

**Final Report for
“Patterns in the Mind ; Patterns in
the World”**

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Wellcome Trust**

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Patterns In The Mind, Patterns In The World

Pulse Project - Final report to The Wellcome Trust

Background

This was a partnership project led by DAISI (Devon Arts In Schools Initiative) and Phil Smith – a theatre practitioner. We knew of each other's interest in exploring science through theatre and were interested in piloting a project with young people in 2 secondary schools in Exeter with the view to seeking further funding should the 'pilot' project fulfil its aims. We offered the secondary schools 8 sessions using physical theatre to explore scientific concepts which were sometimes complementary to their science studies and sometimes were beyond what they would have studied. The schools that joined the project were Priory High School and St James' High School. The way each school treated this opportunity was very different, as was the composition of the group at each. This provided a good contrast from which we could learn. The work took place in Priory November-December 2003 and in St James' January-March 2004.

Process

The project set out to explore whether understanding the mind's experiencing and processing of information from the world, together with research into the patterns in that world, might have positive applications in a science educational context. The idea was to reference the idea of 'dynamic patterns' that occur irrespective of scale and context as described by J.A.Scott Kelso appearing materially in situations as diverse as human social interaction and the morphogenesis of a fruit fly cell **or** as imaginative rather than 'real' patternings that assist scientists in making connections that lead from data to hypothesis, as described in Evelyn Fox Keller's 'Making Sense of Life'.

The project would explore whether these ideas could form the basis for a performance or art work specifically for young people – presenting them with a picture of how their minds make pictures, and how they do (and can) harness that pattern-making in their daily lives **and** how they might extend that to using patterns in their lives and in their education.

After a successful application DAISI organised meetings between Phil Smith and the key teachers at two schools in Exeter. At these meetings the ideas of the project were sketched out and the teachers responded with their own needs and hopes. The project was to engage with pupils in years 8 and 9. Each school was offered 8 x 90 minute sessions in which the students would be encouraged to explore patterns in the natural and physical world. Both schools asked that there be some performance outcome from the project.

The structure of the sessions changed and developed, but the basic principle grew stronger and more emphatic as experience accumulated: that the sessions should begin with the simplest thematic stimulus ("show me how a wave in the sea might form") and then should build on the ways that the students made these simple suggestions complex in their invention of physical patterns to meet the task.

A mistaken tendency at the start of the project was for the sessions to begin with simple stimuli and then increasingly to introduce more complex ones. The problem with this was that students began by responding creatively and were excited by the significance of the 'leaps' they were making spontaneously, but were then hemmed in by the need to model rather literally the increasingly complex stimulus-information given toward the end of the session. There was a profound danger: this structure implied that creativity in science is a superficial introductory phase (icing on the cake) before the real mechanistic discipline kicks in and leaves the creativity behind. Learning from this structural mistake, the sessions were altered so they progressively attempted

to keep open the opportunities for the students to think broadly and topologically and avoid mechanistic 'words into equivalent actions' modelling tasks.

In the deployment of simple stimuli, inviting a complexifying response, the sessions were different from the use of modelling that some teachers were using in the classroom. Though when the students arrived at such models as they might be expected to create in the classroom this was cause for celebration and explanation/extrapolation by facilitator or teacher. Another difference was the way that sessions could range from patterning familiar subjects from the curriculum – cells, particles, interdependence - to subjects unlikely to be approached in the classroom like optic array, the question of the 'self' and speculative ideas like 'memetics'. This mixture was slightly challenged at St James High School, where the Head of Science was very keen that we experiment on Key Stage Three subjects – the basic idea and the structure seemed quite able to contain this demand while also stretching the subject area beyond what would usually be taught in the classroom: so, for example, the session on particles not only looked at particles in solid, liquid and gas states, but also at the idea of a miniscule imbalance between matter and anti-matter.

The genres of physical patterning that the students could deploy in creating their patterns in response to these diverse stimuli were not defined for them. Instead, the students could draw from whatever genre or style they wanted, inventing as they wished and were able. This threw the emphasis away from judgements about the aesthetic value or cultural meaning of the patternings and more on to keeping the students in a direct physical relationship with each session's themes.

In the sessions the use of dialogue and naturalistic improvisation was avoided, with the exception of parts of one session at Priory School - the students enjoyed this anomaly, but it was essentially about the students placing a narrative barrier between themselves and the themes. It is exactly this holding at a distance (where the art promotes itself at the expense of the science) that the project sought to avoid by its rather ascetic process of physical patternings (keeping naturalistic narratives at bay, even in the Patterns In the Mind session).

'Hard science' then followed (and then continued to interrupt and re-direct) the initial intuitive patterning responses of the students (sometime reinforced by the students' use of direct or applied knowledge from their studies or from other life learning). This 'hard science' took the form of relatively brief explanations, demonstrations and/or illustrations from the facilitator or from a science teacher present – the facilitator welcomed interruptions and disruptions for explanation from teachers. Sometimes the students did not welcome these – these interventions reminded them of conventional lessons – but the effect was often to suggest unforeseen possibilities for new physical patternings. And the element of disruption and open-improvisation - the facilitator checking something in a book or a teacher going to fetch a visual aid in order to give an impromptu illustration - was important: to show that while the patternings were always being referred to the science, the particular patternings the students devised were changing what science it was that the facilitator and the teacher responded with.

The facilitator had to be prepared sufficiently both to follow a session plan and/or to depart from it in response to the students' reaction to any given stimulus. So a preparation around the theme, rather than of a fixed, linear 'progression' from it, was necessary.

At the end of each session – unlike most drama sessions – there was no final product to be 'run', there was no composite sequence into which the patterns could be put (although in the body of the session opportunities for such combining did sometimes occur). Instead what the students took away was the journey (that where they had responded creatively they had played a part in leading); a journey in which they physically partook in order to bodily map processes, relationships, developments and boundaries in the physical and natural world, into which the sessions repeatedly ask them to site their consciousness as one patterning among many. This

feedback – making explicitly physical the consciousness they applied to the corporeal patterning tasks – was a crucial structural element to the project.

As part of his continuing preparation, once the sessions were underway, the facilitator, Phil Smith, visited a clinical psychologist, a mathematician and one of the editors of the Journal of Consciousness, and fed elements from all these meetings into the sessions.

In both schools where the sessions were held the teachers were very keen, for 'political' or institutional reasons, for some performance outcome to accrue. In both cases the students responded enthusiastically to this and devising and performing seemed to reinforce in students' minds much of what had been learned in the sessions. At Priory School it was the facilitator's responsibility to write/collate and stage this performance. At St James High School the drama teacher and science teacher (head of science) who had been closely involved in the sessions asked to be allowed to make their own piece – this was an unexpected and welcome emergent development. These performances met a need among the students for a way of marking the completion of the sessions, and at St James High by choosing to perform to a neighbouring Middle School the students were given a clear 'teaching' role – passing on the patterns to others.

Although final performances were not in the original project plan, DAISI and Phil Smith responded to the schools' requests – and learnt a great deal by doing so.

Outcomes

16 sessions of 90 minutes duration were run in two schools for students from years 8 and 9 (an average of 8 students per session at Priory School and 15 per session at St James High School), each based on a particular theme: waves, energy, measuring and constants, cells, crossover patterns in the natural world, patterns in the mind, light and vision, gravity and relativity, particles, interdependence, etc. – until the final sessions which were used to generate the physical actions required for the performance. This was a series of sessions that, particularly at St James High School, seemed to command the enthusiasm and loyalty of the students involved. In both schools from the second session onwards a core group of attenders was established and remained loyal to the project until its completion.

A model for a session gradually emerged – in which simple stimuli were used to encourage more complex patternings of the theme subject. For example, a simple suggestion to show how a particle of light might behave generated patterns recognisable as those of reflection, refraction and dispersion. Each of which could then be re-described and used as the catapult to new devising stimuli.

Perhaps the most telling aspect of the sessions has been that, despite the unevenness of some of the sessions – where sometimes ideas would misfire (for example, trying to model a BZ reaction in a large hall and realising that other than hanging from the ceiling it wasn't possible to 'read' the patterns beginning to being formed) – the students always continued to create, and then create again, physical responses to suggested ideas. One of the problems of assessment is that one looks to the students to articulate what they have taken from the project, verbally or textually. Whereas, this was a project about students responding in terms of space – their own corporeal space in relation to the space of everything else. A more telling assessment, internal to the sessions, might be the final session at St James High School, when in preparation for their performance the students were able, in 90 minutes, to produce variations on about twelve previously devised and three new patterns (and these were only the ones used – so the actual number of patterns improvised in the session was higher). This represents a facility with patterning, and a physical/scientific 'vocabulary', that would have been unlikely to have otherwise arisen spontaneously.

At Priory School one science teacher attended all the sessions. At St James High School the Head of Science initially attended and then asked various of his science teachers to attend for one session each as part of their professional development. This was an unpredicted development. In future, where schools wished to participate in this deep way, the sessions should take account of this – the facilitator always attempted to engage the science teachers, but their engagement could have been prepared in some way. As it was, they were trying to get to grips with what was going on, without the benefit of having been through previous sessions like the students, while also being challenged to participate actively.

At St James High School the project engaged the enthusiasm of the Head of Science who began to see all sorts of possibilities for these physical patternings – in terms of a method for assessing how far students had understood material conceptually, topologically and in ways that they could then apply to tasks, rather than how well they could repeat given (textual or mathematical) formulae. Although this was not, and probably will not be, central to the original idea of this project, nor its development, it is a gratifying potential spin-off.

What professional development the teachers experienced was purely fortuitous as this was not planned into the sessions. But this aspect should be part of any future project's pre-planning with schools.

Final performances: the Priory School performance seemed to greatly enthuse the performers, but probably somewhat bewildered an attentive audience at what was the school's Christmas entertainment. By not conceding to a simplistic entertainment the 'difficulty' hopefully at least gave the performers respect for what they had achieved in the sessions and for the science involved. The St James High School script was Symbolist in structure and this allowed the patterns to metaphorically and literally take centre stage. The non-naturalistic form maintained the ethos of the sessions. The 17 students who participated in the performance were extremely enthusiastic about the experience and keen to repeat the performance to others.

Expenditure

	Budget	Actual
Income		
The Wellcome Trust	3,000	3,000
Expenditure		
Director/researcher	1,950	2,100
Event costs	150	150
Venue hire	150	0
Admin costs and overheads	<u>750</u>	<u>750</u>
Total	3,000	3,000

Reflections

a/ This was always a 'pilot' project and as such was always a partial one, only a part of what a fully formulated project might become. A holistic version of this project might offer a considerably more powerful experience for the participants. The project had set out to explore the potential in 'dynamic patterns' for creating a performance. The success of many of the sessions suggested that a future project might consist – at least in part – of just such a sequence of sessions, re-sculpted in the knowledge gained from the ones created for the 'pilot'.

b/ The above conclusion in no way excludes the possibility of a performance as part of a future project (perhaps as an initial stimulus or introduction to the idea, or a halfway house intervention to introduce a new sophistication in the use of patterns that the students might not generate spontaneously and also introduce parts of a supporting framework (mini-clubs, adjuncts to a science club, etc.) in a culturally reinforcing genre, but the direct engagement of the students in making the patterns clearly should be at the heart of any future project.

c/ In order to develop the sessions themselves, the basic principle used in the 'pilot' seems sound and effective. The lesson that the stimuli should be kept simple at all times and that the complexity should come from the students' responses needs to be applied in any future project. Numerous lessons were learned about how to re-structure individual themed sessions – after the sessions were over the most enthusiasm at St James High School was expressed for the 'waves' session where the development of pattern after pattern was perhaps the most free-flowing. Sessions might significantly benefit from having an open-minded dancer/choreographer/s to work with the facilitator in order to help the students achieve those patterning where they are pushing their physical and devising skills in order to realise the complexity of what they have perceived in the theme.

d/ The two final performances by students demonstrated the appetite for a 'closure' and celebration and a passing on. Any future project could certainly encourage the schools to take charge of making their own performances – with the assistance of facilitator/s or the project-managing body (Phil Smith assisted the St James High School performance by suggesting changes of detail to both script and staging and running the session in which physical sequences were revived and gaps filled).

e/ The students' and teachers' enthusiasm for the final performances should be enjoyed, but not allowed to become a mask for the only partial success of these as closures for the series of sessions. The basic patterning idea has greater potential for opening up an enthusiasm for the sciences than this 'pilot' realised. A key part of that realisation could be a different kind of closure that might still include performance, but would predominantly be directed towards encouraging and supporting the continuation of the participants' involvement in patterning into new media (interactive use of the net, formal or informal scientific 'superheroes' clubs for sharing ideas about science, a 'magic box' of science experiments/measurements/monitorings that can be carried easily in a pocket or rucksack, etc.): in other words, ways of transposing the desire for theatrical narrative into a performative and hybrid use of more varied media. This implies the employment of specialists to introduce these possibilities and give know-how back-up to students wishing to pursue them. The positive role assumed by the St James High School students as 'actor/teachers' in their performance of the patterns to a neighbouring Middle School suggests that similar information-spreading roles in different media and contexts (eg. creating graphic commix, websites, etc.) for passing on the patterns might be a good way for the students to reinforce and continue their learning beyond a sessions and performance structure.

f/ The involvement of teachers went to a new level at St James High School and this level, as a baseline requirement from a participating school, should be made clear at the earliest meeting/s. At least one science teacher and one drama teacher should be present at each session. They should be encouraged to be informal, active and occasionally interventional – any danger that they will pre-empt a carefully prepared session structure (it happened a couple of times and it didn't stop the session!) will be overwhelmed by the positive structural message about science as an improvisatory discipline, responsive to new, often unexpected information.

g/ Any integration with the science curriculum should be kept under the control of the project's managers. The project crossover with the curriculum was almost always fruitful, but if the project has long term aims they lie in the deep rooting of an approach to the natural and physical sciences for the stimulation of lifetime, creative commitments to those disciplines. And to an underlying cultural siting of those disciplines within an engagement with patterns (the cultural 'coolness' of patterns needs to be drawn upon in encouraging the students in an applied commitment to the sciences), patterns that can be applied across social, scientific, psychological and cultural disciplines. For this reason the sessions should not be subservient to the demands of curriculum teaching, but welcome those, hopefully many, instances where there is a beneficial overlap.

h/ Prepared illustrations – like the Big Bang in a bowl or the Baywatch theory of refraction – were successful in terms of being memorable and engaging students' attention. The frequency of such performative illustrations could be profitably increased.

i/ There were two key areas where this 'pilot' failed, but in failing the attempts suggested solutions:

1/ At both schools, sessions on patterns of consciousness were held. Both worked in parts, but given the remarkable content on which they could draw the impact that should have been possible was not achieved. The experience of the whole series of sessions was that patterns of consciousness could be successfully addressed in an integrated way, re-appearing in a number of the other sessions. (Indeed, this suggested that while individual sessions should retain their flexible structure, a new project structure could include a developing pre-planned 'narrative' of patterns of consciousness from session to session.) Having said that, an explicit 'patterns of consciousness' session may still be appropriate, but would need to be re-thought and made more appropriately affecting.

2/ Anecdotal evidence from the students' feedback suggested that the students were not consciously applying what they learned from the patterning in the sessions to their daily lives or to how they "saw the world". Often what was being presented to them – ideas about the 'self', about anti-matter, relativity, Big Bang, the brain's regeneration, etc. – was challenging to their 'world views', but the sessions lacked a framework to feed this impact into their everyday lives. Any future related project could counter this absence. Such a framework (perhaps mini-clubs, or an adjunct to a school science club, or suggested activities and tasks given to the students on cd or in text such that they can make of them what they would as individuals or in informal social groups) should include a culturally affirming encouragement of the students' excitement about making the patterns and also the opportunity for them to place their pattern-making (in comix, websites, in verbal tasks like generating conversations with friends, or in inventing fantasy/science narratives including patterns, etc.) into their own social worlds in and beyond school, so they could pass on what they have learned to others. Crucially these frameworks should **consciously and explicitly** use patterns, their form should be in patterns, not just be about patterns – so the students are set tasks to create emergent narratives or information spreading effects and to trace their developing patterns. This framework could be established, at first, parallel to the sessions, but timed to flower beyond the sessions and the final performance or any other such closure.

In Conclusion

The project has been a fascinating and productive experience for everyone concerned. It has led to new opportunities for theatre/science collaboration within school, between schools and between organisations. It has led to new possibilities being considered in Devon for Continuing Professional Development for Science teachers. It has led to Phil Smith presenting at 3 forthcoming conferences (The Wellcome Trust conference, the BA Science Conference at the University of Exeter in September and the Theatre of Science conference at the University of Glamorgan in September). It has also given Phil new ideas for further exploration.

We would like to thank The Wellcome Trust for making this all possible.