to engage in peer assessment does not rely on a need to recognise direct benefits for their own progress to the same extent that is does for Y12. Again, this might be due to Y8 experiencing less academic pressure at this time in their school careers.

In response to research question one peer assessment does seem to have had some effect on Y8's feelings of autonomy and responsibility for the progress of others. Students in Y8 indicated somewhat that they now have a greater awareness of the progress of others, they are more likely to help others, they have less reliance on the teacher and they experience greater classroom collaboration and feelings of autonomy. For Y12 however the picture is less clear and they report fewer positive outcomes.

Regarding research question two it appears that there is not enough evidence to claim that the introduction of regular peer assessment encourages students to feel comfortable with discussing their areas of weakness with one another. However, Y8 do report more positive benefits than Y12 as discussed earlier.

The aim of this study was to address the stigma of failure amongst my students by building a collaborative classroom which supports the development of confidence and trust for one another. Overall, I believe that the timescale of the study was not long enough in order for one to claim conclusively that the use of peer assessment resulted in a more collaborative learning environment for the students. Students did indeed claim benefit from greater exposure to one another's work and this, in many cases, encouraged a richer communication between them. However, the level of impact was highly variable between individual students and between year groups. In general students were not found to have experienced an increasing willingness to ask for help in front of others, make public mistakes or take risks. Hence, I am not convinced that the stigma of failure was sufficiently addressed. Despite this conclusion the findings did demonstrate many benefits for students as discussed and I believe that peer assessment shows potential as a positive learning tool in the classroom.

Although I am now more mindful of the level of discomfort students feel when it comes to presenting their work to others for critique I view this as an incentive to encourage further engagement with peer assessment rather deter from it. As our work is continuously assessed throughout our lives students will need to be able to sit

comfortably with failure and peer critique. Therefore, with the view to normalise mistakes and encourage students to see each other as learning resources rather than as competitors I do intend to introduce peer assessment to my students in the lower school (key stage 3) next academic year. As will my colleague who collaborated with me on this initiative. We will both continue to monitor and reflect on outcomes.

5.4 Summary of learning resulting from this investigation, implications and further work:

Next academic year I will continue to reflect on the learning from this investigation. Below I have summarised some main areas for consideration and some actions to be taken:

- I will continue to use peer assessment as a resource in my classroom. Peer assessment will be used with key stage 3 only for the time being as findings indicate that students are more likely to engage if introduced at a younger age.
- Likewise, the colleague who was involved in this initiative throughout will be continuing to use peer assessment in the classroom next academic year as she observed richer levels of communication between her students.
- To allow for maximum benefit I will ensure that peer assessment tasks are continued over a significant time frame (at least one year) and become a routine part of life in the classroom. The intention is to achieve benefits discussed in the literature which were beyond the scope of this study due to time constraints.
- To ensure that students are motivated to engage fully with any peer assessment task they need to be convinced that the task is worth their time and effort (Divaharan, S. Lourdusamy, A, 2003). Hence, I will reconsider how I communicate to students the potential benefits of peer assessment as described in the literature to ensure a better outcome here.
- Additionally, I will demonstrate to students how the feedback that they produce will be used and its value (Hanrahan & Isaacs, 2001). With a longer time-frame I will be able to consider how the peer assessment marks can be included in my own mark book with the aim of increasing accountability and hence motivation for peer assessors.
- I now have a better understanding of the level of discomfort students feel when it comes to presenting their work to others for critique. Therefore, I will ensure that students are given space to discuss their concerns with the teacher and one another in the classroom (Lan Li, 2017).
- Taking note of learning from the literature review and my own findings I will ensure that peer assessment should be used in addition to (not in replace of) traditional teacher assessment.
- I will present my findings to other departments in the school through our teaching and learning meetings and discuss the ways in which these findings could be useful for colleagues.
- I note that this initiative was completed in a highly academic environment and I will be mindful that findings may not necessarily relate elsewhere

This study came about as a result of my recognition that high achieving students such as those in my classroom had developed reluctance to make mistakes or ask for further clarification in front of others. Although the use of peer assessment did not fully address my aim of reducing the stigma of failure amongst my students by building a collaborative classroom, there were some significant benefits noted as discussed. Therefore, I concluded that the maintenance of regular peer assessment over a longer time frame has

the potential to further address my initial aims and the learning from this investigation is highly valuable for my continued work in this area.

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7. Appendix

7.1 Research Questions

1. *Does peer assessment increase a student's feeling of autonomy in the classroom, including a shared responsibility for themselves and others.*

2. *To what extent does the introduction of regular peer assessment encourage students to feel comfortable with discussing their areas of weakness with one another?*

7.2 Questionnaire and interview questions

Initial Questionnaire

How far do you agree with the following statements? Participants will choose from the following responses for each question: *strongly agree, agree, uncertain, disagree, strongly disagree*.

Questions adapted from
McGarr, O. Clifford, A, M. (2013) *Just enough to make you take it seriously': exploring students' attitudes towards peer assessment.* 65 (6), 677-693

Relating to RQ1

1. I like to share my knowledge with others in class
2. I am aware of the progress and achievements of others in my class
3. Seeing examples of other students' work is helpful for my own progress
4. I often communicate with others in my class regarding my work (not just my close friends)
5. I often engage in discussion with peers on how we can both improve our work
6. I feel in competition with my peers regarding my school work and grades

Relating to RQ2

7. I do not like others in class to know if I am finding a topic difficult
8. I try to avoid making mistakes in front of classmates
9. I feel just as comfortable with having my work marked by my peers as by my teacher
10. I do not feel comfortable when others know my grades or level of progress
11. I feel comfortable with handing my work to my peers for correcting and comments.
12. I believe I can learn something from marking my classmates' work
13. If I was to mark my classmates' work I would feel uncomfortable with giving criticism

Interview Questions

1. *How do you feel the peer assessment initiative has been working out for you? (opening question)*

Relating to RQ1

Since the introduction of regular peer assessment do you…

2. *Feel more willing to ask others for help if stuck*
3. *Feel more empowered to offer help to others in the class?*
4. Feel less reliant on the teacher for feedback

5. Feel that the class communicates more as a whole and is more collaborative

Relating to RQ2

6. *How did you feel about sharing your work with others in your class? How do you feel now?*
7. *How did you feel about others in the class knowing that you are finding a topic difficult? Has this feeling changed since engaging in regular peer assessment?*
8. *What are the benefits you have experienced of engaging in peer assessment on a regular basis?*
9. *What are the drawbacks/is there anything you disliked about the process?*
10. *Would you recommend that the peer assessment initiative continues?*

Final questionnaire questions

Relating to RQ1

1. Since engaging in peer assessment I am more likely to offer help to others
2. Since engaging in peer assessment I now have more awareness of the progress of others in my class
3. Seeing examples of other student's work during peer assessment was useful for my own progress
4. Since engaging in peer assessment I feel that the class communicates more as a whole and is more collaborative.
5. Since engaging in peer assessment I feel less reliant on the teacher for feedback
6. Since engaging in peer assessment I feel I have more responsibility and control in the classroom

Relating to RQ2

7. Since engaging in peer assessment I am now more likely to ask others for help if I am stuck
8. Since engaging in peer assessment I worry less about making mistakes in front of classmates
9. I feel just as comfortable with having my work marked by my peers as by my teacher
10. Since engaging in peer assessment I feel more comfortable with others knowing my grades of level of progress
11. Since engaging in peer assessment I now feel more comfortable with handing my work to my peers for correcting and comments.
12. I believe I can learn something from marking my peers work
13. I would like to continue engaging in regular peer assessment

7.3 Student assessor feedback template

What did they do well?	Suggestions for improvement
• • • •	• • • •

7.4 Questionnaire data

Key - 1 strongly disagree, 2 disagree, 3 uncertain, 4 agree, 5 strongly agree

Initial Questionnaire

Year	Set	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
8	2	2	2	4	2	2	3	5	5	2	5	2	4	1
8	2	2	4	4	4	4	2	4	5	3	4	4	4	2
8	2	4	4	3	4	3	2	4	3	5	4	4	3	2
8	2	3	4	4	2	2	4	4	5	2	5	2	3	4
8	2	3	3	3	5	2	4	4	4	4	3	5	3	1
8	2	4	2	4	5	5	2	3	4	5	2	5	5	1
8	2	1	4	4	4	4	3	4	3	3	4	2	4	3
8	2	5	3	2	4	4	4	4	5	2	4	2	3	2
8	2	5	3	4	5	2	1	3	3	4	2	4	4	1
8	2	2	3	1	4	1	5	5	5	1	5	1	2	4
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8	2	2	2	4	4	1	2	2	4	4	4	4	2	2
8	2	4	3	1	1	4	4	4	4	2	2	4	2	4
8	2	5	2	5	3	4	2	4	4	5	2	5	4	2
8	2	4	4	1	5	3	1	2	2	1	3	2	1	3
8	2	2	1	2	1	1	5	5	5	2	3	1	2	5
8	3	5	3	2	2	3	3	4	4	5	4	5	3	4
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8	1	4	4	4	4	2	4	1	1	5	1	5	5	1
8	1	4	3	2	4	4	4	4	5	2	4	3	4	4
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12		4	4	4	5	4	3	3	5	2	4	1	1	5
12		4	2	4	4	4	3	4	5	2	2	2	4	5
12		4	4	4	5	4	5	5	3	1	2	4	1	4
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12		4	2	3	2	3	4	5	3	2	4	3	3	4
12		4	3	4	4	2	4	4	5	3	3	2	3	3
12		3	5	4	4	1	5	3	4	3	3	2	3	5
12		2	2	5	2	2	5	5	5	2	5	1	1	4

Final Questionnaire

Year	Set	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
8	2	2	2	4	2	2	4	2	1	2	2	4	4	4
8	2	4	4	4	4	4	4	4	4	4	4	4	4	4
8	2	4	4	4	4	3	4	4	3	5	2	2	4	4
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