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Fibonacci and the Golden Section

By Graham Connelly



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The title of this article might sound like the name of a band, but what has it to do with the education of children and young people in residential care? Stick with me, but first I need to explain that Fibonacci was a 13th century Italian mathematician who discovered an infinite sequence (1,1,2,3,5,8,13,21,34...) whereby successive numbers are derived from adding the previous two in the series. The 'golden section', or number, discovered by ancient Greek scholars, is calculated from the formula $(\sqrt{5}+1)/2$ which works out at about 1.6. It turns out that the Fibonacci sequence and the golden section are related. Divide each number in the sequence by the one before it ($1/1=1$, $2/1=2$, $3/2=1.5$, $5/3=1.666\dots$, $8/5=1.6$, $13/8=1.625$) and the ratio levels out around 1.6.

But I digress from my main topic. A recent news release from the Scottish Government landed on my desk. The release said that 52 per cent of care leavers in Scotland had at least one pass at Standard Grade foundation level or better in 2006-7, an increase of one per cent on the previous year, and the proportion gaining both English and maths at this level (a 'Closing the Opportunity Gap' target) remained unchanged at 34 per cent. Minister for Children and Early Years, Adam Ingram, said: 'There's nothing inevitable about young people who are looked after coming behind their peers in terms of qualifications and the statistics out today are disappointing.'

So, what are we to make of this apparently disappointing news? Well, three things need to be acknowledged immediately. First, we need to be careful not to see these particular statistics as a measure of the quality of care provided. Without going into the complications of how the figures are compiled, they represent a 'snapshot' sample of all young people aged 16/17 looked after by a local authority on the census date of 31st March and who subsequently left care. Secondly, considerable efforts have been made by the previous administration, the present Scottish Government, local authorities and dedicated professionals to address a very difficult – and deeply shameful – social problem. Thirdly, as Hare and Bullock¹ have pointed out, there is a danger that the 'shock therapy' of poor attainment statistics 'will merely reinforce negative stereotypes of looked after children that not only insult them as individuals but also make it virtually impossible for them to make their way in the world.' The work by the Social Work Inspection Agency (SWIA), which resulted in a series of influential reports under the general heading of Extraordinary Lives², included a report based on the positive experiences of adults with care backgrounds. The authors identified five factors which emerged in the life stories of their interviewees:

Having people in your life who care about you;

Experiencing stability;

Being given high expectations;

Receiving encouragement and support;

Being able to participate and achieve.

What is striking about these factors is that they boil down to one general characteristic – high quality relationships. There is nothing implicit here about qualifications of carers, or detailed knowledge of the school curriculum, or specialist knowledge of school subjects. There is, however, consistent research evidence indicating that the quality of residential care is best where a unit has a clear ethos and where that ethos can be



¹ *Adoption & Fostering* 30 (4): 26-36, 2006

² <http://www.scotland.gov.uk/News/Releases/2006/09/14091356>

articulated by staff members who believe they are engaged in a shared purpose. A case study was provided by Gallagher and colleagues³ in a paper in which they described a unit with an ethos centred on valuing education. The key elements of the unit's policy on education were set out in a set of policies and practices, one of which is shown here for illustration.

Policy	Practice
Establish expectations of children in regards to education	Gave children clear and consistent messages as to what was required of them in terms of their own education; used reinforcement and sanctions to support these messages.

It is clear that a number of things need to happen if educational experience, and therefore attainment, are to improve and the Scottish Government report *Looked After Children: We Can and Must Do Better*⁴ has established a clear agenda for eight working groups with a very simple message: 'The problems are deep rooted and difficult but not impossible to deal with.'

There is a lot happening, such as government-funded projects in 20 local authorities, including Inverclyde's Children's Champions' pilot, and funding to improve understanding of the role of corporate parents. Other work includes improving data collection and transfer, the development of a web site, revision of training materials and providing clearer guidance for school designated senior managers (DSMs). Space permits me to elaborate on only one aspect. National Assessment data show that looked after children fall behind other children in reading, writing and mathematics and that the gaps are evident at an early age, when systematic intervention would make a huge difference. The deficits are greatest for children looked after at home and for those in residential care. And yet these children are vulnerable to the twin evils of missing out on being assessed and also receiving no effective support.

³ *British Journal of Social Work* 34 (8): 1133-1160, 2004

Photos: A glimpse of the Summer Academy programme at Strathclyde University, for S3's who show potential. This includes some LAAC. Daily coach travel from various Strathclyde regions is organised.

⁴ <http://www.scotland.gov.uk/Resource/Doc/162790/0044282.pdf>



These photographs are a glimpse of the Summer Academy programme at Strathclyde University, for S3's who show potential. This includes some LAAC. Daily coach travel from various Strathclyde regions is organised.

Residential staff can help in two important ways. First, they can be proactive in discussing progress with teachers, even where that means arranging special meetings outside the normal cycle of parents' evenings. Secondly, since research suggests that the contribution of the home is probably greater than the school in relation to reading, care staff can do a lot to promote literacy, and a significant amount of impressive work is already evident within residential settings in Scotland.

But, to return to the significance of the title of this piece: it encapsulates a very simple message but it may have taken me a long time to recognise it. I learned about the Fibonacci series at school. But it was presented as a mathematical quirk and quickly forgotten. Recently I discovered that it is present throughout nature. For example, if you view a sunflower from the top, the number of leaves appearing successively down the stalk follow a Fibonacci sequence. The explanation is in the optimum placing of leaves for maximum access to light. The 'golden section' also has real life applications but I leave this for the reader to research. I related this personal experience to a story I heard in a meeting of 'literacy co-ordinators' for children's units in one local authority about planning a unit holiday. The young people without adult prompting went off to compile a holiday guide book which not only included travel directions but provided details for excursions and historical and geographical information along the way. This was learning with a purpose but the young people would not have recognised it as having much to do with school or exam attainment. The point is that it would not have happened without the groundwork laid in a series of collaborative efforts by staff in social work, psychological services, home-school liaison and IT services. The unit had access to the same computer network as schools, there were reference books available and the young people had been encouraged to join and use the local library. No-one should underestimate the challenge of improving outcomes for looked after children, but providing the optimum environment is not rocket science – or even maths.