

# **Mathematics Outside the Classroom**

## **Case Study by Vicky Barwell**

### **Background**

Upon joining a co-coaching group at Babington CTC, my coaching partner and I decided to focus our attention on developing strategies to engage boys in their learning. We found the research suggested that Learning Outside the Classroom (LOtC) opportunities helped to improve engagement and motivation in both boys and girls.

Following discussions and meetings with Roberto Amoroso the local authority Outdoor Education Officer whose work very much focuses on this area, I decided to take a group of low attaining year 8 students to the Leicester Outdoor Pursuits Centre (LOPC).

The objective of the trip was for my students to take part in a six week block of outdoor adventurous activities and link this to their learning in the mathematics classroom. The group was split into two groups of boys and girls.

The activities they took part in were the following:

- Archery
- Bouldering
- Climbing
- Crate stack
- Orienteering

### **Links to the Classroom**

#### **Climbing Wall**

Whilst at the LOPC, students were given stop watches and asked to record each other's time taken to get up the climbing wall.



This data was then recorded in a table.

### Climbing Wall

Name	Time taken in seconds
Dillon	
Ahmed	
Khader	
Ryan	
Kamil	
Kristian	
Fahad	
Abdul	
Sindiso	
Hamah	

In the following two classroom lessons students were expected to calculate their own speed (seconds per metre instead of m/s as it seemed more logical in the context of the activity). They were also asked to calculate the average time taken for boys and girls to see which group were faster on average. Calculations of range and median were also used. Students then wrote a brief report of how they had used mathematics in the activities and what the mathematics had enabled them to learn about the activity.

### Bouldering

The five different coloured boulders were assigned a points value of 1-5. Students worked in pairs to cross the bouldering wall with the objective of doing in with the lowest score possible.

Bouldering Score Sheet			
Name .....			
Colour on boulder	Number value	Tally	Frequency
Red	1		
Blue	2		
Purple	3		
Yellow	4		
Green	5		

Students were quick to work out that they needed to touch as few boulders as possible and avoid the higher scoring boulders. One member of the pair tallied the colours of the other member, swapping upon completion.

When back in the classroom students calculated their total score and that of other members of the class to see who had won by achieving the lowest score. Averages were again calculated to assess team performance and students completed reports on the use of mathematics in the activity.

## Crate Stack

Students were put into pairs and had to construct the tallest tower of crates within a 15 minute time period. For each crate that was used and secured they received one point.



Before their tower was toppled they also measured its height which enabled them to measure their speed of construction. (Seconds per metre instead of m/s as it seemed more logical in the context of the activity). They were also asked to calculate the average time taken for boys and girls to see which group were faster on average.

## Archery

The archery was developed into a numeracy activity by assigning numerical values to each colour. Students worked in teams aiming to get the highest score possible. Tallies were done on the number of times students hit each colour and experimental probabilities were worked out for each colour during the following mathematics classroom lessons.



## Orienteering

During the Outdoor Pursuits Centre session students followed a map course in pursuit of clues. Whilst going around the course students measured distances between places using a metre stick in order to ascertain the scale of the map. During the classroom lesson students were given a blank copy of the map and asked to fill in key features of the area shown by the map (displayed on an interactive whiteboard version). They were then asked to use the scale to determine distances between other key points on the graph and converted distances between different metric units for length.

### Outdoor Pursuits Centre - Orienteering Map questions

#### Task 1

Mark all of the numbered locations on the coloured map.  
REMEMBER TO BE NEAT AND ACCURATE.

#### Task 2

Which number is East of number 19?  
Which number is North of 21?  
Which number is South-East of 14?  
Which number is South-West of 10?  
Which number is North-East of 2?  
Which number is furthest from the main building? How far?

#### Task 3

Measure the perimeter of the high fence in cm.  
What is the actual distance around this fence?

#### Task 4

Measure the bearing of 20 from 19  
Measure the bearing of 21 from 13  
Measure the bearing of 23 from 21

## Quotes from Students

*'I really enjoyed going to the outdoor pursuits centre to do maths'*

*'Going to the outdoor pursuits centre helped me to understand why we learn different stuff in maths'*

*'Maths is a lot more fun than I thought it was!'*

*'Going climbing and orienteering and other things made the maths way more interesting and easier to understand'*

## **Impact on Students**

“The mathematics Outside the Classroom project has had a positive impact on both the motivation and the attainment of the young people who took part. They are much more engaged in their learning as they see relevance in what they learn. The entire group has made huge progress in areas such as Handling data and Number which I believe is as a direct result of taking part in the project. Although no marked differences between the sexes were found, a clear finding was that taking mathematics outside the classroom has a positive impact on the learning of all.”

*Vicky Barwell*

### **Roberto Amoroso Outdoor Education Officer concluded;**

“There is strong evidence that good quality Learning Outside the Classroom adds significant value to classroom learning and I believe this experience demonstrates this. There were clear learning objectives for these students behind every trip to the LOPC. Vicky Barwell had clearly thought and planned how this learning experience should begin before going outside the classroom, outside the classroom and then followed up on returning to school. These students clearly had fun linking outdoor adventurous activities with maths and by showing them that maths can be used everywhere in our environment, it provided that hook that engaged those pupils.”