Through Growth Mindset approaches, can we raise attainment, achievement and enjoyment in Numeracy within an Additional Support Needs provision?

Introduction

The ultimate goal of this project was to dispel the perception of maths as a 'formulaic', and present it as a creative and enjoyable subject, based more on the learning process than 'right' or 'wrong' answers. It was anticipated that this would not only benefit the health and wellbeing of the learners and their perceptions of the subject, but crucially result in greater success for each individual learner. In the educational setting, the importance of health and wellbeing is valued very highly. Despite this, there has been no specific focus on Growth Mindset, and many of the staff have little or no understanding of the concept.

It has been recognised and acknowledged that a growth mindset approach can have an enormously positive impact if executed correctly and with commitment, therefore it was predicted that this project should lead to improvements in health and wellbeing as well as teaching and learning. The focus on numeracy was an important factor because many pupils, parents and staff members share 'negative' perceptions of maths. Generally, it is seen as the least enjoyable curricular subject, which can be difficult and/or boring. As an establishment, and particularly as an additional support needs provision taking into account the needs of the learners, maths must be made more accessible and less daunting. This project shows that it can be done by changing the approach to learning and teaching so that it is enjoyable, challenging, stimulating and engaging, thus leading to a more positive mindset and attitude around maths.

Background

Fundamentally, wellbeing lies at the heart of many Scottish legislations and policies which underpin teaching practice; for example, it is absolutely central to the Getting It Right For Every Child (GIRFEC) approach, as well as the Curriculum for Excellence (CfE) on which education in Scotland is based. This highlights the importance of practicing in a child-centred way and reflects the need to provide tailored support for the learners. It is also clear that Growth Mindset is a key driver in delivering 'excellence and equity' for young people (Scottish Government, 2019). When children believe that their ability is fixed, they lack resilience, which is paramount to learning and achieving (Dweck, 2015). A growth mindset empowers children to reach their full potential by developing perseverance, thus leading to increased academic success (Dweck, 2015). The Transforming Scotland into a Maths Positive Nation (Scottish Government, 2016) report acknowledges that children's wellbeing is significantly impacted by their learning experiences and environment; therefore the vision for this project was focused on improving attitudes and confidence around maths, promoting the value of key maths skills, and delivering learning in a creative and transferable way.

There is a substantial body of research to support the theory that Growth Mindset has an unequivocally positive impact on the success of both children and adults as learners. Much of this research directly supports the findings from this project, by endorsing the practice of

interweaving a Growth Mindset approach within the daily curricular learning (Rhew et al., 2018) and recognising the importance of teaching in small groups to promote problem solving and collaborative working (Herseim, 2020). Furthermore, research also shows that active learning, which is flexible and stimulating, is one of the most successful methods for implementing Growth Mindset within the classroom; particularly among learners with complex needs (Morningstar et al., 2017). These strategies were used throughout the project to engage the participants, and the results support the findings of Alpay & Ireson (2006), that students with a growth mindset are more inclined to engage in group work and develop a more positive perception of 'creativity'.

One of the key benefits of developing a growth mindset is a pronounced increase in motivation, which then leads to increased achievement through hard work and perseverance (Dweck, 1999; Christensen et al, 2008; Rhew et al., 2018). It has also been found that a growth mindset can improve students' eagerness to learn (Blackwell et al., 2007; Haimovitz and Dweck, 2017).

Many researchers have highlighted the significance of students perceiving learning as a process and valuing these learning opportunities more than the product or the outcome (Herseim, 2020). Strader (2019) advocates that an emphasis on this can empower learners to believe in their own abilities, thus resulting in greater engagement. Furthermore, it is vital to teach 'for understanding', rather than focusing on summative assessments, which can have detrimental effects on pupils (Stone, 1999; Haimovitz and Dweck, 2017).

In addition to the vast research on the growth mindsets of learners, there is also a school of thought that educators themselves must have a growth mindset in order to effectively nurture the minds of their learners and provide the best possible learning environment.

However, Haimovitz and Dweck (2017) highlight that it is not enough for educators to simply possess a growth mindset and hope that it will positively impact the students; teachers must actively share growth mindset approaches in order to instil this perspective in the minds of the learners. Teachers must also have positive expectations of their pupils, and believe that they can reach their full potential, in order for the learners to benefit from Growth Mindset (Morningstar et al., 2017). Furthermore, fostering resilience, and helping students to view failure as an opportunity to learn, are significant factors which can contribute to success through a Growth Mindset approach (Dweck, 2006).

In order to cultivate a true 'Growth Mindset Classroom' it is essential to encourage open discussions about challenges, mistakes, confusion, and disappointment, as well as endorsing teamwork and supporting one another (Haimovitz and Dweck, 2017; Morningstar et al., 2017). Similarly, Gutshall (2013) found that praising learners' 'ability' can result in a lack of effort and dedication to learning, whereas acknowledging the hard work and perseverance of students can lead to increased productivity and resilience, particularly in school children (Mueller and Dweck, 1998). Constructive feedback is also imperative to improving and learning from the success of others (Saunders, 2013). Rhew et al. (2018) conclude that educators must ascertain how students perceive their own learning and the influence that they have over their own achievements, which compounds the idea of openness and reflective dialogue within the classroom.

In conclusion, there seems to be no debate that Growth Mindset can lead to substantial benefits in relation to success, attainment and achievement in children and adults, although it is important to acknowledge that Growth Mindset is not a 'one size fits all' approach and there are many factors which should be considered when putting the theory into practice. So far, it is evident that the mindset of teachers can have a significant impact on the learners and their outcomes, however further research is necessary in order to explore this aspect in more depth. Although there is no shortage of research material on the impact of Growth Mindset on learning, there is limited research with a specific focus on additional support needs. Furthermore, there is little evidence based solely around Growth Mindset in Numeracy, therefore there is a sizeable gap in existing research relating to both additional support needs and maths together. Hanushek (2010) and Rhew et al. (2018) acknowledge the significance of the attainment gap in relation to learners with additional support needs, and recommend that more research is done, ideally by educators, to promote growth mindset approaches and greater academic success.

Research design part 1

This project involved a group of learners, stages P7 to S1, with varying needs. The pupils are all early level learners, and they have a keen interest in maths. They enjoy practical learning with lots of tactile resources, concrete materials and opportunities to explore. Their Numeracy targets for the academic year were based around core number processing skills, and it was assessed that these learners had the potential to make steady progress towards their targets when fully engaged and supported, thus a group was formed to provide them with suitable learning opportunities for their needs.

Their existing skills were determined prior to commencing the project, and progress was tracked throughout using the Curriculum for Excellence Benchmarks alongside the rigorous recording systems used within the establishment. Progress was recorded in this way to ascertain whether improvements to achievement and attainment were made throughout the duration of the project. Although the learners are at a relatively similar stage in their skills and abilities, it remained imperative to differentiate and ensure that challenge and support were provided appropriately for each individual.

Growth Mindset became a key focus of Health and Wellbeing lessons, and the learners were introduced to this concept through appropriate videos and other visual resources initially. Once they become more familiar with the concept, and the differences between a fixed and a growth mindset, the pupils were supported to explore how a growth mindset approach can have a positive impact on learning. Furthermore, picture books and stories were used as part of Literacy and Health and Wellbeing to reinforce the issues surrounding Growth Mindset.

Maths and Numeracy skills were taught through a Growth Mindset approach and inter-disciplinary learning, using visual and concrete materials, as well as problem solving strategies. 'Thinking Boards' were used as a key methodology for the maths lessons, as the learners benefit from manipulating resources in a way that makes sense to them. Appropriate support was provided for each pupil, whilst still challenging the learners to use their existing knowledge and problem solving skills to explore problems with independence.

The potential ethical implications of being part of the focus group, or not, was considered, with input from the Line Manager. Each pupil's individual needs, and best interests as a learner, were taken into account. Based on these considerations, it was determined whether or not the student would benefit more from being a part of the focus group, or if it would be more of a detriment to them. The wellbeing of all students was, and will always remain, of paramount importance. Permission for photographic evidence to be submitted was provided by the parents of all five learners. All photographs relating to this project are stored on the school's secure server, along with any other pertinent evidence and data, in a confidential folder which is only accessible by the project leader.

The Class Teacher led the project, with support from the class team which consisted of two Pupil Support Assistants (PSAs). PSAs provided some support during focus group activities, however, they were also required to support any learners who were not participating in the group. Lessons for the focus group were planned around the routines and schedules of the class, and also the PSAs, to ensure that timetables were not unnecessarily disrupted. Focus group lessons were delivered mainly within the classroom and took place 2-3 times per week, for a duration of 45-60 minutes at a time.

The school was awarded some funding which was delegated to the project leader for the purchase of resources and materials to use within the group lessons. Resources were carefully selected with the project aims in mind, and these resources were also made available for use throughout the school, so that others may also benefit from them too.

This project was well supported by the Senior Management Team within the school, who were familiar with the vision and aims. They were instrumental in providing opportunities for professional dialogue regarding the progress of the project. Further opportunities for sharing findings has also been discussed, for example through staff meetings, in-service days or classroom observations.

Research design part 2

Intended outcomes for the project, and the relevant aspects of research design for each intention, are as follows:

- To improve the learners' attitudes, perceptions and enjoyment of mathematics at school.

The success of this was measured by a child-friendly questionnaire, based on the learners' thoughts and feelings around maths. This was undertaken once prior to the project, and repeated once again at the final completion of the project.

- To contribute to an increase in engagement and attainment in maths.

The success of this was tracked using a rigorous skills planner intertwined with the Curriculum for Excellence Benchmarks. Progress was strategically evaluated at the three month point, to reflect on how successful the approach was. Although assessment was ongoing throughout the duration of the project, a final analysis was carried out upon

completion of the project. Any progress made by the learners towards the targeted skills was seen as an increase in attainment. Furthermore, this data, in conjunction with professional judgement, was used to determine levels of engagement in the learning opportunities. Formative assessment and professional judgement were used to ascertain whether the learners contributed more freely and began to pay attention for longer periods of time.

- To change the opinion within the establishment (that maths is separate, formulaic, boring etc.) and promote numeracy as a creative subject.

This outcome was addressed by sharing good practice with colleagues and providing ideas to be used across the wider school community. The focus group of learners participated in a range of creative learning experiences, and these were shared and promoted in order to demonstrate how these core numeracy skills can be taught and learned through creative and artistic pursuits.

Findings and Analysis

The comprehensive analysis and evaluation following 6 months of this project indicates that there has been success across a number of areas relating to the original aim. Tracking of academic skills has evidenced that all of the learners have progressed in all of the numeracy based targets. In certain areas, all of the pupils have reached the 'secure' stage for completely new skills that were introduced to them. This is a significant achievement for these learners with additional support needs, as it would not be unusual for them to spend a significantly longer time (potentially several academic years or sometimes their entire school career) working on these core skills. Based on this method of assessment, there is evidence that the project has led to an increase in attainment and achievement in numeracy.

Pupil voice, in the form of a focus group questionnaire, has been instrumental in highlighting the other benefits which have arisen from the project so far. On comparison of the results before the project and following 6 months of the project, there was a much more positive response from the learners in relation to their engagement and enjoyment in numeracy after participating in the group activities. This data indicates that the learners' attitudes around numeracy have improved, as well as their confidence. For example; after the project, none of the learners stated that they found maths difficult, compared to three learners who felt they struggled with maths at the beginning of the project. Furthermore, two of the participants who initially chose 'creative' subjects as their favourites, selected numeracy as their favorite subject after participating in the project. This would suggest that the creative and engaging delivery of the focus group lessons has resonated with these learners, and their perceptions of maths may have changed as a result.

For all of these reasons, the project has perhaps exceeded expectations, as this level of success was not expected in such a short space of time. However, if this project were to commence again, it would certainly be beneficial to have a larger number of participants, split into small groups, as this small group setting worked well for the delivery of the activities. More participants would increase the rigour of the data and enable more learners

to benefit from this opportunity to develop in numeracy. It may be the case that other teachers could adopt the same group work approach, and delivery methods, to meet the needs of the learners across the school.

A pupil focus group questionnaire was undertaken immediately before the project commenced in August 2019, and repeated as the project was drawing to a close, by which point the learners had participated in several focused sessions based on a Growth Mindset approach to Numeracy. The questionnaire was identical both times, and the learners participated in open discussions before completing their own questionnaires. Due to the nature of the learners' needs, adult support was provided in order to support pupil voice and inclusion, however the views recorded were entirely the learners' own. The results of these questionnaires were compared and the findings would suggest that the project has had a vastly positive impact overall.

Learner number two, who displays challenging behaviour, chose not to complete the second questionnaire, therefore the second set of data contains four results which have been collated and evaluated. This situation was not predicted or planned for, however if the project was repeated, it would be beneficial to consider such factors in advance and devise a strategy for overcoming these hurdles.

In August, none of the five learners ranked numeracy as their favourite subject at school; it was ranked second last (out of six options) by four of the learners, and ranked third by learner number five. After the project, two of the learners chose numeracy as their favourite subject, and numeracy also moved up one place for two of the other learners. This shows that all four learners who provided both sets of data now enjoy numeracy more than they did prior to the project. Therefore, it could be concluded that the aim of increasing enjoyment in numeracy was met through the project, and this may be attributed to the creative activities and resources which the learners found more exciting.

Before the project, two learners did not like numeracy at all, two learners liked numeracy a little, and one learner liked numeracy a lot. Six months later, three learners answered that they like numeracy a lot, and one learner answered that they like numeracy a little. Although two of the learners' opinions stayed the same, it is fair to say that the overall perception of numeracy within the group is more positive, as nobody stated that they disliked the subject.

Initially, three learners felt that numeracy was difficult for them; however, none of the learners chose numeracy as one of the subjects they struggle with at school after engaging with the focus groups. This feedback highlights how child-centred and needs-led the lessons and activities were, as all of the learners were supported and challenged appropriately throughout the project. One of the learners also provided verbal feedback in relation to this question, stating that he enjoys numeracy more now because it is not as difficult for him as it used to be.

Furthermore, amongst the original responses when asked how maths makes them feel, two learners answered that numeracy made them feel sad. After six months of the project, all of

the four learners who provided data answered either happy or excited, with none of the participants expressing any negative feelings towards numeracy and mathematics.

There was some significant variation in the ways in which the participants like to learn, however, on the whole, it was evident that the pupils preferred working in a group after six months of focus group activities. This was an extremely positive response that has also had an impact on Health and Wellbeing within the classroom. The group have formed stronger relationships, and are now demonstrating a lot more respect and kindness for one another. These learners have also grasped the importance of supporting one another and they will now frequently encourage one another and celebrate success together.

Based on consistent and measurable assessment, alongside professional judgement, it is evident that this project has had a positive impact on the learners who took part. As described in the project plan, the measurement tools* for assessing the impact of this project were taken from the existing curricular tracking framework within the establishment.

Initially, three of the learners (learners 1-3) had not begun learning about addition, and two of the learners (learners 4-5) were at the developing stage. Furthermore, the learners had significant gaps in their basic number processing skills. Overall, the following aspects had not been covered:

- identifying the number 'before' and 'after'
- counting on from a number other than zero
- identifying missing numbers from a sequence
- understanding the meaning of 'more than' and 'less than'

The plans for the focused lessons and activities were derived from these key skills, with a particular focus on number sequencing, before progressing towards number manipulation through practical and written addition activities.

The learners all engaged extremely well with the tasks and resources that were presented to them. As a result, they were able to benefit from active learning using number balance scales, Numicon and Ten Frame materials. As the learners grew in confidence and began to enjoy the lessons, their grasp of number sequencing developed significantly, and all five learners are now able to state what comes before or after a given number. Learner 5 has been assessed as 'secure' (green) for this skill, as he can independently say and write numbers before and after (within 50). Learners 1-4 have been assessed as 'consolidating' (yellow), as they require low levels of support for this skill (within 20-30). All learners can now also count from various starting points with confidence.

Learner 1 has been assessed as 'developing' for identifying missing numbers from a sequence, however learners 2-5 are currently progressing towards the 'secure' stage, as they are able to complete increasingly complex sequences with decreasing support. All learners have been assessed as 'consolidating' in regards to 'less than' and 'more than', as they still require support to apply this concept to various contexts.

*For the purposes of this project, the Early Level Numeracy and Mathematics skills planners were used, both before and after the focused teaching and learning. Key mathematical skills are monitored using a traffic light system, which pertains to the headings 'developing, consolidating, secure'. If the skill is highlighted red, the learner is developing skills in this area of the curriculum; yellow represents consolidating, and green represents secure. If the skill has not been highlighted on the planner, this means there has been no direct teaching in that area (see Appendix 2).

<u>Conclusions</u>

According to colleagues who have observed the delivery of the project, the most noticeable change has been the learners' attitudes towards Numeracy. These colleagues have recognised that the learners seem to be far more enthusiastic about Numeracy than they were at the start of the project and are now much more keen to participate in lessons. This has been attributed to the new resources which make maths more accessible and it is also acknowledged that the delivery of the learning experiences has made a difference to their levels of engagement. Colleagues feel that the lessons within the project have been particularly stimulating and participatory, with increased opportunities for the pupils to learn from one another.

The colleagues who support the learners on a daily basis have commented that they would benefit from some further insight into the growth mindset approach, and it was agreed that this should be a focus for professional development. This can be resolved by dedicating some of the fortnightly team meetings (including the Class Teacher and Pupil Support Assistants) to professional dialogue and reading surrounding a Growth Mindset approach.

Further opportunities for collegiate professional development within the wider school environment will also be explored, with the aim of reporting to colleagues about this project, sharing the findings and good practice.

Finally, it is the expectation that Growth Mindset will continue to be addressed through Health and Wellbeing, ensuring that the pupils have a sound understanding of this concept and how it affects their learning and personal development within and outwith the school environment.

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