"I'VE NEVER BEEN ABLE TO DO MATHS!"

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Abstract

The aim of the Action Research was to establish whether learners would grasp Maths concepts better by using a learning tree, illustrating the building blocks in the process.

There are links with scaffold learning (Bruner 1967), where learners build upon knowledge in small chunks to develop their knowledge and skills.

Hairdressing learners studying level 1 Maths pinpointed their achievements on a model of a tree. The main stem had various branches representing a different topic of Maths. I thought by allowing the learners to see their progress visually this may enhance their enjoyment, promoting more engagement and having an effect on success rates. The ultimate result was to improve the quality of teaching and learning in the classroom, whilst challenging learner's personal constructs about themselves.

Introduction

Only 45% of pupils in England get a grade C or better in English and Maths and the government has often raised concerns over basic skills. This research is trying to establish whether learners would grasp Maths concepts better by using a learning tree to pinpoint their achievements. I had observed the use of a learning tree in further education and wanted to adapt the idea to suit my learners. Approximately 15-20% arrive with previous qualifications onto this type of course. Learning support and intervention may have been offered at school and still many arrive with low or no previous grades. I want to strive for greater enjoyment from Maths lessons by removing barriers to learning. Many learners have struggled through school and their reluctance to learn is evident due to previous built personal constructs about themselves and Maths.

Fisher (1999) believes that our interaction with others is the result of our past experiences. This interpretation confirms behaviours are not static. Learners may feel less confident about learning Maths due to previous experiences. They may have a narrow minded approach to learning the subject and will undoubtedly be less receptive to learning if they struggled with basic concepts during secondary education.

Bruner (1967) supports discovery learning and scaffolding, which can help learners understand more and recognise their growth and development. Their confidence increases and this can lead to a more receptive learner. It encourages enquiry and the benefits of this type of learning may help those who have missed out in the past.

Context

The research is in the curriculum area of Functional Skills in Maths, which is used to teach numeracy skills to learners in a North West College of Further Education. It was aimed at a Level 2 Hairdressing group that were studying Level 1 Maths.

Research related Policies

Governments Skills for Life Policy (2001) promotes the importance of numeracy skills in preparation for employment. Mindful of this, and the governments Leitch and Wolf reports, I wanted to help learners to recognise the different concepts as building blocks to solve real problems within the workplace, in addition to their own lives. I also wanted to create a fun and engaging environment which is essential for learning, with the intention of a positive outcome and 'success for all.' 'The process of action research assisted my teaching by assessing learner needs' (McNiff 2010)

Both Government (Leitch Report 2006) and employers in industry want a workforce that is numerate and literate so learning these subjects whilst in Further Education can only improve knowledge and capability in preparation for work.

The constructivist theories of Vygotsky, Gagne, Bruner and Piaget have had a significant influence on education. They look at the thinking process where learners understand a concept by constructing their own meaning. They then link new

learning with existing learning. Vygotsky's peer learning and Gagne's chaining complement scaffold and experiential learning.

Research Questions

By using the learning tree the learners can identify the different tasks and the teacher can guide using appropriate tasks and effective surface and deeper questioning to encourage learners thought processes.

The questions that I wanted to answer from the research were:-

- Will the introduction of the learning tree enable the learners to identify concepts they have successfully achieved?

- Can personal constructs concerning Maths be challenged and changed through the introduction of the learning tree?

- Will the learning tree provide a more engaging environment in which to learn?

- Will the enjoyment of Maths lessons be enhanced?

- Can learners achieve better results in Maths assessments?

The intervention I carried out, using a learning tree involved a model of a tree and pinpointing each learner's individual strengths and limitations. The aim was to enable them to reach their full potential. The tree had a main stem which had various branches representing a different topic of Maths. Every learner added leaves to the branches; the leaves represented different concepts. As they gained knowledge and learned to apply it, they added to the tree of knowledge, showing understanding.

This was linked with scaffold learning; topics learnt in the lesson were assessed using problem solving tasks. During the intervention, links were made with past and future pieces of learning throughout the sessions.

I expected the learners to recognise the concepts as 'stepping stones' in their learning. I hoped that the novelty of the learning tree would generate interest and motivation, improve concentration due to more enjoyment in lessons and ultimately improve achievement in Maths. The tree acted as an incentive, which

helped to promote confidence and develop learning.

Methodology

Action Research is a practical way of looking at my delivery of Maths lessons, with the intention of improving practice and checking whether it is as I feel it should be. It is a kind of self-reflective practice. It was a valuable research approach as one constantly looks at different ways to improve, to achieve both personal and college strategic aims. McNiff and Whitehead (2002) agree that it is good practice to take stock from time to time in order to decide how to move forward.

I chose a small group of ten L2 Hairdressing learners studying L1 Maths. I felt comfortable working with this group as I knew them a little better as they were L1 Hair progression students that had studied Entry 3 Maths with me previously. They were not the most motivated or bright but were a typical group at this level of learning.

Data Collection Methods

I used predominantly qualitative methods; most of this cannot be measured or quantified but it can be interpreted as qualitative data to show how the practice can be judged to have improved.

I chose five data collection methods; a focus group, lesson plan evaluation, research journal and observation providing qualitative data. Assessments provided some quantitative data also. All methods except for the focus group were carried out whenever there was class contact.

The Focus Group

This was chosen because I considered this group would say exactly how they feel helping me to determine their honest opinions. This was carried out at the end of the research so the learners had an opportunity to reflect on their ideas holistically.

Lesson Plan Evaluation

I evaluated the sessions as I went along. I had made comments such as 'positive attitudes to work seen', 'students asked about recording their progress on the tree'.

Research Journal

Records of thoughts and ideas were kept in a journal and these were then reviewed, reflected upon and monitored in relation to my original intentions, purposes and consistency. Adaptations to the plan could then be made as necessary.

Observation

I found the questions that the learners were asked at the end of every session were an effective way to gather data. I observed their behaviour and body language and this helped the process of triangulation.

To test the validity I needed to establish whether the learners experience had been enhanced by using the learning tree and used standardised questions for this.

I considered my practice had improved by using the research. Action research involves researchers investigating their own practice "with a view to altering these in a beneficial way" (Denscombe 2003:75).

Assessments

Finally, I looked at the mock assessments which showed that all the learners present on the day had been successful with the test.

Arrangements, Access and Ethics

Methodological triangulation was used for this study as it bridges issues of reliability and validity. It involved the use of more than one method in the pursuit of my objective and is frequently used in educational research. Cohen et al (2007) promote triangular techniques to give a holistic view of educational outcomes.

I needed to be sure the focus group was not used to complain about irrelevant and inappropriate information, so careful instruction was necessary at the start to be sure that data was not spoilt.

The group interview relied on the interaction within the group. Although a helpful method for triangulation, surprisingly it did not provide much additional information, the group tended to confirm each others thoughts rather than stimulate new ideas within the group.

Also, the assessments were not the real tests – they were mocks due to the timing of the research. However, they are valid as data collection methods to check on learning and understanding. To ensure they were reliable they were conducted under exam conditions, their answers being produced without help to ensure they are accurate. Standardisation of questions being asked during the observation ensured the data was reliable. Validity and reliability were aided by triangulation; weekly lesson plan comments, a learning journal and a focus group, promoting analytical rigour. To confirm conclusions, observation of the group and mock tests provided supporting evidence to aid reliability of the data.

Weekly lesson plan comments were the most helpful as I could feed these into my journal, both of which helped to track what happened during the research period. The focus group was useful to triangulate but did not stimulate as much discussion as hoped, more agreement. Observing the groups reactions, comments and body language was interesting and helpful to support the findings. Mock tests did not really prove or disprove my research as I do not know for sure what would have happened in those tests had I not used the learning tree.

I made it clear to the learners that their participation in the intervention was voluntary to ensure an ethical approach to improving their learning; (Mauthner et al 2005). It was unlikely they would realise the importance of the results and data so honesty about their feelings was probable.

I did not wish to potentially abuse my position of power, so I promised confidentiality, ensuring them they had the right to withdraw at any stage to keep good faith.

Data Analysis

The data was analysed using the research questions. I was looking for common themes and sorted the data evidence by colour coding into: concepts, interest, enjoyment value, understanding and Maths views following the intervention.

I needed to make a correlation between my data and the questions I wanted answering and therefore chose to code the themes accordingly.

- Focus group data was analysed and answers put into the above themes.
- Lesson plan comments were evaluated to provide a weekly, then overall evaluation using these themes.

- The learning journal helped me to interpret whether personal constructs could be challenged and changed using the learning tree.
- Observation of the group, how they work, co-operate and any comments I heard them make during lessons – were all recorded in a journal to look for these themes
- Mock test results were used to interpret understanding of concepts.

I then considered the themes:

1. Will the introduction of the learning tree enable the learners to identify concepts that they have successfully achieved?

The learners were asked questions at the end of the first session about 'the cake problem' a problem solving exercise using laminated cards. The learner's response to this question was a unanimous 'yes' when asked whether the learning tree had helped them to understand the concept of 'problem solving.' They suggested the activity as a method of learning had helped them to problem solve whilst the tree had helped them to clarify the stage they were at with their learning and provided the motivation to learn by the plotting of their success on the tree. Data evidence of this was the observation of their enthusiasm and encouraging comments 'Can we do the tree today?' 'I get it now!' 'Why did they not do things like this at school?'

At the end of week two, learners had to draw a picture that represented how they felt about using the learning tree as a method of identifying their progress in Maths. They had completed a 'smarties' activity which involved finding the mean and range of data, drawing graphs and then eating the smarties at various stages in the task. Again, the results were all favourable; they all drew a smiling face. Two learners drew a tick at the side of their drawing and three drew a hand showing a 'thumbs up' sign. I understood the message but felt they had more than likely copied others ideas so maybe this was not completely reliable. The learners were eager to plot their success and were asking to do this as soon as I had reviewed their work. This was showing me the tree was acting as a huge incentive in their motivation for learning.

For week three, the learners completed an exercise on 'handling cash in a salon' it was a paper based activity relating to their vocation. All learners stated that they enjoyed using the tree to plot their progress. The tree facilitated the learning by providing motivation and enthusiasm. Their comments indicated that they 'understood better' and 'it was good to see where we are at'. Observation of the group showed better concentration, they achieved more within the lesson and there appeared to be a deeper learning of concepts. Comments were evidenced in the lesson evaluations: 'students were more focussed,' 'improved concentration shown,' and 'students seemed to grasp a deeper understanding this week.'

The final 'bedroom' activity was designing a room and involved shape, space and measure. This was a colourful paper based activity using scaffolding as the task progressed. I asked the learners to complete a questionnaire about all the weeks and about whether using the learning tree helped them to understand how the various concepts match the tasks in Maths. At this stage the learners answered positively but also added explanations regarding each task. 75% of questions were answered with the words 'liked' and 'enjoyed' indicating their feelings about the lessons. 'I enjoyed this because I found it easy to understand and to work problems out.' So, the combination of liking the tasks and being able to plot their success provided motivation. Many educational theorists including Bruner (1967) confirm that motivation aids the learning process.

When answering whether the learning tree had helped them to understand how the various concepts match the tasks in Maths they responded *with* 'It has helped because it shows what I have improved on' and 'because it was a fun team working exercise which we can look back on'. All learners felt that by seeing it visually they were able to identify the concepts more easily.

2. <u>Can personal constructs concerning Maths be challenged and changed through the introduction of the learning tree?</u>

Learner's views, understanding and attitudes towards mathematics are deeply influenced by their experience in the classroom. By choosing the learning tree approach to teaching it becomes more learner centred so they have the opportunity to flourish into independent thinkers. The tree encourages the learners to take responsibility for their own learning.

Being able to see their progress build step by step promoted confidence. They could see what they were capable of achieving and previous typical comments such as 'I've never been able to do Maths' ceased. Evidence of their growth in confidence was observed during this period; one learner offered help to another and positive body language in response to lessons was seen.

3. <u>Will the learning tree provide a more engaging environment in which to learn?</u>

The focus group feedback and my comments in the journal indicate that the answer is that it is more engaging with the learning tree. Discussion comments such as 'It helps you look back on what we have learnt' and 'It shows what we have done and learned about in lesson' all helped to reinforce the feedback on the tasks. The learners were very keen to be given a leaf and asked at the start and in the middle if they could 'do the tree'. Learners felt it was valuable to look back and see their own record of success.

4. <u>Will the enjoyment of Maths lessons be enhanced?</u>

The responses throughout were unanimous regarding liking and enjoying the sessions. 'I liked using the cards to work out the problems then I could get a leaf' and 'I enjoyed this task because I had forgotten about the mean and range so it was good to recap it and it meant I could get a leaf for the tree.' However, I do not feel that these responses are conclusive as the participating group was small. In addition, the exercises were all in the context of hairdressing as opposed to some abstract concept.

5. <u>Can learners achieve better results in Maths assessments</u>?

Learners were given mock tests during a Functional Skills 'mop-up' day during Enterprise week. All eight learners taking part in the research passed the mock tests, illustrating more thorough understanding, clear calculations, interpretations and explanations. Their work was considerably more methodical and neater. 70%, twenty one of my remaining thirty learners that had not taken part in the research did not pass at this stage. The statistics were positive; they all proved they could pass a mock assessment. However, the two weakest learners were absent on the day. Indications were the existence of the tree provided the motivation which in turn helped to improve the results but it was not conclusive.

Making Concepts Concrete

Many learners at 16-19 years of age will not recognise the importance of Maths concepts; they may believe that because they struggled at school they will always be at the same level. Bruner (1967) proposed the spiral curriculum where a subject or skill area is revisited at intervals. The learning tree provides a visual reminder of the concept that has been learnt. This can give young learners confidence and add value to the subject by re-enforcing the fact it is in their lives everyday. It can also be used for reference when re-visiting the concept at various stages in the curriculum.

Kolb (1984) theories also link with the learning tree, the idea of the maths concepts being made concrete with the use of practical resources and visual interpretations has proved successful. I have been following Kolb's theories on the learning cycle by reflecting on practice, then analysing experiences and data. I have been developing my methods of teaching and learning to keep up-to-date with new teaching strategies and effective resourcing of Maths lessons.

Recommendations

Swan (2006) supports the more active learning approaches to Maths and the tree combined with creative problem solving tasks are helpful resources to help motivate learners.

The data indicates that the learning tree is a positive and useful resource to support the teaching of Maths concepts. My recommendations are:

- To use the learning tree as a focal point to record the learning of Maths concepts
- Develop the learning tree further by splitting the concepts into smaller chunks, including more learner activities which can be spread over a longer period of time.
- Extend the use of the tree with other groups at Level 1 and Entry Level 3.

Conclusion

This research required thought and consideration and the process was lengthy.

Challenges were the type of students that took part in the research. The group comprised of learners that find it difficult to focus for any length of time. In addition, there is a general reluctance to learn Functional Skills subjects.

The research proved successful as the learning tree provided the motivation to learn and learners liked being able to plot their progress. Also, focussed activities help to maintain interest throughout. I should like to pilot it with other groups in the future. If they are also successful it can be used as a model for the organisation. (The organisation is striving for an Ofsted grade one status, it constantly looks at ways of improving teaching and learning, whilst matching government policy to the organisations strategic aims.)

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