

*This paper is compiled from three individual contributions relating to Mathematics Prison Education in Ireland.*

## **Mathematics in Prison Education (Contribution 1)**

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*This article shows how mathematics is “sold” through other subjects. Some learners are afraid of mathematics and need to lose some of the fear before they proceed. Others come in and crave mathematics, as it is “easier on the head than poetry”, so it is not possible to generalise. Thus some come to mathematics by undercover means, and others seek it out to fill their minds. Those who are keen can be taught by more conventional means while the others need a different approach.*

*This article will focus on some methods to introduce mathematics by stealth, to the reluctant learner. Topics covered include starting mathematics conversations, mediation and mathematics, interculturalism and mathematics, and assurances used.*

### **Introduction**

Wheatfield is an adult male prison in west Dublin. Prisoners are all ages, backgrounds, nationalities and types of offender.

Mathematics has been offered as a core subject, at all levels from basic to leaving certificate, since Wheatfield Prison Education Unit started in 1990. While it has not got the waiting lists that other subjects, such as cookery have, it has had a steady flow of takers. Many of these come to mathematics or “mathematics” through other teachers referring them to it for example, Physical Education, Music, Cookery Literacy or Art classes.

### **Starting mathematics conversations in prison**

Teaching in a prison is often about catching the learner’s interest and drawing them in to a subject through conversation. Examples of conversations that have proved useful in the author’s experience include the following.

#### **Greyhound racing story.**

One man came in to do mathematics one day and when we started chatting he told me he had trained greyhounds. He talked about how drugs were used to fix races and the money that was involved. He knew how certain drugs could speed up a dog and some would slow down a dog and by how much in each case. This drug taking took a toll on the dogs, shortening their lives and also their running lives. He knew how many dogs were put down each year as a result and outlined the more humane option of emigration for dogs. He knew there was demand in other countries and that Irish greyhounds could in the future go abroad to be re-homed after finishing racing, instead of being put to sleep. The

system of betting and fixing was very complex, as were as the details about drugs, their effects on finishing lengths and times. These provide perfect examples of ratio and proportion and the law of diminishing return. Coming in to the class on the first day, he did not think he was any good at mathematics but as we talked about the mathematics skills he had just outlined - measurement, comparisons, percentages, money, distance, body weights, statistics, probability and horse racing odds, his mathematics confidence grew. He was surprised to think that this was mathematics, as mathematics was “in books, with mad symbols”. This was a ready made teaching and learning opportunity.

### **Pigeon story**

One man was a serious a pigeon fan; in particular he loved a type known colloquially as a tumbler pigeon. He could describe the angle of each bird’s flight, how the wingspan affects this, how each feather was angled, and the effect of clipping the wings on the tumbling speed; the wind resistance, the food, the weights, symmetry of the markings. This offered lots of potential for mathematics work. All we need is our own pigeon loft and a programmer to computerise their movement and mathematics class will never be the same again! The depth of mathematical knowledge that this man had was vast and provided material for many mathematics classes. Moving from the particular to the abstract concept is smoother when the learner has understanding and passion about the activity.

### **Drugs**

Drugs are a feature of modern society and also feature in prison. There is currently a programme of addiction counselling in prisons, and while this has had enormous benefits for those dealing with their addictions, it also means that drugs are a feature of conversations. Even for those who have given up drugs, it is a subject that often returns to conversations, as it can be a feature of rehabilitation, to reflect back on the whole activity around addiction. People who come in to learn mathematics and who have been or are still addicted have a ready-made topic through which the teacher can teach many mathematical concepts. The division of drugs, the cost, the dose, the process of de-toxing, the sliding scale of methadone use as they wean themselves off, the weight gained as health improves, are all very relevant conversations from which the teacher can draw mathematical concepts such as addition, subtraction, multiplication, division, ratio and proportion, percentages.

### **Prison building and environment**

At times conversations can be hard to start in prison education, for example a person may be private about his hobbies, work and past life outside prison. Yet there is a wealth of material within reach simply by talking about the mathematics of the prison. Shapes, proportion, concepts such as parallel and perpendicular lines, angles and rotation are encountered everywhere. Questions that arise include the building shape, whether it is a rectangle, hexagonal or circle.

- The corridors and their angles, either parallel, perpendicular or guess what angle?
- If there is a circle in the middle and six corridors off it, how can we work out the angle at the point where the corridor starts, given that a circle is 360 degrees?
- Looking at shapes, starting with window panes and how many fit into the frame?
- How many floor tiles in a classroom?
- How many rectangle tables do we push together to make a square?
- The temperature
- Sentencing policy: differences between concurrent and consecutive sentences can help describe abstract concepts such as the number line.

### **Citizenship and mathematics**

“The aim of the Prison Education Service is to provide a high quality, broad and flexible programme of education that meets the needs of those in custody through helping them: to cope with their sentence, achieve personal development, prepare for life after release, establish the appetite and capacity for lifelong learning.” (Warner). Citizenship education is critical and mathematics is a great part of this subject. Areas such as the environment, global warming, voting, wealthy distribution and fair trade economics, genocide and war all have lots of mathematics in them. Statistical data on bar charts, percentage changes in temperature, all offer current examples of mathematical concepts. In prison often people can feel cut off from the world outside and citizenship education can help reorientation to the outside world.

Other topics that have in the author’s experience yielded rich mathematical conversations include:

#### **Gambling:**

Cards design  
 Winnings  
 Debts  
 Probability

#### **The body:**

Symmetric or not?  
 Fingers for counting  
 3 dimensions of the body as applied to area and volume.  
 How big a shadow do you cast, now and in another season?  
 How much volume of water would you displace in a bath?

#### **Music and Mathematics:**

Music and sound waves bouncing off walls  
 Number of beats in a bar

### **Mediation, mathematics and literacy**

Mediation skills training is taught as part of Personal Development and Citizenship Education in Wheatfield and some mediation concepts have great application to the teaching of mathematics and literacy to adults. The following core concepts in the process of mediation and conflict resolution can, in the author's experience, help the teacher of adult learners.

- Work with what's in the room. ( Teacher and learner are as you are, in this setting at his time; accepting it may enable learning, wishing it was different inhibits learning)
- Trust the process. (Given the right opportunity and activities, learning will happen)
- Small events can bring huge changes. ( Adults can have great "spikes " in learning as their life experience is so varied)
- Go where people are. (Start by acknowledging the interests and values of the learner.)
- Reframe (Take what they say and "mathematise" it.)
- Move with the parties ( Leave a topic if the learner wants to, no matter how interesting you find it)
- Encourage storytelling. ( This can reveal hidden skills and interests in the learner)
- Ask powerful questions ( The right questions can allow the learner to reflect on his own learning needs and his prior learning)

Mathematics is everywhere; it is just a matter of raising awareness, looking with new lenses at our immediate vicinity and applying mathematical words: thus we "mathematise" the world.

### **Mathematics and Icebergs**

The iceberg image as applied to mathematics can help us develop ways to work with learners in a non intrusive way. The top of the iceberg represents those elements that are primarily in awareness, and those deeper areas that lie below the surface and are out of awareness. Mathematics is primarily in awareness, and can be a great starting point as it helps us look at the physical world and deal with it, and so there is less potential for causing distress than with other subjects. It can be a good starting point for some learners, and is a "safe" subject; many learners talk of how home mathematics homework in a cell can "fill your head", and "relax you, like crosswords or Sudoku" when under stress, in a way that more emotional or stimulating subjects can "wreck your head". It can provide a way to the abstract part of the brain that can help sooth and detach. Learners from different cultures often find mathematics a good starting place as it transfers well; many concepts are the same in different languages. Also there is less risk of causing offence as it is more in awareness than other subjects that may evoke more emotions.

### **Assurances used in teaching mathematics**

It is acceptable often in our culture to say that we are bad at mathematics but not to say we have problems reading and writing. This gives us teachers of mathematics a great advantage as we can assure the learners that they are in good company, as mathematics

students all over the country and even the world are struggling with the subject. The following assurances have been useful in the experience of the author.

*“No one is an absolute beginner at mathematics”*. When we were babies we played with our toes, figures how many we could eat at a time, which was mathematics and measuring. We use mathematics when we move and turn up the radio and cook and eat and drink and work.

*“It’s OK to say “I can’t do mathematics”, lots do.”* Ask friends, other teachers and staff, you will be guaranteed to find more who say they are bad at mathematics than admit to being bad at English.

*“Mathematics is often taught badly”*. Some mathematics teachers are so “brainy” they can’t understand anyone who does not get it straight away, we can say. Also, some are doing mathematics and don’t really want to do it as they are not that sure of it themselves, so can not express concepts they do not get themselves.

*“Everyone has a way of doing mathematics; we just have to find yours”*. Some learn through practical ways, by doing, feeling shapes, counting fingers, others through memorising, songs or nursery rhymes! Here it can be useful to refer to Gardner’s eight intelligences, and reassure that we all have these intelligences but may need to bring in several of them before a concept clicks with us.

*“Self esteem is linked to mathematics; it’s easier when you feel good about yourself”*. Anxiety and negative attitudes to mathematics can be eased and can lead to improvement in learning, by good mathematics tuition.

*“It can fill your head when you are in the cell”*

Mathematics can lead to abstract thinking which can help us detach from stressful situations.

## **References:**

Gardner, Howard. *Intelligence Reframed (1999)*: Multiple Intelligences for the 21st Century Basic Books.

Warner, Kevin. <http://www.pesireland.org/Aspects.htm>

## Mathematics in Prison Education (*Contribution 2*)

*Brendan O' Hara*

Wheatfield is an adult male prison in west Dublin, Ireland with a population of approximately three hundred and sixty inmates. It caters for an increasing number of nationalities year on year who are serving time for all types of offences and are aged eighteen and over. The prisoners are obliged to attend the following daily activities: school, workshops, laundry, kitchen or garden. On average fifty percentage of inmates attend the school and their attendance will vary from one class a week for a short number of weeks to five days a week including night classes over a number of years. There are approximately fifty programmes of study offered to students as well as having full access to all Open University under-graduate and post-graduate programmes.

Education must compete with the aforementioned activities for students and mathematics must then compete with the many other programmes on offer. This large spectrum of choice for students results in them choosing activities and subjects, which they like and usually this correlates with activities and subjects that they are good at. Hence, the students who enrol for mathematics are usually those who have a good grasp of basic numeracy and enjoy solving mathematical problems. There are however, a minority of students with basic needs in mathematics who have come to study this subject as they recognise it as a barrier to progress in their everyday lives. Some of these students are sent to us from the workshops and have specific needs, for example they need to find area and volume or to know how to make a right angled triangle. Others come from having a trade such as building and need or wish to improve their mathematical ability.

The challenge faced by me as a mathematics teacher is how to attract more students (especially those who have basic mathematical needs) to study mathematics. Firstly, I must ask the question – Why would or should they study mathematics? I can think of many positive reasons why they should but from their perspective things might look very different. Consider the following student's attitude as summarised in this poem:

### **Maths – A Tool**

Maths! Oh Maths!  
You made me such a fool  
You etched away my confidence  
And made me feel  
A Tool

Students who come to me for help for basic numeracy often begin by telling me how bad they are at mathematics. They talk about having a mental block, about X's and Y's and not having a clue what that's all about. They talk about maths in such a negative way that a blind man could see that its no fun. They are now returning to maths because they need maths.

These students fail to see that since they ceased their formal education they have continued to study mathematics through their own subject area such as carpentry (working out lengths, angles, etc.) and/or their day to day living. Now, as adults their bank of knowledge is much greater than when they were teenagers.

I do not pretend to have the answers as to how to attract students to engage in mathematics. I have through general observation made the following points regarding pupils with basic mathematical needs:

- In prison education, which is voluntary, we get a disproportionate low number of students with basic mathematical needs.
- Students with basic mathematical needs have a negative attitude towards mathematics. This seems to emanate from a negative attitude towards mathematics in formal education, especially that of algebra.
- These students seem to under-estimate the amount they know and have learned regarding mathematics and logic through their life experience.

One of the ways that I, (with the help of other mathematics teachers) have addressed this need is to develop a folder aimed at these students. The folder is self-contained and is aimed at fulfilling the level three FETAC requirements. Each new exercise in this folder contains questions followed by a sample answer and explanations followed by similar questions. Some students (even those who deem themselves to be weak at mathematics) can complete this folder with little or no assistance. Students seem to like this method of study as it frees them of deadlines, of the pressures of examinations and they can study in their own time and at their own pace without the embarrassment of being corrected publicly.

To conclude I now teach mathematics in an ideal setting to ascertain the most appropriate mathematical content and method of delivery to my captive audience. I have the freedom to experiment. I have the interest in this subject to motivate me to design both new syllabi and methods of delivery. The students have the freedom through voluntary education to give me the feedback I need –but sadly if their feedback is negative I may never see them again.

## Mathematics in Prison Education (*Contribution 3*)

*Gerard MacElligott*

### **Chess as a tool to get students in maths:**

Maths is often perceived as a difficult subject. So difficult in fact that one nearly needs to be a genius to be any good at it. For those who haven't seen the game, chess can be seen in the same way – i.e. very difficult and beyond the reach of the average student.

However chess is not a difficult game and is accessible to most people. So the strategy is to get students interested in chess. Once the student can play chess his/her confidence grows and he/she will then feel less intimidated by the prospect of doing maths. Maths by stealth

Chess is taught as a subject in Wheatfield Prison and is also frequently played by prisoners during recreation periods. The “Open Learning Centre” in the prison which is a supervised study area often has students playing chess. This allows students studying arts type subjects to be introduced, by stealth, into the wonderful world of maths. Often inmates will see the game being played and will come over to investigate – they are, now, being lured, unknowingly into the world of mathematics. The equations are

Chess is very much a mathematical game - both maths and chess are about problem solving. In chess every move of ones opponent poses new problems to be solved. There is, more or less, instant feedback. If one fails to solve the problems posed - one loses the game. But solving the problems posed means winning and is very gratifying.

Chess can help in the understanding of many mathematical concepts. For example each of the 64 squares has a grid reference. The files (columns) are lettered a-h while the rows are numbered 1-8. So the squares on the board have references such as a1, c4, d2, h8 etc. This is of course is similar to co-ordinate geometry or a spreadsheet.

The different chess pieces move in different ways and therefore have different relative values. So when capturing an opponents piece but possibly losing a different value piece in return, one has to compare the profit/loss of the transaction.

Chess also improves mental calculation because one has to calculate possible moves before executing them on the board. With practice one can calculate more deeply and more quickly. One then starts to recognise patterns of solutions just as one would in solving mathematical problems.