Action research: Which resources are most effective in supporting the progress of the students in my GCSE re-sit classes.

Word count: 5354

By Alex Woor

Action research is described by Baumfield, Hall and Wall (2013 p. 3) as an "integrated approach to the analysis and evaluation of action through research on particular instances of social problems". When presented with the opportunity to undertake such a task I immediately started to think about my GCSE Maths re-sit classes. These students are the ones who struggle the most with Maths, so therefore I wanted to find a way to improve my teaching. My aspiration is that I can then take what I find and apply it to help these students in achieving that all elusive Grade 4. When I reflected on my own teaching up to before the research took place, I noticed that my resources were all very similar, consisting of booklets of exam questions, focused on specific topics from the GCSE syllabus. I would then teach students the topic followed by the booklet, to confirm their understanding and to give them practice. Although a good way of assessing the learning, as stated by the teaching standards in TS6 (Department for education teaching standards, 2012), this resource may not have been the best way for all my students to access the knowledge or reinforce it. Therefore, the focus of my research is to evaluate the resources I use, and assess, which learning styles suit my students.

There are various theories on learning styles. Dryden and Vos (2001, quoted in Capel, Leask and Younie, 2016, p.340) say that learners can be put into three categories; visual, auditory or kinaesthetic. Students respond better to different resources dependant on what category they come under. For example, a Kinaesthetic learner might learn more from a hands-on activity, where as an auditory learner might learn better from hearing the information from a video. I personally feel that this theory is too simplistic. Learners might respond differently for each topic, and so to categorise them in a particular way, usually from a questionnaire, does not mean that they will benefit from a particular resource. Another theory proposed

by Riding and Rayner (1998, quoted in Capel, Leask and Younie, 2016, p.341) suggests that "learning styles may be grouped into two principal cognitive styles.". If the individual processes information as a whole or in parts is one learning style, and the second being if they are inclined to written words or imagery. Riding and Rayner describe these as two dimensions, meaning that a learner could be anywhere on the scale for either principle. They explain how this style is involuntary and can change. From this pre-data collection research, I determined that the resources I would use during the research needed to be varied and suited to a variety of different learners and learning styles.

To make this research ethical, I ensured all participants were kept anonymous throughout the entire project, which consisted of them partaking in classroom activities as normal, followed by a questionnaire. All paper copies of the questionnaires were kept in a locked room and will be destroyed upon completion of the project. All digital data is kept on a secure encrypted hard drive and once the project is completed the data will be wiped. Information on the outline and purpose of the research was shared with all participants in the form of a letter. No information on any of the participants will be kept or shared. Verbal confirmation of participation was obtained from all participants, all of which are over the age of 16. All participants were told that they did not have to fill in the questionnaires if they did not want to and could stop filling them in at any time.

The initial plan was to complete six lessons each with a different style of resource. After each of the lessons were completed the class filled in the questionnaire. The main questionnaire consisted of five quantitative questions and three qualitive questions. Each questionnaire also had a couple of questions totalling five marks linked to the topic of the lesson to check their understanding. The theory was to then use this information to see if

this matched up with their thoughts on the resource, for example if they really enjoyed the resource but scored low on the topic questions was it then a good resource? This however was not very effective as during these questions I ended up helping certain people and so the results of this have very limited to no use in the comparison. If I was going to do this research again, I would ask the students to complete this section in test conditions, which would then provide a more realistic insight into how well they achieved.

The five quantitative questions asked were: if they found the resource enjoyable, if they found it helpful, if it challenged their abilities, if it was engaging and easy to get involved in and if they would like to see more tasks like that in class. For each statement they would then grade from strongly disagree to strongly agree. I then imputed this data into a master spreadsheet. To do this, each grading was given a number -2 to 2 to represent strongly disagree to strongly agree. I did this to allow for the summation to reflect both positive and negative views of the resource. This summation was then converted into a percentage of the maximum possible score for the resource. By doing this for each of the resources I was able to compare the values and easily see that the most popular resource would be the ones with the highest percentage.

As well as these quantitative questions were three qualitive questions. These were: what had they enjoyed about the resource, what did they think could be improved and if they had any further comments. The plan was to use this information to reflect on each resource and improve it to suit the needs of the class. My intention was to use the resource in class again. My resources should always be evolving and adapting. By getting qualitive feedback the students' anonymous views on how my resources could improve, was very important as these were the very people who would benefit from them the most.

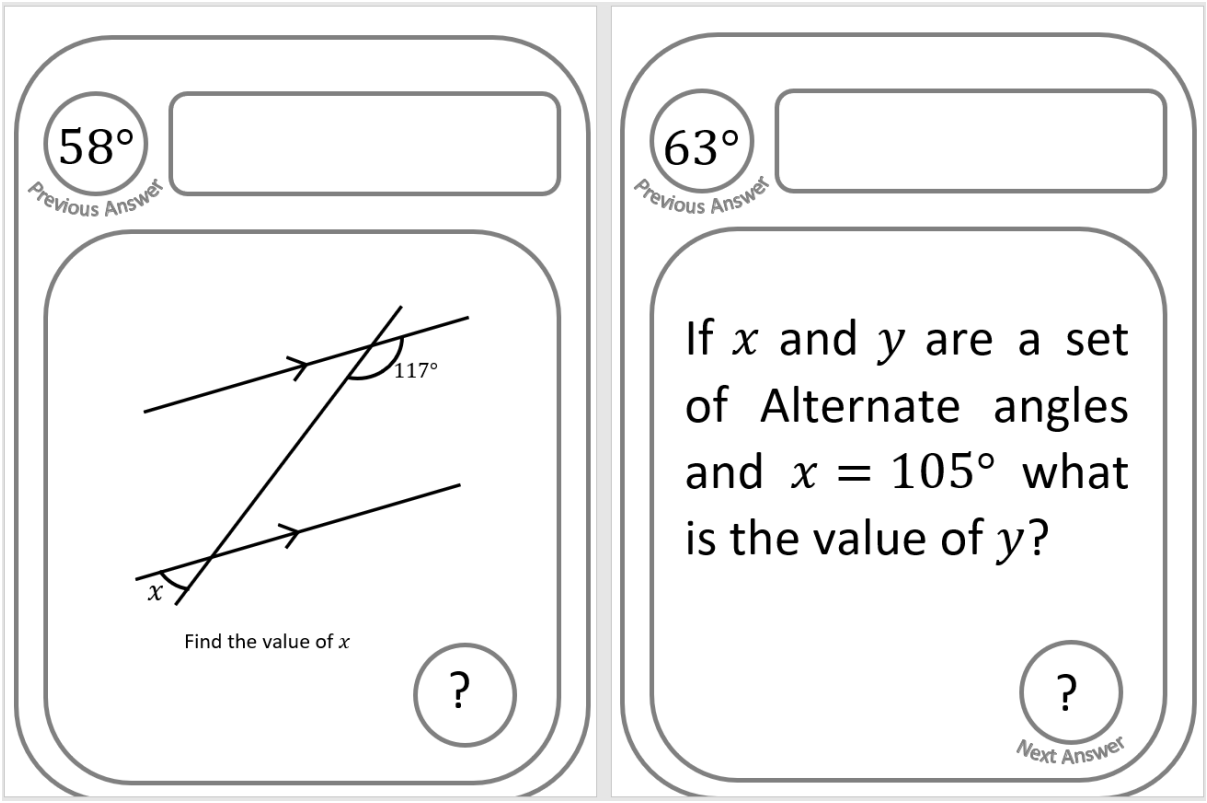
There are some limitations to using a Questionnaire as stated by Cohen, Manion and Morrison (2007 p. 317) such as “respondents cannot be coerced into completing a questionnaire”. They follow this by listing some limiting factors of questionnaire such as the reaction I might have to their responses. I would say this factor had a large contribution to the feedback I receive through the students’ questionnaires and might have prevented some opinions from being shared. I still, however, think that a questionnaire was still the correct method of data collection, and by keeping the questions simple and including a mixture of open and closed questions as suggested by Cohen, Manion and Morrison, helped me to minimise the discrepancies that could come from a questionnaire.

During each of these lessons I was fortunate to have at least one other member of staff in the room for the lessons. Because of this, I also created a separate questionnaire to fill in to get a more professional overview of the resource. This questionnaire consisted of four quantitative questions and the same three qualitive questions as the students. The quantitative questions were as follows: is the resource well planned and designed, was the resource effective, was the resource suitable and was the resource engaging. Again, for each of these questions their answers ranged from strongly disagree to strongly agree. These responses were then uploaded to a separate part of the spreadsheet and graded from -2 to 2, before being summated and turned into a percentage of the maximum possible amount. This information, combined with the students’ views and my own personal opinions of the resources, gave me three different forms of feedback for each resource and allowed me to see the whole picture, assessing the positives and negatives for each one.

My GCSE Maths re-sit classes happen once a week for two and a half hours, with a break in the middle. Due to the length of these lessons, the research activity would take place in the

first half of the lesson and the second half of the lesson was for exam practice as the GCSE exam was approaching. Therefore, each resource was planned for roughly an hour of the class time. In these two classes I have 30 students which make up my sample population. However, the numbers vary each week due to lack of attendance and the occurrence of work experience during a couple of weeks. This meant my sample size varied week to week with the lowest attendance of 15 students, so any results would be specific to these classes and I would question how well suited they would be for other classes. However as TS5 states the work should be differentiated to meet the needs of the students, so would check the suitability of each resource dependant on the students in front of me.

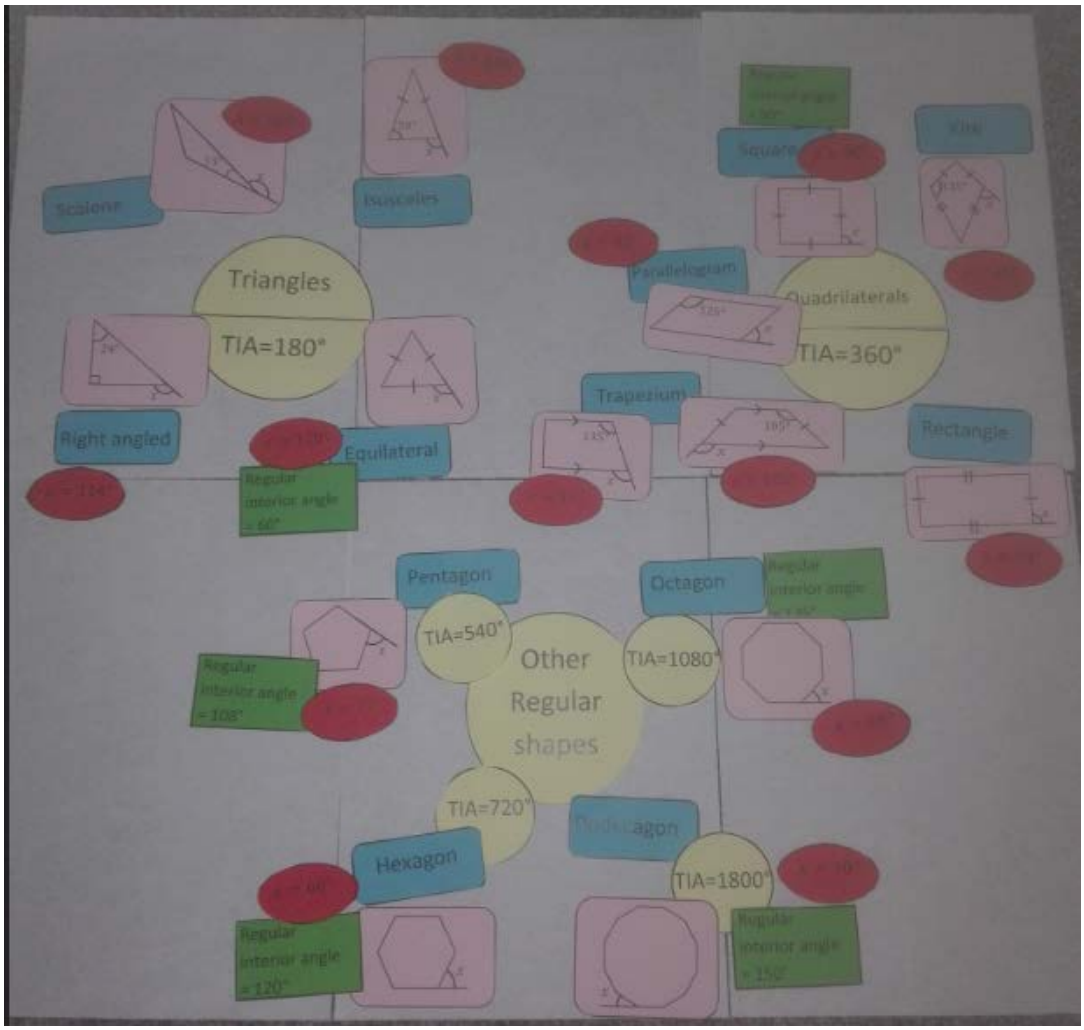
The first resource was an angles in parallel lines “treasure hunt”. This consisted of 12 questions stuck around the room. After I had gone through the various methods of calculating the angles and explained the rules of the activity. The students would go to a question to work out the answer, and the answer would then be on the top of the next question that they would need to answer. An example can be seen in the following picture.



The answer to the one on the left is then on the top of the one on the right which would be elsewhere in the room. Each student was given an answer sheet to collect their answers on. This resource only took a couple of hours to make from scratch and had a good mixture of both picture and written questions (examples of both seen above). The feedback I received suggested that I should have gone through one of them as an example due to some confusion and that I could have added some more challenging questions. It was good to get the students up and about the room, but this made it difficult to answer any questions people had and to prevent them from cheating from each other. In the future I will include a stronger emphasis on differentiation, in accordance with TS5 and spend more time explaining the task.

The second resource was an elaborate card sort on interior and exterior angles in shapes. After I had gone through the method and explanations of how to work out the interior and

exterior angles of shapes each pair was given a card sort, to then complete. An example of what the end product may have looked like can be seen below.



Before they started this task, I went through in detail what each of the coloured pieces meant and left this information on the board throughout the task. This task by far took me the longest to make, with a total of nine hours being spent to design, make and cut out this card sort. From now on when I next make a card sort, I will endeavour to use shapes with straight edges, as the most time-consuming aspect of setting this up was having to cut them out by hand. Students responded very well to this task, but for some students this could have been scaffolded a bit more, perhaps giving them the cards in sections rather than all at once. This task was also the most colourful task out of them all, which I felt made it more

appealing to them. Because of this I plan to implement more colour not just into my power points, but also into any of my future activities.

The third resource was the closest resource which resembled what I would normally do, using booklets of exam questions of a specific topic. This lesson's topic was on bearings. Each student got a copy of the booklet and my power point had all the questions separated to one question per slide. After I had gone through the rules of bearings and a couple of examples, I got the students to all look through the booklet and find questions they did not think they would be able to answer. I then randomly selected students to give me a question they were unsure of and I got everyone to attempt it. After a few minutes I pulled the class back together and got students to explain how to answer the question. This was then repeated for half an hour, after which we had covered 5 or 6 questions. They then spent some time individually attempting more questions allowing me to help those who were struggling still. This lesson was quick and simple to set up, but due to the style of task, a quick pace had to be kept ensuring we got through a series of questions. Because of the speed of the lesson, I feel that some students may have struggled to keep up. When doing this style of lesson again I would like to spend more time in covering the questions.

The fourth resource was based on Venn diagrams and set notation. After they had taken note on what the set notation meant, I handed out a sheet full of blank Venn diagrams. The same picture then came up on the board with the title of which section they needed to then shade using a pencil. After a few minutes a student was chosen at random to then come to the board and shade in what they thought was the right answer. Once everyone had checked and agreed with the answer on the board, they then had to go over the correct answer on the same diagram but with a highlighter. This made it easier to spot

misconceptions and errors from students. Students were reluctant to participate in this activity to begin with but once they got into it, it flowed much better. To improve this in my future professional practice I will include what they had to shade on the printout, this would allow for a faster pace to the task. This task also allowed me to teach from the back of the room, and allowed me to give more immediate help to specific struggling students and helped to manage some minor behaviour in accordance with TS7 which requires me to manage the class effectively.

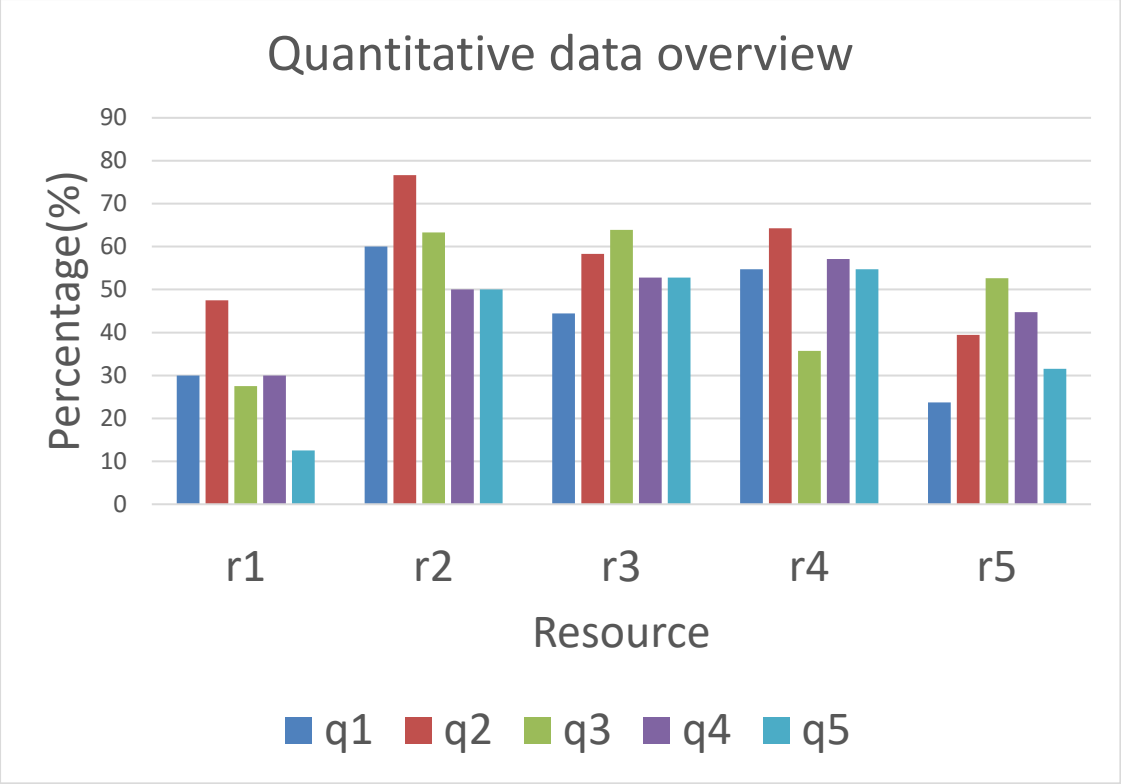
The fifth resource was focused on individual differentiation. This was on the topic of ratio and consisted of me going through a couple of examples using a specific method before putting on the board a set of bronze, silver and gold questions, an example of which can be seen below.

BRONZE	SILVER	GOLD
Share 12 in the ratio 1:2	Share 50 in the ratio 4:2:4	Share $12x$ in the ratio 1:2
Share 15 in the ratio 2:3	Share 42 in the ratio 1:1:1	Share $35y$ in the ratio 3:4
Share 28 in the ratio 3:4	Share 130 in the ratio 2:5:6	Share $60x$ in the ratio 5:1
Share 24 in the ratio 1:3	Share 25 in the ratio 2:1:2	Share $72y$ in the ratio 4:5
Share 30 in the ratio 1:5	Share 75 in the ratio 9:2:4	Share $22x$ in the ratio 5:6

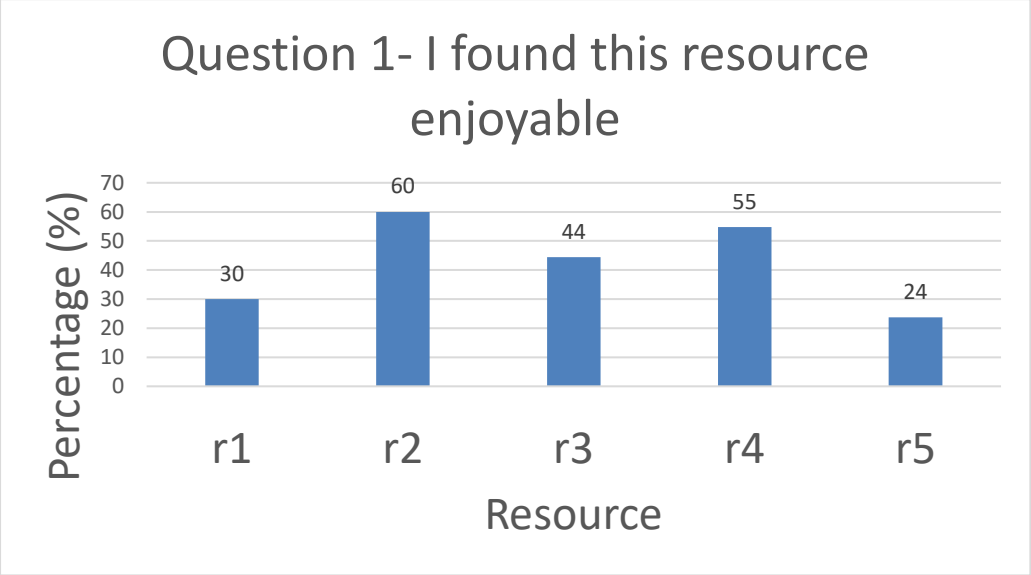
From this, students were then told to complete two from the bronze and if they were confident with these, to then move on and complete two from the silver. If they were then happy with these to finally move on to gold. This allowed them to choose what questions they did, promoting them to be accountable for their own success as mentioned in TS2.

After a set time I then put the answers on the board for them to self-check how they did. If they then got something wrong, I went through it on the board getting them to tell me what they did and see if they could spot their own mistake. To be able to achieve this interaction requires a good relationship with my students (TS7) as they need to be able to tell me when they got something wrong. I chose bronze, silver, gold instead of red, amber, green as I felt this moved away from the feeling of bad, ok and good that could come from using red, amber and green. When I implement this again in my future practice, I will label the questions and answers which will make it much easier for them to then read, and thus speed up the self-marking process.

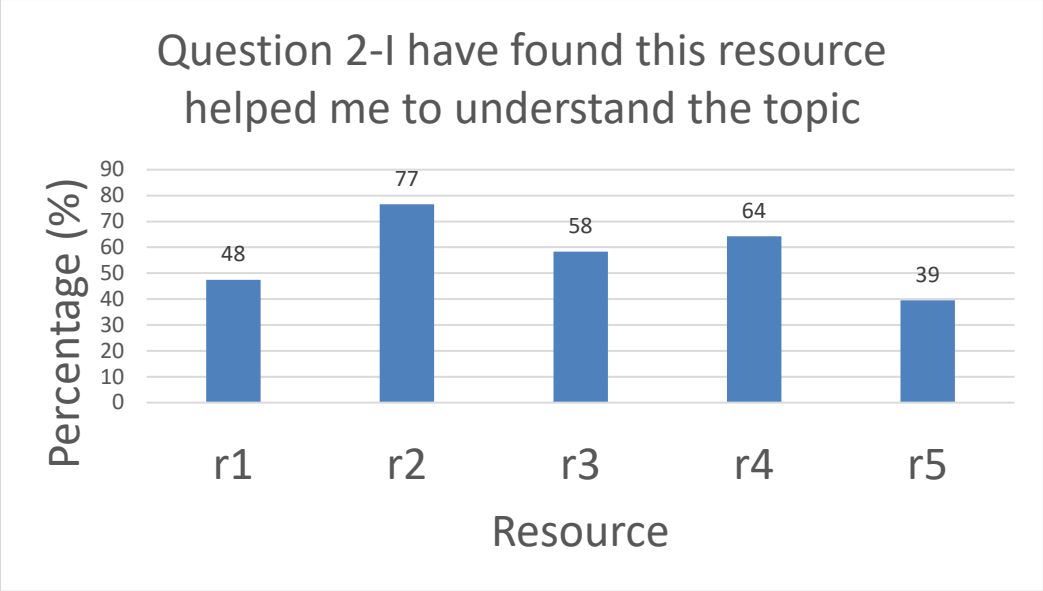
The final resource would have been a group project, where they would have been put into groups decided by me and given a research task to complete, but due to the limited time frame set aside for this research, it was no longer appropriate or suitable for the students to complete this task. This type of resource is something I will include if I were to do the project again and is something I still plan to implement when a more suitable and appropriate time is available.



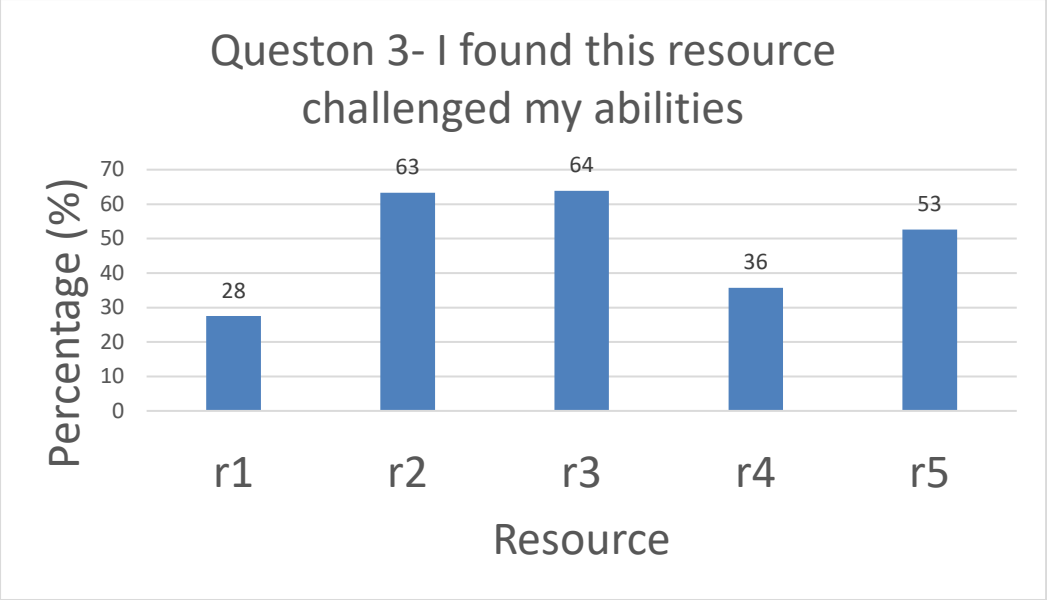
The table above is a graphical representation of the quantitative data collected from the students. At first glance resource 1 (r1) had the lowest overall results from the students with resource 2 (r2) having the highest. To look at this in more depth I will separate the questions and review each individually.



For the ease of reading and interpreting all percentages within this and the following graphs, I have rounded the results to the nearest whole number. From this graph on question 1, the students enjoyed resource 2 and 4 the most. Both resources were the two most colourful resources out of the five. Which along with quotes such as “I thought it was good to colour the cards” for resource 2 and “Practical highlighting” for resource 4, suggests to me that making the resources more colourful contributes to making the resources more enjoyable. This is reflected by Reid (2005 p. 3) who suggests that colours influence the” health, mood, attention and general alertness of people” and that colour has a “profound effect on one’s well-being”. From both my findings and this information, by making the simple change of adding colour allows students to not only enjoy the work, but consequently learn from it. The least enjoyable was the fifth resource. A reason for this might be because, by doing the differentiated tasks meant they were faced with a lot of questions at once. Quotes for this resource such as “less writing” and “larger font”, suggest that by having all these questions in front of them, even if they did not have to complete them, could still be seen as daunting and hard work, leading to what they would perceive as a less enjoyable task. A possible reason for why the enjoyment was not so high for resource 1 may partly be due to the level of explanation that it required but they did not receive as reflected by the statement “better more clearer instructions”. By explaining this task with more detail and going through an example may have increased the enjoyment they took from it.

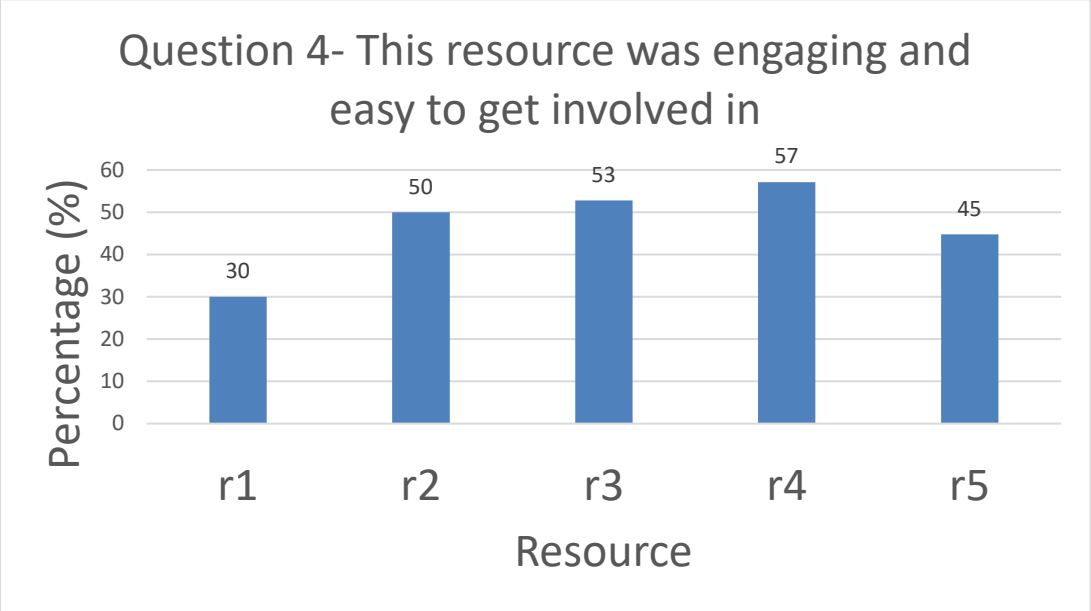


Question 2 follows a very similar trend to that of question 1, This could suggest the theory that if a student enjoys a task then the students feel they understand the topic better. The card sort of resource 2 is much higher than the others for this question, a reason for this might be because this was the only task that included small group work. This could suggest that the best way for my students to understand the topic is to talk to each other and build up each other's ideas and thoughts. This has strong links to the learning theory of social constructivism which is described by Sullivan (2011 p. 24-32) that students learn by finding the answers through dialogue with both me as the teacher and their peers. This can only be achieved through having good relationships with the students, in accordance with TS7 and to be able to guide students in accordance to TS2. The data from this question may therefore suggest that my classes learn best when social constructivism styles of teaching are implemented, so from this I plan to implement more small group activities into my future teaching.

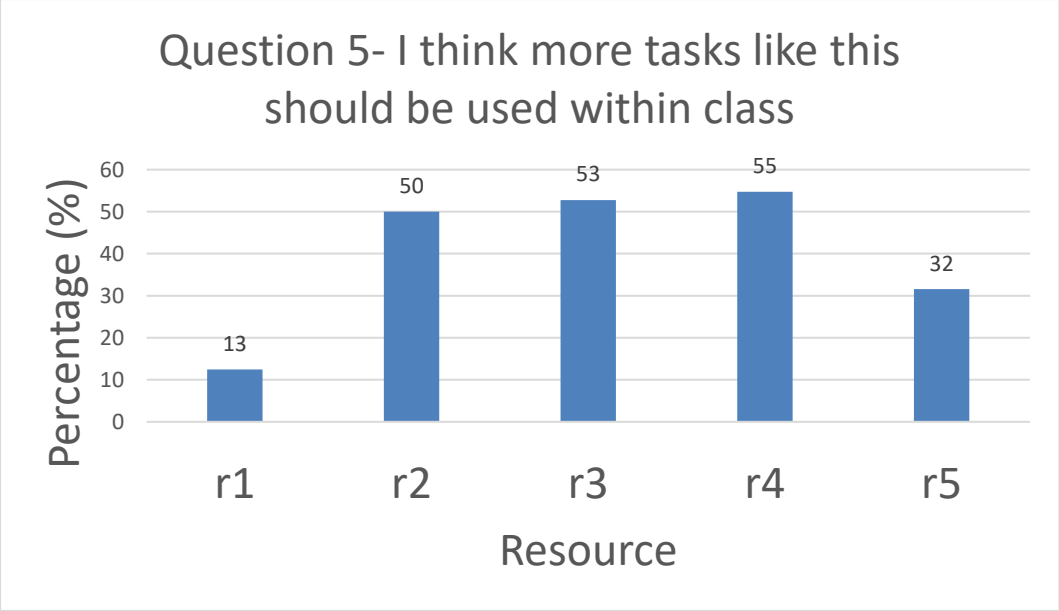


This question has strong links to TS5, in differentiating the work suitably to meet the needs of the students. Being the lowest scoring one, the treasure hunt (resource 1), this may explain why the students were not able to take very much away from it. If the questions were not challenging enough then they can't take anything away from it. I believe this is an easy thing to solve in my future professional practice, I will make the questions more challenging. This may encourage the students to learn more and push them to apply the methods to gain a greater understanding. From this, I plan to implement a wider range of questions to ensure all students are challenged within my lessons. The outcome for this question for the card sort (resource 2) highlights how a task can both be enjoyable but also challenging. I have realised that challenge does not have to come in the form of a separate question but can be an increment within a task. Resource 3 was the only task to emphasise exam style questions and the responses indicate how difficult they can be for these low ability students, suggesting that when these types of questions are involved, students automatically start to lose confidence in their abilities, causing them to find the work more of a challenge. For the percentages to be near identical for resource 2 and 3 and reflecting

this with the second question on how much the resource helped, shows that within the class I can still reach a reasonable level of challenge with a task that the students can get more out of. From this I plan in my future practice to implement tasks less focused on exam questions mindful that they can then apply the gained knowledge to the exam style later.



My initial theory behind this question was that if a task was engaging and easier to get involved in then the student would get more out of it. Again, the lowest percentage was for the treasure hunt (resource 1), this may again be because of the confusion caused from the explanation rather than the task itself. The easiest to get involved in was the interactive Venn diagram resource (resource 4), this might be because this task included no numbers but involved them shading in the correct areas. Therefore, for students who do not like maths and lose interest when numbers are used, this was a good way for them to get involved. From question 2 and based on my theory, I would have expected the percentage for resource 5 to be much lower for this question. However, the results suggest that a student can still be engaged regardless of the resource and I plan to take this into account when planning resources in the future. A resource needs to both be useful and engaging.



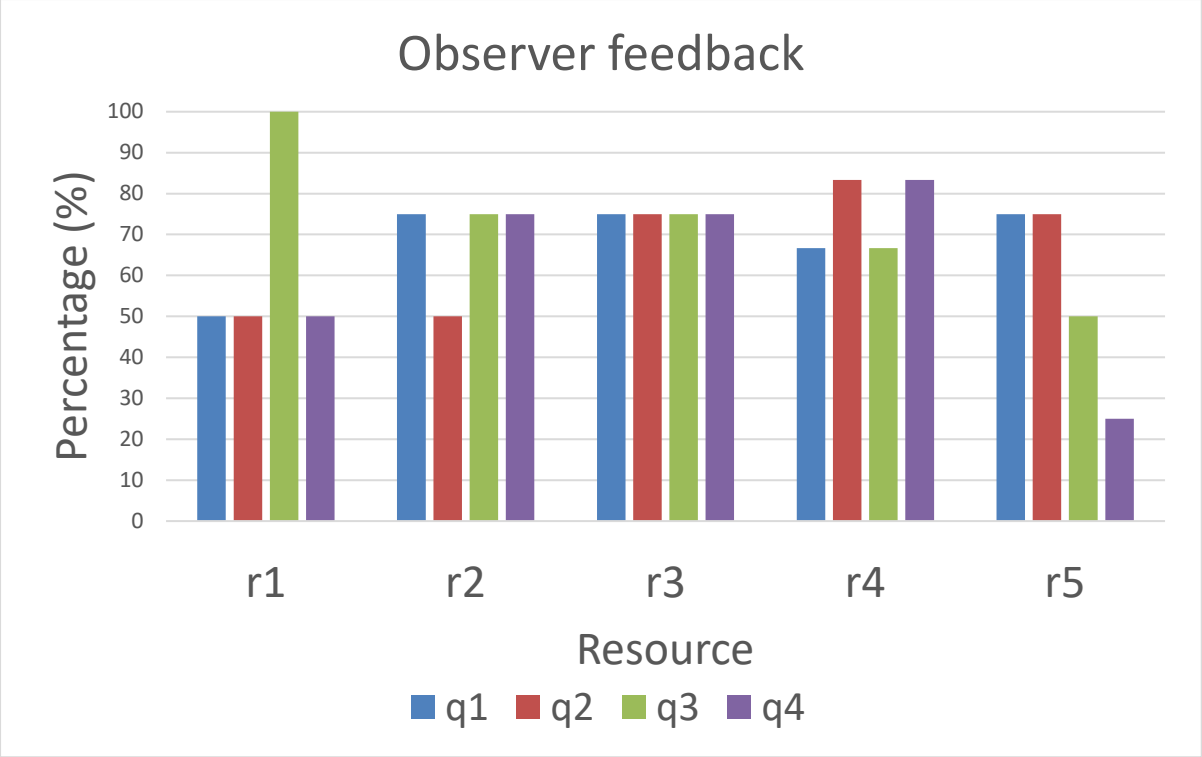
From this question, the treasure hunt (resource 1) scored the lowest out of any of the questions. A reason for this could be that students did not like the task of getting up and moving around and could be connected to the time of day this lesson was taught. Both lessons happened on a Monday morning and getting teenagers to get up and move about for the lesson is unlikely to be something they want to do regularly. However, this is only speculation as I did not ask the students this. If I was to do this again, I will include a sub-section for the questions asking why. The highest percentage being from the interactive Venn diagram resource (resource 4) corroborates what was said about question 4, students prefer easier tasks that require little to no effort. From this I have learnt that resources like resource 4 are a good way to engage the student in work but does not present them with enough challenge or substance to benefit from it.

The first qualitive response was for question 6 which asked, what was good about the resource. For all of the resources the answers to this question were all very similar," enjoyable" and "easier to understand" being a couple of examples. These responses suggest that the resources were helpful in building their understanding and the students felt

encouraged to achieve from them. This highlights TS2 in promoting success within the classroom and indicates that any resource can be improved with the use of encouragement and support, especially for the low ability within the GCSE maths re-sit classes.

Question 7 asked how the resource could be improved, but for many of the sheets this box was left blank or had written the words “nothing”. This suggests to me that they could take something away from each resource that in some way has helped them improve their knowledge or could suggest that as students they themselves do not understand how they learn best, and as a teacher, is something I should promote more. By getting them to understand how they learn best they can then take more responsibility for their own learning as stated by TS2.

For the students who did fill in this box consisted of statements such as “more questions and more challenging” as well as “more time to complete questions”. Both improvements are things I plan to build into both my resources and my future lesson plans, allocating more time to work on the questions. This not only lets students get through more work but helps to build up their confidence in the work. This has strong connections to the learning theory of behaviourism that, according to Brooks, Abbott and Huddleston (2012 p.41) is that learning can only take place with repeated exposure, this meaning that students learn by the repetition of tasks. In my future practice I intend to keep this theory in mind as well as have more challenging questions to hand for those who finish early which I hope will easily solve the problem of not being challenging enough.



Above is an overview of the quantitative data collected from the observers within the classes. From this data I feel there is little to note aside from the treasure hunt (resource 1) being the most suitable for the students and the differentiated ratio resource (resource 5) being the hardest for the students to get involved in. For resource 1 they stated “Made them think” as the reason it should be used again. This contrasts the opinion of the students who felt they did not want this type of resource too often. The differentiated ratio resource (resource 5) being the hardest to engage complements the opinion of the students. As I suggested, this could have been due to the fact that students were faced with a series of questions all in one go, however the observer suggested I “make the questions differ so they do not look like previous slides”. This indicates that the questions were too similar and so caused some confusion to the students about which method they needed to use.

The qualitive answers from the observers were of more interest to me. Getting a professional opinion on the resources and how to improve them has been a great help, and

from doing this I realised that I should seek advice on how to improve my resources more frequently during my teaching career. Many of the improvements my observers suggested such as “a few blank so students can fill in their own responses” and “1st example demonstrated” are easy to implement. They also gave some tips on the layout of resources and how tweaking this can help students to engage and learn from a resource. In the future I plan to spend more time thinking about the layout of my resources and how the student will view it, by making a few changes, such as separating the questions or adding some more colour could make a resource much more accessible for struggling students.

Completing this research has allowed me to determine some of the learning qualities my students have. If referring to the learning theory of Dryden and Vos, of learners being visual, auditory or kinaesthetic, I still believe this to be too linear a theory. From my research I have seen that students benefit from a range of these three and to categorise them into one specific would not be appropriate. This could be seen by looking at what the students considered to be the best and worst resources. Both resource 1 (worst) and resource 2 (best) could be considered as kinaesthetic resources where students were up and involved in the task. From Dryden and Vos’s theory a Kinaesthetic learner would have benefited the most from both. From this I take away that learners require a mixture of all three to get the most out of a resource.

Riding and Rayner’s theory of having learning styles grouped into two principle cognitive styles of having the work in parts or as a whole and having it in words or pictures. From what I have seen from this research, Riding and Rayner’s theory compliments my students more accurately. The tasks they preferred were split into sections and the most preferred one, being the card sort (resource 2), had the largest mixture of pictures and words, as well

as separating it into parts that could then be looked at in sections or as one big puzzle. From this data, I therefore plan to implement more compartmentalised resources into my future lessons. I noticed that students struggled when faced with a wall of questions. By giving it to them in parts allows them to access the work, and consequently get more out of it. This is instead of looking at a large group of questions, finding it too much and shutting off, meaning they are gaining nothing or very little from it.

If I were to do this project again, I would like to have included more styles of resources, such as the planned group research task, or perhaps a task that did not involve any paper but had students using items to create something. I think if it was to be done again, I would want to delve deeper into the parts of the resources that worked the best and see if transferring these parts into another resource style has the same effect. For example, would compartmentalising the strongly differentiated resource 5 and giving it to them in sections make it more useful to them? This could benefit them by removing the wall of text and reducing the amount they see in one go, encouraging them to complete more work.

From my own reflections I also came to realise that even between the two classes there were a lot of differences. I need to look more closely at not only this but other factors such as gender or background and how this may affect which resources suit them more. To do this I will add more questions to the questionnaire asking which class they were in and what gender they are, and before I anonymised their responses, I would be able to add further data, such as if they were disadvantaged. It would then allow me to compare the results between these groupings. For this to have worked I would want to do it over a longer period of time for a larger group of students to be able to see any trends much more clearly.

From this experience the largest takeaways that I can implement into my teaching are colour and challenge. Colour is a very minor change that I plan to implement that, from what I have seen in this research, will have a great impact to my learners. By implementing more colour into my classes makes them more appealing to look at and can hold the attention of the students much more than plain black and white. That is why, where possible, I plan to implement more colour into the resources I use. Challenge links closely to TS5 and differentiating my work appropriately and is something I want to implement more into my teaching. From this experience I realised that even though these students are not there by choice they still want to be challenged in their abilities and pushed to achieve the best they can be. From this I have realised that part of my duty as a teacher is to do this so from now on I plan to inject more challenge and differentiation into my classes.

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