



Making It

Studio teaching and its impact
on teachers and learners

Guy Claxton, Bill Lucas and Ellen Spencer

Published by the Centre for Real-World Learning at The University of Winchester, 2012
Winchester
SO22 4NR

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ISBN: 978-0-9571653-0-4

ACKNOWLEDGEMENTS

This research would not have been possible without the willing involvement of three London schools, their headteachers and senior staff and, most of all, the six teachers who gave up their time to undertake this research. We are enormously grateful to them.

We are also very grateful to Professor Louise Stoll from the Institute of Education in London who acted as our critical friend throughout the project and to Hilary Hodgson who commissioned this research and greatly helped us to shape it. Our thanks also to our field researcher Melanie Ledwith.

Finally, we are indebted to a number of individuals who gave up their time to attend our research dissemination event. Their constructive input was of great value in shaping this final publication:

Bob Bailey, Advanced Skills Teacher - Stanmore Park High School
Katy Bevan, Artist - Crafts Council
Jonathan Birdwell, Head of Education Research - Demos
Susan Byatt, Deputy Head teacher - Ludlow CE School, Shropshire
Emily Campbell, RSA projects - RSA
Deborah Carter, Assistant Head teacher - Bullerswood School, Bromley
Rebecca Cramer, Senior Officer Classroom Leadership - Teach First
Jim Dobson, Director - Pearson
Edward Fennell, Writer and Journalist - The Times
Chris Gerry, Executive Principal at Future Schools Trust - Future Schools Trust
Linda Gregory, Chief Executive - University of First Age
Claire Herbert, Researcher - Making Learning Work
Prof Alice Kettle, Artist - University of Winchester
Pedram Parasmand, Senior Officer Teach On - Teach First
Bernie Peploe, Executive Headteacher - Fulham Cross Girl's School
Yvonne Roberts, Senior Associate - Young Foundation
Kate Shoesmith, Senior Manager Policy & Practice - City & Guilds Centre for Skills Development
Sarah Smith, Researcher - Making Learning Work
Prof Louise Stoll, Visiting Professor - Institute of Education, London
Charlotte Taylor, Director of Learning - Shireland Collegiate Academy, Smethwick
Simon Taylor, Education Manager - The Making
Kirsty Tonks, Director of e-Learning - Shireland Collegiate Academy, Smethwick
Liz Walters, Programme Manager 14-19 - Learning and Skills Improvement Service
Maureen Ward Educational Advisor - London Borough of Hammersmith & Fulham
Prof Mick Waters, President - The Curriculum Foundation
Joseph Ellison, Senior Officer - Teach First
Manjit Shellis, National Manager - University of the First Age

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EXECUTIVE SUMMARY

Making It grew out of our concern that lessons could beneficially be organized in ways that are closer to the craft workshop or studio than to conventional classrooms, what we have called ‘studio teaching’. Specifically we wondered whether, over a period of less than a term, teachers could create studio-style lessons which would enhance students' engagement, improve attainment and develop the kind of learning habits of mind, or wider skills, which characterise successful 21st century learners.

An extensive review of research and practice enabled us to develop a seven-dimensional model of studio teaching. Having successfully trialled this model with a group of secondary school teachers, we believe that our conceptualisation of studio teaching and, by implication, of ‘studio learning’, is itself a real achievement. We have specifically designed a template for instructional design which can be applied in most ‘academic’ as well as in more practical subjects.

The six Design and Technology teachers who committed their time to take part in our research helped us to refine our thinking and validate the studio teaching model. More importantly they have shown that, without coming from the specialist arts backgrounds more commonly associated with studio approaches, they both understand the principles of studio teaching and are capable of changing their habits to teach in a recognisably different style, albeit for a short while with one specific class. This shift in practice arose from a combination of professional development, the expertise and support of the Centre for Real-World Learning and the creation of a small professional learning community.

Most importantly, our project has shown that, as a result of this shift in students' educational experience, their behaviour changes in a number of ways:

- They became more resourceful, resilient, reflective and collaborative in their approach to learning.
- They generally became more engaged.
- 34% exceeded their predicted grades.

While our study was small in scale we believe that our findings have some potentially significant implications for practice, for research and for policy. These include:

1. Schools may want to use studio teaching approaches across the curriculum as a means of enhancing engagement, improving attainment and developing students as lifelong learners.
2. Those providing continuing professional development for teachers may be able to learn from the ‘develop with’ rather than ‘done to’ approach to professional development we found to be successful.
3. Other researchers will, we anticipate, want to further test our model in a wide range of curriculum contexts and phases.
4. Given the current interest in Studio Schools, University Technical Colleges and given the ongoing concern about the quality of some vocational pathways, our model of studio teaching may provide a useful pedagogical framework for all teachers to ensure that student learning experience continues to improve and that the dispositions they acquire have real-world relevance.

If *Making It* helps identify the design features of an educational environment in which today's learners can develop the collaboration, creativity and critical thinking displayed by committed craft apprentices in well-run real-world workshops or studios, we will consider that we have made a useful contribution.

1. INTRODUCTION

'In schools, we create artificial learning environments for our children that they know to be contrived and undeserving of their full attention and engagement. Without the opportunity to learn through the hands, the world remains abstract and distant, and the passions for learning will not be engaged.'

A technology teacher¹

Imagine a group of craft apprentices – sculptors, jewellers or weavers, say – working and learning together in a communal environment. Under supervision, they work on progressively harder projects that tax and develop their individual technical skills. Techniques that once were clumsy become subtle and sophisticated; and tools that were wayward become natural extensions of their thinking and crafting. But they are also developing more general attitudes and habits. They are learning to imagine more fruitful possibilities, and to reflect on and evaluate their own progress for themselves. They are learning how to 'graft' when things are not going well. And, through interaction with both tutors and peers, they are learning to learn from one another: they watch and co-opt skilful behaviour, borrow and adapt creative ideas, and both support and critique one another's evolving products.

A somewhat rosy image perhaps – but it seems to embody a kind of learning that is found only patchily in many schools, where learning is often more individual, piecemeal and lacking in intrinsic value. It seems to contain several of the features that young people themselves say they respond to well – the chance to work on something difficult that produces a tangible and novel product; to stick at it by themselves; to have some say over how they work and what they are working on; and to learn with and from their peers. In the project on which this publication reports, we asked: would desirable things happen in a classroom if the ethos was brought closer to that of the craft workshop or studio? Would the opportunity for protracted 'making', in a collaborative and reflective atmosphere, lead to the development of valuable learning habits, as well as to higher levels of engagement, performance and achievement? And perhaps most importantly, would teachers see the value of this kind of approach *and* be able and willing to adapt their practices?

1.1 THREE CONCERNS FOR EDUCATION

Making It was developed in a climate of three major concerns about 21st century education. The first concern is the serious lack of engagement in their education by many young people, especially – but by no means exclusively – by those who are not naturally studious. There are, of course, many possible and well-rehearsed reasons behind this disaffection, but we wondered if one factor might be the constitution of the conventional lesson, classroom and timetable: not so much the 'relevance' or otherwise of what was being taught, but the way that the learning environment was being set up. Perhaps some young people do not take well to learning that is predominantly solo; where tasks are bite-size and constantly interrupted by the bell; and where the outcome was a mark rather than a solution to a genuinely felt problem or urge. Maybe this, rather than a hypothetical 'lack of ability', was behind some of the worrisome levels of disengagement, particularly amongst secondary school students.

¹ Quoted in Crawford, Matthew (2010) *The Case for Working with Your Hands: Or why office work is bad for us and fixing things feels good*. New York: Penguin.

Harvard's David Perkins, in his recent book *Making Learning Whole*², has argued that traditional education has suffered from two 'ailments' which he calls 'elementitis' and 'aboutitis'. Elementitis involves breaking down complex bodies of knowledge, and their associated skills, into smaller ingredients which students are supposed to have to master, before they can put them back together again and start to 'play the whole game'. The trouble with this assumption – as well as being often untrue – is that the elements on their own lack meaning, and not all students are willing to take on trust the assertion that this is the way it has to be, and it will all turn out for the best in the long run. Increased emphasis on objective testing and on modularisation have meant that elementitis has, in some places, recently got worse.³ Aboutitis refers to the tendency in schools to talk endlessly 'about' subjects, but much less commonly to involve students directly in the activities that enable knowledge to be created and tested out. They learn the skills of retention, comprehension, manipulation and recapitulation, but not so often those of imagination, exploration and appraisal. Obviously, you do sometimes have to study the elements, and to understand what others have written and thought, before you can get going, but Perkins wonders whether the traditional didactic classroom has got the balance wrong.⁴ We conjecture that students might be more engaged if they were able to learn more often through extended projects that were genuinely tough (and hopefully satisfying), and less through the bite-size curriculum. And, as a corollary, we wonder whether levels of disruptive behaviour might drop. Some disengaged pupils certainly vent their frustration through disruptive behaviour, making learning harder for other pupils, and teaching more stressful and disagreeable. People who are stretched and absorbed by what they are doing tend not to muck about. So would studio classrooms be calmer and more harmonious places?

Secondly, behind these worries about engagement lies real concern about students' lack of achievement, and especially at the moment, about how to 'narrow' or 'close' the 'gap' between the most and the least successful students (in examination terms). Self-evidently students who are not engaged – who are not cognitively locked on to what they are studying – are not bringing their mental resources to bear on the lesson, and thus cannot be stretching and expanding those resources. People are not sponges, and merely putting someone in the same room as an excellent teacher does not guarantee that they will learn anything – if they are not engaged. So our second conjecture is: if students were in an environment that more effectively invited their engagement – such, maybe, as a workshop or studio - would their levels of achievement improve? Would the change in the teaching and learning milieu help the lower-achievers to engage more profitably, raise their levels of achievement, and thus maybe narrow the troubling gap? In education systems which judge 'success' predominantly on the basis of examination grades and test scores, this worry is the most visible.

However there is a third concern that is, to many people, at least as – if not more – important than issues of engagement or attainment, and that is the extent to which education is preparing young people to flourish *beyond* school. Many countries are concerned that traditional forms of curriculum, pedagogy and assessment do not reliably help to equip all young people with the transferable skills and attitudes they will need for employment, for coping with the vicissitudes of personal life in the 21st century, or even with the demands of further or higher education. Significant numbers of bright young people arrive at prestigious universities clutching an impressive sheaf of credentials, but

² Perkins, David (2009). *Making Learning Whole: How Seven Principles of Teaching can Transform Education*. San Francisco: Jossey-Bass.

³ Perkins (ibid) writes 'The U.S. 'No Child Left Behind' policy has both narrowed and fractured the curriculum. What's not relevant to the test gets dumped, and what is relevant gets chopped up into test-sized bites.'

⁴ This is exactly the same argument that has radically changed the nature of teacher training from sitting in a lecture theatre consuming theory about the psychology, history, sociology and philosophy of education, to getting out into real classrooms and much more rapidly learning to 'play the whole game' of teaching by experience.

flounder when they hit circumstances that call for greater responsibility, self-organization, resourcefulness and resilience than they are able to muster. Employers the world over are calling for schools to pay greater attention to the cultivation of habits of mind such as creativity, collaboration, effective communication, initiative and responsibility. A recent survey by global education provider EdExcel found universal dissatisfaction with education as a preparation for employment.⁵ More broadly, many governments are worried that schools are not preparing people to cope with the complex and intricate demands of 21st century life.⁶ Our third conjecture is that more opportunity to engage in extended problem-solving at school might be a better incubator of these 'key competencies', 'wider skills' or 'learning dispositions' than the traditional piecemeal, teacher-led curriculum.

1.2 THE VALUE OF MAKING

It is perfectly possible to create a studio-like atmosphere in any school subject, and there are many examples where this has already been tried. English can be 'taught' by turning a class into a newspaper office, and having the students play all the roles necessary to produce a proper newspaper, on time. A History class can be organized into a research community collecting and validating evidence about a local historical event. Maths students can be convened into different groups and given open-ended problems to inquire into. There are even whole schools that function as small towns, with the students running business, handling budgets and so on. Where such innovations have been evaluated, they tend to show a variety of benefits in terms of both achievement and personal development. Jo Boaler, for example, found that an extended problem-based approach to teaching mathematics produced slightly better GCSE results than a good, traditional school control, and also left lasting and flexible habits of mathematical thinking in students' minds for eight years or more (whereas the lasting benefits of the more traditional approach were negligible).⁷

Part of our intention, in our own project, was to explore in more detail the dynamics of the studio-like learning experience that could have been created in any subject. We chose, however to focus our attention on one of the subjects where studio learning might be most at home: Design Technology (DT). And we did so because of our next supposition: that there might be something particularly engaging about the process of crafting a physical object – at least for some students. While some students clearly do get enormous satisfaction from crafting a story, a poem, or a mathematical proof, there are many others who find it easier to engage with projects that require physical tools and materials.

Indeed, it may be that this kind of physical crafting and practical problem-solving cultivates habits of thinking and learning that are of real-world, transferable benefit more reliably than do some of the traditionally more highly esteemed subjects such as Maths or Science. In his book *The Craftsman*, Richard Sennett argues that 'It has proved easier to train a plumber to become a computer programmer than to retrain a salesperson [because] the plumber has developed craft habit and material focus, which serve retraining'.⁸ In other words, the kinds of concrete problem-solving which are required in the arts, crafts and trades seem to cultivate learning-oriented habits of mind that stand one in good stead when new challenges and changes appear, and to do this better than the more abstract kinds of learning that are more highly valued in traditional schools. The plumber or

⁵ Hall, Ross (2009). *Effective Education for Employment: A Global Perspective*. London: EdExcel.

⁶ Lucas, Bill and Claxton, Guy (2009). *Wider Skills for Learning: What are they, how can they be cultivated, how could they be measured and why are they important for innovation*. London: NESTA.

⁷ Boaler, Jo (1999). *Experiencing School Mathematics: Teaching styles, sex and setting*. Buckingham: Open University Press.

⁸ Sennett, Richard (2008). *The Craftsman*. London: Allen Lane.

hairdresser, Sennett is suggesting, has developed habits of attending and investigating, thinking things through and exploring possibilities, evaluating and adapting, that the A-grade Science or History student may not have needed to develop. At the present this is more of an informed hypothesis than a well-evidenced fact, but it is an idea which we have found stimulating and, if true, of considerable significance. It is also an idea with a long and illustrious pedigree. In his treatise *On Generation and Corruption* Aristotle wrote:

‘Those who dwell in intimate association with nature and its phenomena are more able to lay down principles such as admit of a wide and coherent development; while those whom devotion to abstract discussions has rendered unobservant of facts are too ready to dogmatise on the basis of a few observations.’

We are particularly interested in two of these habits which we think might be especially pertinent in the studio situation. The slowly evolving physical product – a wooden box, say, or a mixed-material construction – together with sketches and models that might be produced along the way, invite *reflection* and *self-evaluation*. They invite its creator to, as it were, hold a conversation with it and expose something of their thought processes. Secondly, when a student is crafting an object round a work-station with a small number of others, the physical objects make it very easy for people to have conversations about each other’s work-in-progress. Thus we were led to wonder whether DT projects might prove especially useful in cultivating the dispositions to reflect both privately and in collaboration with others.

The development of the project was also influenced by the kinds of wider considerations discussed by Matthew Crawford in his influential book *The Case for Working with Your Hands*⁹. Crawford argues that, as the digital world becomes ever more pervasive, so the ability to derive satisfaction from engagement with real, solid material becomes more, not less, important. Home-grown mechanics will always be needed; someone in a call-centre in Bangalore cannot fix your lawn-mower, unblock your toilet or paint your kitchen. But the tangible is important not just when we need someone to fix it for us; it is, suggests Crawford, a vital part of what can give all of us pride and satisfaction. The senior civil servant tending his roses; the university vice-chancellor who is a passionate wind-surfer; the lawyer on *Masterchef* who yearns to be the chef in her own restaurant: these are people who are skilful materialists in a deep and healthy sense. We do all young people a disservice, says Crawford, if we persuade them to see the physical and manual as second-rate kinds of activity and accomplishment. The highly-esteemed physical should not be confined to the sports field, the gymnastics hall or the concert chamber; an elegant and sturdy book-shelf, a knitted sweater or a carefully nurtured crop of flavoursome tomatoes could do just as well. And the discovery of the pleasure to be had from investing skilful effort over time could be nurtured through those extended opportunities for making. So we conjecture that the kind of learning that goes on in DT workshops could, if presented rightly, offer all students access to this source of embodied well-being.

Painting and sculpture afford this kind of satisfaction, but we wanted in our project to decouple the physical from the self-consciously ‘artistic’, and attend to the former in its own right. We wanted the value of extended making to be available to those whose preferred tools were a spanner or an emery board, as much as a saxophone or a palette-knife. And we wanted to see if offering the chance for extended making would appeal to the broad cross-section of students found in inner city schools. Lois Hetland and colleagues at Project Zero at Harvard have already explored the value of studio learning with biddable students in arts workshops, and shown that significant benefits, of all the kinds we

⁹ Op. cit

described above, do develop under those conditions.¹⁰ But that seemed a little too easy for us. So we conjectured that students who did not come from homes where fine art was an everyday topic of interest, or who might have little apparent interest in disciplined learning *per se*, could also benefit from the studio learning opportunity. We also deliberately worked with a range of DT teachers, some of whom were relatively comfortable with studio-like ways of organizing their classrooms, and/or familiar with the idea of trying to cultivate students' learning dispositions, and one less so.

1.3 A VIEW OF TEACHING AND LEARNING IN THE 21 CENTURY

Shaping our thinking also has been an abiding belief that there are certain habits of mind which learners need to acquire during their time at school if they are going to be successful and fulfilled in their lives. We have described these in varying degrees of detail elsewhere¹¹.

In this project, as in all of our work, we are trying to help schools shift the focus of their endeavours from subject knowledge *alone* to subject knowledge *with learning skills deliberately embedded*. In the research which led to *Making It* we focus on three outcomes for students:

- 1) The Development of Learning Habits of Mind (also sometimes referred to in this report as 'dispositions' or 'wider skills')
- 2) Engagement
- 3) Attainment.

Listed in Table 1 are the specific learning habits of mind on which we chose to focus as we worked with teachers to help students to develop what we have termed their 'learning power'¹². These are explored in more detail later in the report. We chose these habits of mind as a result of ten years of empirical research with schools using the Building Learning Power materials¹³.

¹⁰ Hetland, Lois; Winner, Ellen; Veenema, Shirley and Sheridan, Kimberly (2007). *Studio Thinking: The real benefits of visual arts education*. New York: Teachers College Press.

¹¹ Lucas, Bill and Claxton, Guy (2009) Op. cit. See also: Claxton, Guy; Chambers, Mary; Lucas, Bill and Powell, Graham (2011). *The Learning Powered School: Pioneering 21st century education*. Bristol: TLO Ltd. Also: Claxton, Guy; Lucas, Bill and Webster, Rob (2010). *Bodies of Knowledge: How the Learning Sciences Could Transform Practical and Vocational Education*. London.

¹² For the history of this term see, for example, Claxton, Guy (1999). *Wise Up: The challenge of lifelong learning*. London and New York: Bloomsbury. See also Claxton, Guy (2000). What Would Schools Be Like if They Were Truly Dedicated to Helping All Young People Become Confident, Competent Lifelong Learners?, in Lucas, Bill and Greany, Toby (eds.) *Schools in the Learning Age*. London: Campaign for Learning.

¹³ <http://www.buildinglearningpower.co.uk>

Table 1 Aspects of Learning Power

RESILIENCE – emotional strength

1. Inquisitive: has a questioning and positive attitude to learning
2. Adventurous: willing to risk and ‘have a go’; up for a new challenge
3. Persistent: stays determined and positive in the face of difficulty or mistakes
4. Focused: concentrates, ignores distractions, becomes engrossed

RESOURCEFULNESS – cognitive capability

1. Imaginative: comes up with creative ideas and possibilities
2. Connecting: looks for links and relationships; likes to ‘hook things up’
3. Crafting: keen to work on improving products and developing skills
4. Capitalising: makes good use of resources, tools and materials

REFLECTION – strategic awareness

1. Methodical: well-organized; thinks things through carefully
2. Self-evaluative: makes honest and accurate judgements about ‘how it’s going’
3. Self-aware: knows their own strengths, styles and interests as a learner
4. Transferring: looks for other applications and lessons for the future

RELATING – social sophistication

1. Independent: articulates and defends their own thoughts and ideas in discussion
 2. Leading: shows initiative; willing to take a lead in learning and problem-solving
 3. Open-minded: Asks for, accepts and makes good use of feedback, advice and support
 4. Empathic: good at understanding others, and offering helpful feedback and suggestions
-

Schools cannot do enough in our view to teach these dispositions to their learners and we have deliberately infused our work with teachers with practical suggestions for how *as well as* teaching DT they can *also* consciously be nurturing effective learners.

These opening remarks set the scene for our project. We hope they convey a sense of the kinds of hunches and questions which we were keen to explore, and the reasons why we decided to set ourselves a ‘hard test’, as it were, by choosing to work with teachers and students who might not all be familiar with or sympathetic to the kinds of learning we were trying to create and evaluate. In the next chapter we lay out our guiding conceptual frameworks more methodically and in more detail.

2. UNDERSTANDING STUDIO TEACHING

'The students look relaxed...You see the teacher introducing the concepts and demonstrating, and then you watch as students become engrossed in the day's project...Students talk among themselves quietly as they begin to work, and the teacher circles around, watching for teachable moments... At the end of the class there is a critique in which students gather to share and discuss work, a session in which critical judgment and metacognition are nurtured.'

The how of studio teaching¹⁴

If you were trying to create an ideal learning environment of the kind that the very best craft apprentices or artists or technologists or designers would thrive in, what would it look and feel like? How would it be different from a typical school classroom? What would the teacher do and not do? How would learner roles be different? How would the physical space be organized?

Drawing on research from across the world we sought to define the elements of studio teaching more precisely and so define what studio teachers do. We were impressed by the meticulous research undertaken by Lois Hetland and colleagues at Harvard University with highly experienced and dedicated visual arts teachers. We were also interested in the work of the Studio Teaching project in Australia¹⁵. We also drew more widely from approaches to teaching and learning *not* historically associated with arts disciplines (which tend to think of their teaching spaces as studios) in a deliberate attempt to look more broadly at the concept of studio teaching.

2.1 THE SEVEN DIMENSIONS OF STUDIO TEACHING

To enable us to describe the studio learning environment we envisaged and to help us to train the teachers to use a different pedagogical approach we articulated seven key dimensions, each one of which draws from a well-worked seam of research. Each of these seven dimensions seeks to pose a question about the way learning is organized:

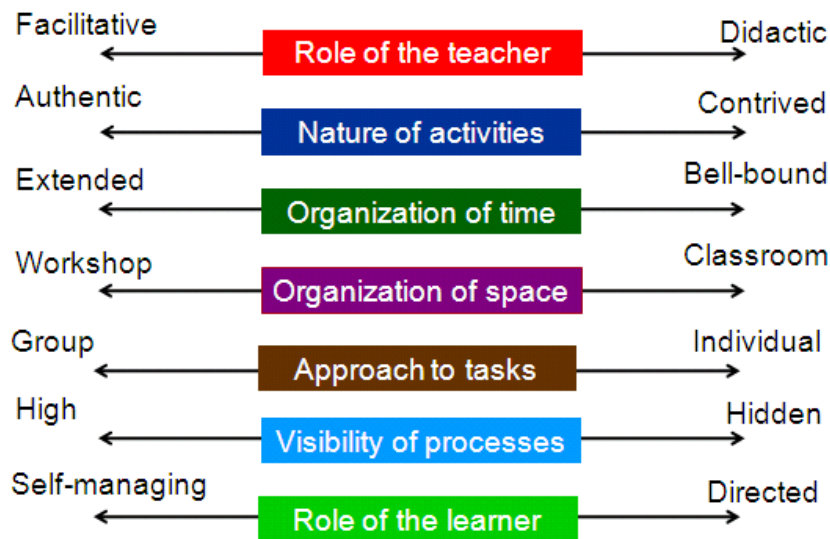
- | | | | |
|----|---------------------------|---|---------------------------|
| 1. | The role of the teacher | – | facilitative or didactic? |
| 2. | The nature of activities | – | authentic or contrived? |
| 3. | The organization of time | – | extended or bell-bound? |
| 4. | The organization of space | – | workshop or classroom? |
| 5. | Levels of interaction | – | group or individual? |
| 6. | Visibility of processes | – | high or low? |
| 7. | The role of the learner | – | self-managed or directed? |

When the dimensions are laid out as if each were on a continuum it becomes easier to conceptualise, as in Figure 1 below.

¹⁴ Hetland, Lois et al. (Op. cit)

¹⁵ <http://www.studioteaching.org>

Figure 1 Dimensions of Studio Teaching



The ‘closer’ a teacher’s practice is to the left hand side, the closer it may be to the kind of learning we have in mind. Of course studio teaching involves operating at both ends of the continuum, it is not an either/or. But broadly speaking we wanted to see a shift to the ‘left’ (with the exception of decisions about group or individual working, which we explore in more detail in 2.1.5). The teacher in a studio is not either a ‘didact’ or a facilitator but someone skilled in knowing which mode is most effective. In good studios the ‘teacher’ will frequently be adopting both roles. So, taking the first dimension as an example, there might be a highly didactic and engaging expert demonstration by the teacher of a new tool and its uses, followed by a period during in which learners are offered various potential routes to practising the use of the tool in different media.

As we explore the seven dimensions we concentrate on the three key outcomes (learner dispositions, engagement, and attainment) that guided our intervention. We have already described the least familiar, but most important, of our three outcomes: the dispositions which make up our 4Rs - resilience, resourcefulness, reflection and relating - earlier in this report. Our indicators of learner engagement included attentiveness, absorption, observable effort willingly given, indications of pride and a willingness to talk with animation about the learning taking place. By attainment we mean levels of achievement as measured by teachers according to National Curriculum levels and sub-levels.

Through a literature review, we searched for evidence of the seven dimensions’ impact upon each of these three outcomes. Throughout the following seven sub-sections we tease out the findings of this review to explore the role of the seven dimensions in respect of these three learner outcomes. Key papers are summarised in Table 2.

Table 2 Outcomes of the Seven Dimensions: Dispositions, Motivation, and Attainment

	Attainment	Dispositions	Motivation
Role of the teacher	Abrami et al 2000	Courcier 2007	Deakin Crick et al 2007
	Deakin Crick et al 2007	King 1992	Gillies 2006
	Galton et al 2009	Perkins et al 1993	Harris 2010
	Gillies and Khan 2009	Perkins et al 2000	King 1992
	Harris 2010	Vik 2001	Kutnick and Berdondini 2009
	Jarvis and Lewis 2002	Hetland et al 2007	Pell et al 2007
	Johnson et al 2001		Wurdinger et al 2007
	King 1992		
	Kutnick and Berdondini 2009		
	Russell 2010		
	Shachar and Sharan 1994		
	Souvignier and Kronenberger 2007		
	Syh-Jong 2007		
	Webb 2009		
	Webb et al 2009		
	Wurdinger et al 2007		
	Zimmerman 1989		
Nature of activities	Farrar and Trorey 2007	Monk-Turner and Payne 2005	Farrar and Trorey 2007
	Marchand 2008	Perkins et al 2000	Helle et al 2007
	Resnick 1987		Hopkins 2008
	Wurdinger et al 2007	Lindström 2006	Monk-Turner and Payne 2005
			Wurdinger et al 2007
Organization of time	Jarvis and Lewis 2002		Hopkins 2008
	Wurdinger et al 2007		Wurdinger et al 2007
Organization of space	Ozturk and Turkkan 2006		Grant et al 2004
Level of interaction	Abrami et al 2000	Lindström 2006	Blatchford and Baines 2006
	Farrar and Trorey 2007	Monk-Turner and Payne 2005	Buckenmyer 2001
	Galton et al 2009	Vik 2001	Choi et al 2005
	Gillies and Khan 2009		Deignan 2009

	Johnson et al Kutnick and Berdondini Mitchell et al Nihalani et al Resnick Russell Shachar and Sharan Souvignier and Kronenberger Syh-Jong Webb Webb et al	2001 2009 2004 2010 1987 2010 1994 2007 2007 2009 2009		Farrar and Trorey Gillies Helle et al Kutnick and Berdondini Mitchell et al Monk-Turner and Payne Pell et al	2007 2006 2007 2009 2004 2005 2007	
Visibility of processes	Deakin Crick et al Flavell Watkins Watkins	2007 1979 2001 2010	Flavell Perkins et al Perkins et al	1979 1993 2000	Deakin Crick et al Flavell Pedrosa de Jesus et al Watkins	2007 1979 2004 2010
Role of the learner	Deakin Crick et al Galton et al Harris King Wurdinger et al Zimmerman	2007 2009 2010 1992 2007 1989	Courcier Harrison King Lindstöm	2007 2000 1992 2006	Choi et al Deakin Crick et al Deignan Grant et al Harris Helle et al Hopkins King Pedrosa de Jesus et al Wurdinger et al	2005 2007 2009 2004 2010 2007 2008 1992 2004 2007

We chose Design Technology because it affords considerable freedom to teachers to devise studio teaching approaches, because it is already physically closer to a studio or workshop environment and because it was *not* an arts subject (where research has already been located, as discussed on page 7). Indeed the idea that Design Technology has a specific pedagogy arising from its focus on projects has been helpfully explored by Richard Kimbell and David Perry¹⁶. But in this project we were also thinking more broadly of studio teaching as an approach with much greater application across the whole school curriculum. While we have chosen to use the phrase ‘studio teaching’ (and sometimes ‘studio learning’ when we are looking at things from the learner’s perspective) we are really interested in the characteristics of effective and engaging pedagogy which is likely to create powerful learners and be applicable in most areas of the curriculum.

¹⁶ Kimbell, Richard and Perry, David (2001) *Design and Technology in a Knowledge Economy*. London: The Engineering Council.

2.1.1 THE ROLE OF THE TEACHER

From the moment teachers enter a room full of students they are faced with choices about the role they play. They can be strict or lenient, serious or jokey, distant or accessible, quiet or loud and so on. But their decision about their overall approach, whether it is mainly facilitative or largely didactic really matters. For it says much about their approach to knowledge, to learning and to learners. While being facilitative or being didactic may appear at first to be a straight choice of style, in reality it is more complex than the choices we have just listed. Part of our study was an attempt to understand more about the characteristics of facilitative teachers, the attitudes to knowledge they tend to have and how this plays out with learners. And we also want to find out more about when it is likely to be appropriate to be didactic rather than facilitative in approach.

The idea of the teacher as facilitator is not new; it has been explicitly part of an approach to learning referred to as 'constructivist' for some hundred years. From a constructivist perspective, learning is created by an interaction between people's ideas and their experiences with other people. The goal of any learning intervention is the generation of new knowledge in collaboration with others. Such an approach requires resourcefulness and relating skills in large measure. The core principles of the constructivist approach have been usefully summarised by John Savery and Thomas Duffy¹⁷ and include the creation of authentic tasks which are anchored to the real world, high levels of ownership by learners of the tasks they undertake, learning environments which support and challenge learners' thinking and opportunities for learners to select as they develop alternative ideas and strategies.

Closely related to constructivism is the idea of experiential learning. As the expert most associated with it, David Kolb, puts it: 'Learning is the process whereby knowledge is created through the transformation of experience.'¹⁸ Clearly this kind of transformation is more likely to take place in a broadly facilitative milieu rather than in one where there is opportunity only really to receive data from a teacher.

A facilitative approach tends to go hand in hand with a more tentative language. Where didacts tend to stand at the front, lecture and tell people what the answers are, facilitators prefer to stand to one side, ask questions, create compelling environments in which learners can explore complex issues and frequently find it impossible to answer learners' questions definitively. Their epistemological standpoint is different. Facilitators are likely to assume that there will be many answers to most questions. Maurice Galton and colleagues¹⁹ consider the polar opposite of 'direct instruction' (the didactic approach) to be an 'interactive whole-class teaching' approach. Their research supports the latter in its promotion of both conceptual and metacognitive learning.

Ellen Langer uses the concept of mindfulness to describe rich facilitative learning environments of the kind we are seeking to create in studio learning: 'A mindful approach to any activity has three characteristics: the continuous creation of new categories; openness to new information and an implicit awareness of more than one perspective.'²⁰ Langer has shown that small shifts in a teacher's language can induce a marked change in the learning habits that students are bringing to bear on their

¹⁷ Savery, John and Duffy, Thomas (1995). Problem Based Learning: An instructional model and its constructivist framework. *Educational Technology* 35: 31-38.

¹⁸ Kolb, David (1984). *Experiential Learning: Experience as the source of learning and development*. Englewood Cliffs, N.J Prentice-Hall.

¹⁹ Galton, Maurice; Hargreaves, Linda and Pell, Tony (2009). Group Work and Whole-Class Teaching With 11- to 14-Year-Olds Compared. *Cambridge Journal of Education* 39(1): 119-140.

²⁰ Langer, Ellen (1998). *The Power of Mindful Learning*. New York: Da Capo Press.

work. Specifically, if a teacher says definitively that something *is* the case, students take it literally and try to remember it. But if a teacher says, of the same thing, that it *could be* the case, they become more engaged, more thoughtful, more imaginative and more critical. ‘Could be’ language invites learners to become more active, inquisitive members of the knowledge-checking, knowledge-developing community, rather than to see themselves as ‘merely’ doing their best to understand and remember something that is already cut and dried. David Perkins and colleagues go further still arguing that: ‘conditional instruction opens up possibilities, whereas absolute instruction tends to produce a more rigid mindset about the information’²¹. In this way, the teacher contributes to a mindful disposition and intelligent behaviour.

A further understanding of the facilitative style derives from the thinking of Carl Rogers. Rogers stressed three aspects of the facilitative style: congruence (realness), acceptance and empathy²². Realness involves not presenting a ‘front or ‘facade’; being genuine. Acceptance is a special kind of trust which conveys to learners that they have valuable opinions and the potential for generating good ideas. And empathy is about seeking to understand learners not simply evaluate them. While the approach espoused by Rogers was explicitly therapeutic, his emphasis on the importance of the relationship between the facilitator and the learner is an important one.

Through the research of Jean Lave and Etienne Wenger²³ we now have a much better understanding of the way in which learning is ‘situated’ in a particular context. How we learn on a sports field, in a science lab, in a design and technology workshop or an art studio is heavily influenced by the social situation and by the nature of the activity in which we are engaged. Contexts really matter. Lave and Wenger coined a useful phrase, ‘communities of practice’, to describe the kinds of social learning that these spaces require. Members of a community pursue a common interest and help each other as they do so. And as they work and solve problems together, so their learning habits and attitudes rub off on each other. New members watch carefully how the more established members talk, respond and deal with challenges, like children do when they want to join someone’s ‘gang’. Lave and Wenger have called this stage of joining a community ‘legitimate peripheral participation’. This kind of almost self-facilitated learning is an important element of studio learning.

Chris Watkins has taken the idea of a community of practice and explicitly applied it to school learning²⁴. In a deliberate attempt to move away from the paradigm that says ‘learning = being taught’ he has concluded that the way a classroom space is managed is a more significant variable than any other in terms of helping learning in what he calls ‘classrooms as learning communities’. Perhaps young people develop precisely because in such contexts, learners not only take responsibility for themselves and their peers but also for what *needs* to be known. Not only are they not being spoon fed, but they are also actively engaged in helping one other.

There is a growing body of research exploring the specific role of the teacher in guiding learners through thought processes. In a number of cases, this literature examines teacher behaviour in the context of group working. Several references are more relevant to the dimension ‘level of interaction’ because these focus on how the teacher selects individuals for group work. Others, however, talk about the specific job of the teacher during group work, and we introduce some of these now.

²¹ Perkins, David; Tishman, Shari; Ritchhart, Ron; Donis, Kiki and Andrade, Al (2000). Intelligence in the Wild: A dispositional view of intellectual traits. *Educational Psychology Review* 12(3): 269-293.

²² Rogers, Carl (1961). *On Becoming a Person: A therapist's view of psychotherapy*. Boston: Houghton Mifflin.

²³ Lave, Jean and Wenger, Etienne (1991). *Situated Learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

²⁴ Watkins, Chris (2005). Classrooms as Learning Communities: A review of research. *London Review of Education* 3(1): 47-64.

Using the ability to explain as a proxy for learning, Noreen Webb and colleagues found a strong relationship between learner ability to explain (which they claim is critical to achievement) and the probing, by teachers, of learners' explanations 'to uncover details or further thinking about their problem solving strategies'²⁵. Particularly important was that the teacher probed learners' own explanations rather than interjecting their own assumptions about what learners might be thinking. This effective process served to clarify aspects remaining ambiguous in the understanding of the learner. Similarly reinforcing the significance of teacher guidance for best practice, Robyn Gillies²⁶ draws attention to the critical nature of the quality of discourse that occurs in groups if problem solving and learning are to happen.

Part of the teacher's facilitative role is to engage in 'scaffolding' learners' questioning. This process of prompting learners to develop 'specific thought-provoking questions', suggests Alison King²⁷, encourages critical thinking and reflectiveness. King hypothesised that motivation is the mediator between questioning behaviour and learning: the process of scaffolding serves to motivate learners, who become better learners as a result. This outcome of motivation / engagement is supported by Peter Kutnick and Lucia Berdondini²⁸, who claim further that this motivational outcome supports attainment. Robyn Gillies and Asaduzzaman Khan²⁹ also refer to teacher 'scaffolding' of learners' questioning during co-operative learning scenarios and, following the task, in providing further opportunities and instruction for learners to reflect in order for the benefits obtained for verbal reasoning to transfer beyond it to the written task.

Teachers also serve as facilitators by training learners how to work effectively in groups, and by debriefing them. Maurice Galton and colleagues link group working to academic performance and hence the importance of the teacher as facilitator. They cite a range of other work emphasising the link between communication skills and successful group working, and argue that the lack of such skills in learners dissuades many teachers from using group work to enhance academic performance. Specifically, learners need to be able to 'undertake focused questioning, explore alternative answers and provide explanations'³⁰ and the role of teachers is to provide this depth of training to them. Confirming the link between a teacher's role in establishing successful group working and, thus, attainment, David Johnson and colleagues³¹ establish 'group processing' (the review of a group situation) as an important mediator of individual 'success'. The teacher has a role to play in developing learners' ability to practice group processing, and a further role in ensuring a balance between teacher- and student-led processing.

²⁵ Webb, Noreen; Franke, Megan; De, Tondra; Chan, Angela; Freund, Deanna; Shein, Pat and Melkonian, Doris (2009). 'Explain to Your Partner': Teachers' instructional practices and students' dialogue in small groups. *Cambridge Journal of Education* 39(1): 49-70.

²⁶ Gillies, Robyn (2006). Teachers' and Students' Verbal Behaviours During Cooperative and Small-Group Learning. *British Journal of Educational Psychology* 76: 271-287.

²⁷ King, Alison (1992). Facilitating Elaborative Learning Through Guided Student-Generated Questioning. *Educational Psychologist* 27(1): 111-126.

²⁸ Kutnick, Peter and Berdondini, Lucia (2009). Can the Enhancement of Group Working in Classrooms Provide a Basis for Effective Communication in Support of School-Based Cognitive Achievement in Classrooms of Young Learners? *Cambridge Journal of Education* 39(1): 71-94.

²⁹ Gillies, Robyn and Khan, Asaduzzaman (2009). Promoting Reasoned Argumentation, Problem-Solving and Learning During Small-Group Work. *Cambridge Journal of Education* 39(1): 7-27.

³⁰ Galton, Maurice; Hargreaves, Linda and Pell, Tony (2009). Group Work and Whole-Class Teaching With 11- to 14-Year-Olds Compared. *Cambridge Journal of Education* 39(1): 119-140.

³¹ Johnson, David; Johnson, Roger ; Stanne, Mary Beth and Garibaldi, Antoine (2001). Impact of Group Processing on Achievement in Cooperative Groups. *Journal of Social Psychology* 130(4): 507-516.

In her study about how best to facilitate student engagement, Lois Harris³² found a shared belief among many teachers that when teachers and students co-create a curriculum that is suited to the purpose of the students, learner engagement increases, and pupils can develop the thinking skills needed to learn. As just one of a number of ways teachers facilitate engagement, this co-creation approach demonstrates the extent to which teachers might consider relinquishing control.

David Perkins and colleagues further define the role of the teacher in ‘enculturating’³³ learners to understand thinking and thus develop their learning dispositions. They provide exemplars, modelling ‘target mindware’ to learners; they transmit key vocabularies so that thinking and learning vernacular become second nature to learners; they involve learners in cultural activities and hands-on practice; and they interact with learners, fostering interpersonal discussion.

Thus far you might assume research suggests that teaching is always best when facilitative. Not so. There are those who challenge the constructivist approach. So, for example, Paul Kirschner and colleagues usefully make us think when teacher guidance rather than freer facilitative approaches are beneficial. They argue that the architecture of the brain, specifically the role of long-term and working memory, demands clear instruction rather than endless problem-based approaches. To be expert problem-solvers, they remind us, we need plenty of experiences stored in long-term memory and we need to be able to access these. Yet more facilitative styles of enquiry or problem-based learning require short-term memory and leave little learning power available. They conclude: ‘Controlled experiments almost uniformly indicate that, when dealing with novel information, learners should be explicitly shown what to do and how to do it.’³⁴

We should heed the advice not to over-praise facilitative constructivist approaches. But note Kirschner’s give-away language ‘shown what to do’. Just as with Langer’s more mindful approaches to learning so, in studio teaching, there will often be lots of different potential approaches and creative teachers will be reluctant to assume that there is only one way of doing something.

There is an even more powerful argument for the value of some kinds of didactic teaching which most of us will have in our memory bank. Think not of a teacher holding forth but of a really persuasive expert teacher demonstrating a complex craft or skill. Coupled with the compelling narrative and explanation they offer us of what is being done and you have the essence of the expert/apprentice/novice tradition of instruction. Most people can recall such electrifying moments from their own school lives. Providing the processes of learning are visible then these kinds of teacherly expositions are a different kind of didacticism from what is sometimes referred to today as the ‘sage on the stage’ (a teacher talking for a long time at students). It is a kind of cognitive apprenticeship which sits very comfortably within what we are describing as studio learning. Lois Hetland and colleagues at Harvard’s Project Zero get close to this notion when they describe what they call the ‘demonstration lecture’, ‘a brief, visually rich lecture by the teacher to the class (or to a small group) that conveys information that students will use immediately’. Such moments of

³² Harris, Lois (2010). Delivering, Modifying or Collaborating? Examining three teacher conceptions of how to facilitate student engagement. *Teachers and Teaching* 16(1): 131-151.

³³ Perkins, David; Jay, Eileen and Tishman, Shari (1993). New Conceptions of Thinking: From ontology to education. *Educational Psychologist* 28(1): 67-85.

³⁴ Kirschner, Paul; Sweller, John and Clark, Richard (2006). Why Minimal Guidance During Instruction Does Not Work: An analysis of the failure of constructivist, discovery, problem-based, experiential and inquiry-based teaching. *Educational Psychologist* 41(2): 75-86.

didacticism work, the Project Zero research suggests, because they are focused, efficient, visually engaging, of immediate relevance, short and connected to skills and concepts *already* introduced³⁵.

Specifically, given that this study sought to encourage teachers to become more facilitative, it is worth noting that recent research by Ikumi Courcier into the views of teachers seeking to introduce ‘personalised learning’ in England since 2004 in Key Stage 3 in a number of secondary schools describes just how difficult it is for teachers really to understand more facilitative approaches³⁶. The introduction of ‘personalised learning’ required teachers to stop assuming that they could didactically teach the whole class and consider how they could facilitate pathways which were personal to each student.

Many of the areas we have reviewed here are also very relevant to the role of the learner (our seventh dimension) and we refer back to them when we deal with this on page 26.

2.1.2 THE NATURE OF ACTIVITIES – AUTHENTIC OR CONTRIVED?

In his influential study of authentic learning in real-world settings, *Cognition in the Wild*³⁷, Edwin Hutchins, describes a navy ship being navigated in and out of a harbour. He points to the extraordinary way in which intelligence is ‘shared’ among the different people on board. Two people take visual sightings. They call their readings out to two other sailors who, in turn, relay them by telephone to the bridge. Other people use specialised instruments and maps to plot the ship’s progress and check on relative position to known landmarks. So a course is steered with a new set of data being relayed every few moments. No one individual could manage alone, because nobody is in possession of all the information needed – there is no individual ‘in charge’. A sophisticated piece of problem-solving relies on each member of the team doing their bit at the right time, and passing their vital scrap of information on to the right person. The ship sails smoothly into harbour because this is the way crew works. This is an unambiguous example of authentic learning in the ‘wild’ (to use the term Hutchins does). Interestingly many of the dimensions of the seven dimensions of studio learning are evident (although the captain and crew are not making anything except a safe passage into harbour)! Above all the actions that the crew has learned are unambiguously authentic.

Of course schools are not like ships! They are, necessarily, more contrived learning environments, organized into subjects and ‘classrooms’. Learning journeys are frequently chopped up into lessons and interrupted for a host of reasons that would not be entertained by a ship’s crew. Nevertheless it is possible to make learning more authentic and research would seem to suggest that this is helpful to learners. More than twenty years ago, Lauren Resnick³⁸ memorably described the differences between school and non-school learning and we have summarised these in Table 3.

³⁵ Hetland, Lois; Winner, Ellen; Veenema, Shirley and Sheridan, Kimberly (2007) Op. cit

³⁶ Courcier, Ikumi (2007). Teachers’ Perceptions of Personalised Learning. *Evaluation and Research in Education* 20(2): 59-80.

³⁷ Hutchins, Edwin (1995). *Cognition in the Wild*. Cambridge, MA: MIT Press.

³⁸ Resnick, Lauren (1987). The 1987 Presidential Address: Learning in school and out. *Educational Researcher* 16: 13-40.

Table 3 The Differences Between School and Non-School Learning

<i>Learning in school and college</i>	<i>Learning at work and at home</i>
Lacks context	Real context
Second-hand	First-hand
Extrinsically motivated	Intrinsically motivated
Often individualistic	Often collaborative
Assessed by others	Self-assessed
Formal	Informal

Resnick is effectively distinguishing between the authentic learning encountered in the real world and the more contrived version students experience at school. But it need not be like this; we can get much closer to authenticity at school or in college. She argues for a configuration of schools that ensures learning is socially shared, uses cognitive tools, engages with objects and situations, and teaches situation-specific competencies.

More recently, in a craft apprenticeship context, Trevor Marchand positioned ‘the animated body in practice’³⁹ as the link between practical know-how and attainment of true knowledge. And through their exploration of skill development in dry stone wallers, Nicholas Farrar and Gill Trorey affirmed the significant effects of authentic activities on both understanding and motivation⁴⁰. What is true in the ‘field’, literally, is applicable also to the school environment: putting knowledge into practice is considered necessary for development of true understanding. As the learner engages with the task, they revert to a state of ‘flow’, and expertise can develop. Farrar and Trorey write of the need for peer support, reflection, learning from mistakes, and emotional commitment.

So authentic learning is complex, frequently interdisciplinary and often messy. It often arises out of a real problem. Indeed problem based learning has been influential in seeking to make educational experiences at school and beyond more authentic. Problem-based learning (PBL) suggests that learning is effective when the learner is empowered to undertake research into real challenges applying both theory and practice to develop solutions. Developed in the 1970s for the training of doctors in North America, PBL sought to take medical education away from its abstract text books by recreating the kind of real-world work environment into which doctors will go as part of their training. Researchers examining this problem-based approach found that it was at least equal to more conventional methods when it came to medical board examinations but superior in terms of the development of clinical problem-solving skills⁴¹. More recently, Scott Wurdinger and colleagues⁴² champion PBL, with its ‘problem, plan, test, reflect’ pattern of inquiry derived from Dewey’s work, as providing a proxy for authenticity. Projects that create meaningful learning experiences lead to engagement and motivation. Unlike lecture-based approaches, which test learners on short term recall, project work gets them to think through and inquire.

³⁹ Marchand, Trevor (2008). Muscles, Morals and Mind: Craft apprenticeship and the formation of person. *British Journal of Educational Studies* 56(3): 245-271. (p260)

⁴⁰ Farrar, Nicholas and Trorey, Gill (2008). Maxims, Tacit Knowledge and Learning: Developing expertise in dry stone walling. *Journal of Vocational Education and Training* 60(1): 35-48.

⁴¹ Albanese, Mark and Mitchell, Sandra (1993). Problem-Based Learning: A review of the literature on its outcomes and implementation issues. *Academic Medicine* 68: 52-81.

⁴² Wurdinger, Scott; Harr, Jean; Hugg, Robert and Bezon, Jennifer (2007). A Qualitative Study Using Project-Based Learning in a Mainstream Middle School. *Improving Schools* 10(2): 150-161.

Laura Helle and colleagues⁴³ similarly found that authenticity tends to lead to engagement. They provide some examples of what authenticity looks like:

- producing a concrete product from beginning to end instead of working on dissected pieces of reality;
- ecological authenticity; not just 'make believe'
- procedural authenticity; 'it was exactly what we will be doing in our future work';
- service value; doing something of real value to someone;
- flavour of demanding work: exceptionally valuable work experience;
- action – not just reflection on cases

In an environment akin to the one described by Helle, Elizabeth Hopkins' study⁴⁴ of Key Stage 4 work experience noticed its motivating and engaging effect upon participants as they partook of meaningful authentic activities in the process of learning 'through', 'about', and 'for' work.

That trying to be authentic is important for learners has been well-articulated by David Perkins⁴⁵. Perkins argues compellingly that it is the job of the teacher to give learners as real or 'whole' experience of learning as possible. He uses the analogy of learning the game *Scrabble* to show how unsatisfactory it would be if you had just to learn lists of three, four and five letter words, say, beginning with different letters rather than play something like *Junior Scrabble*. In *Junior Scrabble*, while the board is not the same completely free one as the adult version, (it has spaces pre-filled in), it nevertheless gives the player a genuine experience of the scope of the 'real' *Scrabble*. Perkins identifies four elements of authentic or 'whole' learning:

- Engage some version of the holistic activity, not just bits and pieces.
- Make the activity worth pursuing.
- Work on the hard parts.
- Explore different versions of and settings for the activity.

The implications are clear. Authentic learning is likely to engender higher levels of engagement. But, importantly for our study, it seems likely to involve the cultivation of resilience and resourcefulness.

2.1.3 THE ORGANIZATION OF TIME – EXTENDED OR BELL-BOUND?

In Lois Hetland's work at Project Zero⁴⁶, projects often extended over a whole day and were carried out over a period of weeks and were linked to engagement and persistence. In most busy schools the norm is for constant bell-induced interruptions. Yet a picture of studio learning is already emerging of constructivist, authentic learning which demands that problems be teased out by learners over more time than is typically allowed. Targets and focus on end product can lead to a linearity of thinking that prevents learners from ever really seeing an idea to its full fruition. Michael Jarvis and Thérèse Lewis'

⁴³ Helle, Laura; Tynjälä, Päivi; Erkki, Olkinuora and Lonka, Kirsti (2007). 'Ain't Nothin' Like the Real Thing'. Motivation and study processes on a work-based project course in information systems design. *British Journal of Educational Psychology* 77: 397-411.

⁴⁴ Hopkins, Elizabeth (2008). Work-Related Learning: Hearing students' voices. *Educational Action Research* 16(2): 209-219.

⁴⁵ Perkins, David (2009). *Making Learning Whole: How seven principles of teaching can transform education*. San Francisco: Jossey-Bass.

⁴⁶ Op. cit

exploration of Design in the English National Curriculum argues for a ‘suspension of focus’⁴⁷ that allows learners to consider design without focusing on the immediate solution to a problem. In an art education context, they write that successful, ‘open ended’ (or extended) practice is ‘a useful model for producing successful learners across all facets of the curriculum and for imbuing learners with a life-long commitment to their subject’.

Currently arguments are being advanced for the benefits of learning which extends over time. In the US and UK, for example, there is a growing interest in extended schooling, ways of providing students with more time for learning, either by extending the school day or by using weekend and holiday/vacation time. The kinds of benefits for learners suggested for this approach include better motivation, increased confidence, improved behaviour, higher expectations and raised attainment⁴⁸. In the UK specifically extended schools and studio schools are exploring the benefits of moving away from short lessons to whole mornings or whole days spent investigating a complex topic. The relationship between time and the quality of learning, however, is not straightforward. Simply spending more time in the same space does not guarantee better learning outcomes although it may help if the outside lives of students are chaotic or under-supported. It is *how* the teacher uses the additional time that really matters. (Nevertheless, extending the length of lessons is a powerful method of helping teachers to change the way they teach).

With this in mind we are most interested in what happens to the quality of engagement engendered in students when they are engaged in learning for an extended period of time. Mihalyi Csikszentmihalyi has studied this phenomenon extensively and coined the word ‘flow’ to describe the state of mind which learners can achieve if they are deeply absorbed in their learning. He describes this as an optimal experience in which learners find deep fulfillment and in which they become unaware of time⁴⁹. To achieve the state of flow three things need to be in place: the task needs to be sufficiently demanding and engaging, the learner needs to have enough skill to be able to tackle the task without undue anxiety or stress and there needs to be sufficient time available.

There is clear evidence from Csikszentmihalyi’s research that the quality of creativity increases when we are in a state of flow and that the experience of flow is itself inherently beneficial to the learner who finds such experiences enjoyable and rewarding. Experiences like this do not come easily or when an individual is consciously relaxing. Rather they involve, to use Csikszentmihalyi’s own words: ‘painful, risky, difficult activities that stretched the person’s capacity and involved an element of novelty and discovery’⁵⁰. The state of flow is not unlike Ellen Langer’s concept of mindfulness in the sense that certain qualities of mind – effortless focus and absorption – are being cultivated.

And, in terms of our conception of studio learning and decisions about the organization of time, we hypothesise that such deeper learning states are much more likely to occur within longer time frames. There are undoubtedly other potential benefits for learners of extended work. After extensive research into creativity, Lars Lindström hypothesises⁵¹, for example, that the disposition of creativity is fostered through investigative work that develops when students have opportunities to work on an assignment over an extended period of time.

⁴⁷ Jarvis, Michael and Lewis, Therese (2002). Art, Design & Technology: A plea to reclaim the senses. *International Journal of Art & Design Education* 21(2): 124-131.

⁴⁸ As summarised, for example on

http://www.continyou.org.uk/children_and_young_people/extended_services/guide_parents/what_are_the_benefits

⁴⁹ Csikszentmihalyi, Mihaly (1990). *Flow: The psychology of optimal experience*. New York: Harper and Row.

⁵⁰ Csikszentmihalyi, Mihaly (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: HarperCollins.

⁵¹ Lindström, Lars (2006). Creativity: What is it? Can you assess it? Can it be taught? *International Journal of Art & Design Education* 25(1): 53-66.

2.1.4 THE ORGANIZATION OF SPACE – WORKSHOP OR CLASSROOM?

The space within which people learn is important. Adam Grant, Ellen Langer and colleagues conducted an experiment to investigate whether a novel setting enhanced peoples' confidence at a task with which they generally felt less competent; drawing, in this case. They found that novelty provoked mindful reflection, which enhanced confidence. Mindful people are situated in the present; aware of the ongoing situation, whereas in the familiar situation 'people do not notice things that are directly presented to their senses; as such, they limit their opportunities for engagement'⁵².

The use teachers make of space should thus be given careful consideration. Most teaching spaces in schools are classrooms. Of course there are labs and workshops and 'art' or 'drama' studios, too. But it is the classroom which is the dominant tradition. Labs are often really classrooms with tall desks and stools. Workshops are often spaces with tools around the edge and desks facing the teacher in the middle. Even art studios can end up being desks facing the teacher with the only difference being that the desks are splattered with paint and there may be music playing.

Öztürk and Türkkan wrote that the aim of the design studio is to equip the learner as a professional through simulation of the circumstances of practice⁵³. In trying to anatomise the elements of studio learning we therefore wanted to go beyond the classroom and think about the features which make spaces more like a workshop. Such spaces are configured to make or repair things and are stocked with the tools of the craft. Where they are teaching workshops there are likely to be a range of flexible workspaces and probably one larger table around which the class can gather to watch expert demonstrations. Ideally it will be possible to leave work in progress securely.

The organization of space and its impact on learners is generally under-researched. The concept of the hidden curriculum, first coined by sociologist Philip Jackson in 1968⁵⁴, is a useful way of approaching the impact of space. By 'hidden curriculum', we mean 'all the messages and meanings – good and bad – that learners extract from their experience of school'. So, for example, if tools are locked away in cupboards it suggests that tools are controlled by the teacher rather than freely accessible. If dictionaries are stored on high shelves, it implies that pupils must ask the teacher before using one. If work in progress can be left out safely, then it might suggest that this interim stage of design was seen as a useful part of the process of making something. If drawers and cupboards are clearly labelled it might be assumed that students are to be encouraged to be resourceful and explore and use their contents. And so on.

We surmise that, just as one of the defining characteristics of Homo sapiens is our ability to create new tools, so one of the most important aspects of real-world learning is the ability to see what any new environment affords in terms of tools and human resources and then use them to best effect. Consequently we imagine that a workshop environment is more likely to encourage exploration, experimentation, tinkering, proto-typing etc.

Teachers use space to underscore their learning intentions and personal belief sets. In characterising the physical organization of space for studio learning we hope to make clear that the kinds of learning dispositions we are hoping to cultivate are those we list in

⁵² Grant, Adam; Langer, Ellen; Falk, Emily and Capodilupo, Christina (2004). Mindful Creativity: Drawing to draw distinctions. *Creativity Research Journal* 16(2&3): 261-265.

⁵³ Öztürk, Maya and Türkkan, Elif (2006). The Design Studio as Teaching/Learning Medium: A process based approach. *International Journal of Art & Design Education* 25(1): 96-104.

⁵⁴ Jackson, Philip (1968). *Life in Classrooms*. New York: Holt, Rinehart & Winston.

Table 1. We should, as Roy Pea suggests, ‘reorient the educational emphasis from individual, tool-free cognition to facilitating individuals’ responsive and novel uses of resources for creative and intelligent activity alone and in collaboration.’⁵⁵

2.1.5 LEVELS OF INTERACTION – GROUP OR SOLO?

Once young people leave school, college or university and enter the workplace, something strange happens. Whereas for almost all of their school life (except where they have been playing sports or in a play or in an orchestra) they have been assessed on the basis of their individual performance, at work they are almost always required to work as part of a small or large team of people and are judged by what the team achieves. Indeed success in life is to a considerable extent predicated on our ability to work with people who have different ways of doing things.

Yet at school, group work is not well-understood and rarely assessed methodically. Hanna Shachar and Shlomo Sharan wrote of the importance of classroom organization for cooperative learning in small groups in constituting ‘the most crucial means available to the educational enterprise for fostering students’ academic, intellectual, and social development’⁵⁶. They argued,

‘educational settings do not take maximum advantage of these means for designing the process of learning, because they are largely focused on teaching instead of expending their main effort on assisting students to learn through inquiry, discourse, and cooperative interaction’⁵⁷.

Of all of our seven dimensions this one might perhaps be better described as ‘Levels of interaction – group and solo’. For we are equally interested in both approaches. We specifically include this dimension because we believe teachers are not yet systematic enough in their approach to group work.

A number of researchers have examined the effects of group working on classroom teaching practices. From this work, we find a range of evidence linking learner interaction and each of our three outcomes. Megan Russell⁵⁸, for example, reviews a range of literature in arguing that collaborative group work enhances attainment. Maurice Galton et al.⁵⁹ link group working and academic performance. Similarly, Elmar Souvignier and Julia Kronenberger suggest that cooperative learning is likely to lead to ‘superior learning effects’⁶⁰, and Noreen Webb⁶¹ cites research linking group working and understanding.

⁵⁵ Pea, Roy (1993). Practices of Distributed Intelligence and Designs for Education. In: Salomon, Gavriel (ed.) *Distributed Cognitions: Psychological and educational considerations*. Cambridge: Cambridge University Press.

⁵⁶ Shachar, Hanna and Sharan, Shlomo (1994). Talking, Relating, and Achieving: Effects of cooperative learning and whole-class instruction. *Cognition and Instruction* 12(4): 313-353.

⁵⁷ Ibid.

⁵⁸ Russell, Megan (2010). The Formation of Effective Work Groups Within an FE Classroom. *Research in Post-Compulsory Education* 15(2): 205-221.

⁵⁹ Galton, Maurice; Hargreaves, Linda and Pell, Tony (2009). Group Work and Whole-Class Teaching With 11- to 14-Year-Olds Compared. *Cambridge Journal of Education* 39(1): 119-140.

⁶⁰ Souvignier, Elmar and Kronenberger, Julia (2007). Cooperative Learning in Third Graders' Jigsaw Groups for Mathematics and Science With and Without Questioning Training. *British Journal of Educational Psychology* 77: 755-771.

⁶¹ Op. cit

Gretchen Vik⁶² associates teamworking with development of learning dispositions such as interpersonal skills, and with enhanced active learning. In terms of the outcome motivation/engagement, collaborative working leads to more active, sustained engagement and reasoning skills⁶³; to increased readiness for the real world⁶⁴.

In working life there are well-used approaches to team working such as Meredith Belbin's team roles⁶⁵ which are designed to help groups work together more intelligently. But at school, with the exception, perhaps, of tools like De Bono's '6 Thinking Hats'⁶⁶ there is little that is systematically designed to develop ways of students working together more effectively and more smartly in groups. (And De Bono's tool was originally developed with adults in mind). It seems we only take the organization of group work seriously once we have left school. Indeed, each of the authors cited above, as well as Tim Deignan⁶⁷, Pell and colleagues⁶⁸, and James Buckenmyer⁶⁹, have drawn attention to the importance of teacher and learner education for effective group working.

As Phil Brown and Hugh Lauder put it: 'Collective intelligence involves a major change in the way we think about the relationship between the individual and society, and consequently the way we organize our schools.'⁷⁰

Group work matters because for all of our lives how we work with others will be a defining characteristic of how intelligent we effectively are. Another aspect of group working is that it provides the simplest way for us to learn by watching others. For it is widely accepted that much learning takes place through a process of imitation. A student watches the way one of her peers is starting to make a bird-box or paint a picture and tries to do it similarly. And teachers offer templates – techniques, tools, patterns of behaviour – for students to copy and make their own. Albert Bandura's work has explored the way we observe behaviour and its outcomes and then imitate (or avoid) what we observe. In Bandura's analysis we cannot escape the fact that we are all learning role models for each other. Bandura described the conditions necessary for effective imitation and modelling. First of all the learner must notice what is being modelled. Then she must remember and retain what has been noticed. And finally she must be able *and* willing to reproduce a desired behaviour. As Bandura nicely put it:

'Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behaviour is learned observationally through modelling: from observing others one forms an idea of how new

⁶² Vik, Gretchen (2001). Doing More to Teach Teamwork Than Telling Students to Sink or Swim. *Business Communication Quarterly* 64(4): 112-118.

⁶³ Blatchford, Peter; Baines, Ed; Rubie-Davies, Christine; Bassett, Paul and Chowne, Anne (2006). The Effect of a New Approach to Group Work on Pupil-Pupil and Teacher-Pupil Interactions. *Journal of Educational Psychology* 98(4): 750-765.

⁶⁴ Buckenmyer, James (2001). Using Teams for Class Activities: Making course/classroom teams work. *Journal of Education for Business* Nov/Dec: 98-107.

⁶⁵ Belbin, Meredith (2010). *Management Teams: Why they succeed or fail*. Oxford: Elsevier Ltd.

⁶⁶ See <http://www.debonothinkingsystems.com/tools/6hats.htm>

⁶⁷ Deignan, Tim (2009). Enquiry-Based Learning: Perspectives on practice. *Teaching in Higher Education* 14(1): 13-28.

⁶⁸ Pell, Tony; Galton, Maurice; Steward, Susan; Page, Charlotte and Hargreaves, Linda (2007). Promoting Group Work at Key Stage 3: Solving an attitudinal crisis among young adolescents? *Research Papers in Education* 22(3): 309-332.

⁶⁹ Op. cit

⁷⁰ Brown, Phil and Lauder, Hugh (2000). Education, Child Poverty and the Politics of Collective Intelligence (Vol IV Politics and policies 1753-1779). In: Ball, Stephen (ed.) *Sociology of Education: Major themes* London: RoutledgeFalmer.

behaviours are performed, and on later occasions this coded information serves as a guide for action'.⁷¹

The great American educator John Dewey, for example, argued strongly for a more cooperative approach to learning, variously using phrases like 'cooperative intelligence' and 'collective intelligence'. Dewey explained this by suggesting that for knowledge to be in any real sense useful it has to have expression in relationships and social activity. No man (or woman) is an island.⁷²

As well as the social intelligence implied by watching and noticing others there is a specific way that young people can help one other, by helping one other. Normally referred to as peer learning, this kind of group working occurs when learners explicitly seek to learn from one other. David Boud's description⁷³ makes this clear: 'Students learn a great deal by explaining their ideas to others and by participating in activities in which they can learn from their peers'. Citing the knowledge construction work of Jean Piaget and others, Ikseon Choi and colleagues propose that, peer interactions can guide and facilitate metacognitive activities allowing existing knowledge to be re-constructed in their mind. In this way, peer interactions, particularly verbal interactions, have the potential to 'expand learners' awareness of what they need to learn'⁷⁴.

A number of words are used to denote work-related learner interactions. Elizabeth Monk-Turner and Brian Payne⁷⁵ distinguish cooperative learning as 'a more structured, hence more focused, form of collaborative learning'. Robyn Gillies made a further distinction between 'group' learning; with its ad hoc approach to interaction, and 'cooperative' learning; characterised by positive interdependence in relation to a piece of work. Although both group and cooperative learning lead to positive outcomes, under cooperative learning, pupils-

'show increased participation in group discussions, demonstrate a more sophisticated level of discourse, engage in fewer interruptions when others speak, and provide more intellectually variable contributions to those discussions'⁷⁶.

Syh-Jong⁷⁷ similarly emphasises the common goal and common incentives of cooperative learning. The question of *how* peer learning should be used as an effective learning tool remains. Just as we find ideas of 'best practice' associated with our other dimensions, such as the role of the teacher, so others have attempted to address the issue with respect to peer learning. A critical element of student interactions is the quality of the discourse⁷⁸. Choi's research begins with the understanding that peer learning must involve 'meaningful discussion that facilitates reflective thinking' and that this takes place 'when learners raise thoughtful questions or provide critical feedback'⁷⁹. To ensure 'meaningful' conversation takes place, their study puts forward a 'peer scaffolding framework' so that novice

⁷¹ See for example, Bandura, Albert (1977). *Social Learning Theory*. New York General Learning Press.

⁷² Dewey, John (1916). *Democracy and Education*. New York MacMillan.

⁷³ Boud, David (2001). Introduction: Making the move to peer learning. In: Boud, David; Cohen, Ruth and Sampson, Jane (eds.) *Peer Learning in Higher Education: Learning from and with others*. London: Kogan Page Ltd.

⁷⁴ Choi, Ikseon; Land, Susan and Turgeon, Alfred (2005). Scaffolding Peer-Questioning Strategies to Facilitate Metacognition During Online Small Group Discussion. *Instructional Science* 33: 483-511.

⁷⁵ Monk-Turner, Elizabeth and Payne, Brian (2005). Addressing Issues in Group Work in the Classroom. *Journal of Criminal Justice Education* 16(1): 166-179.

⁷⁶ Gillies, Robyn (Op. cit).

⁷⁷ Syh-Jong, Jang (2007). A Study of Students' Construction of Science Knowledge: Talk and writing in a collaborative group. *Educational Research* 49(1): 65-81.

⁷⁸ Gillies, Robyn (Op. Cit); Webb, Noreen (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology* 79: 1-28.

⁷⁹ Op. cit

students with little domain and metacognitive knowledge can move faster into a zone of metacognitive learning. Their scaffolding includes nudges for 'clarification / elaboration', 'counter argument', and 'context / perspective-oriented' questions.

In a multi ethnic context, Hanna Shachar and Shlomo Sharan⁸⁰ introduced the Group Investigation (GI) method 'to support heterogeneity through interethnic social, intellectual, and verbal interaction'. This specific method, a form of cooperative learning, was seen to benefit motivation to learn, as a factor further positively affecting academic achievement (measured via a history test). The GI method comprises coordination of four classroom features:

- Classroom organization – a system of small groups
- Design of the learning task – must require: participation of each member; cooperation, to accomplish its goals; synthesis of member contributions; end presentation of group product.
- The teacher's role – guide, facilitator, provider of resources
- Students' role – requires: multilateral communication; initiative; choice of focus; debate.

Observe here the requirement for interdependence, in common with Robyn Gillies' earlier characterisation of cooperative learning.

The use of peer learning indicates a potential role development beyond the idea of teachers becoming facilitators to one where learners become teachers. This is no mere whimsy. For it turns out that, when learners act as teachers, there is a major impact on their educational achievement.

These are not isolated instances. John Hattie in his magisterial review of hundreds of meta-analyses of aspects of teaching and learning and their impact on attainment puts it like this:

'The remarkable feature of [all this] evidence is that the biggest effects on student learning occur when teachers become learners of their own teaching, and when students become their own teachers...Many of the most debated issues are the ones with the least effects.'⁸¹

While students can help each other and can explicitly teach each other, left to their own devices this is not necessarily what happens. So, in developing our understanding of studio learning, we particularly liked an element of Lois Hetland's pedagogy, what she calls the 'critique'⁸². The critiques used by teachers in Hetland's work – actually group critiques is a more accurate description given that they involve groups of students and teacher(s) – offer opportunities for learners to learn from the insights of their peers and other learners to learn how to notice and then put into words critiques which are subtle and useful and likely to be accepted as such by the recipient of the feedback.

Indeed research seems to suggest that groups actually perform better than individuals in problem-solving tests. Both individual achievement and group productivity, for example, went up when secondary age students and first year undergraduates were given a map reading and navigation activity⁸³.

⁸⁰ Op. cit

⁸¹ Hattie, John (2009). *Making Learning Visible: A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.

⁸² Hetland, Lois et al. (Op. Cit)

⁸³ Johnson, David; Johnson, Roger ; Stanne, Mary Beth and Garibaldi, Antoine (2001). Impact of Group Processing on Achievement in Cooperative Groups. *Journal of Social Psychology* 130(4): 507-516.

Part of the role of the teacher as facilitator is to promote collaborative working. Of more relevance to this dimension (arguably more so than to the 'role of the teacher' dimension) is the selection of particular individuals to work in groups. A number of publications attend to the role of group working on attainment of individuals of different academic inclinations or abilities although there is no clear consensus. For example, a review by Philip Abrami and colleagues⁸⁴ concludes that within a context of positive interdependence (where the success of one student increases another's chance of success) low ability learners perform better in heterogeneous groups; medium ability learners in homogeneous groups; high ability in either.

Assigning students to groups is important, not just from an attainment perspective, but from an engagement perspective. Priya Nihalani and colleagues⁸⁵ cite a number of authors recognising the wealth of literature praising collaboration among peers, but questioning discrepancies between performance scores reported at group and at individual level. In their study, focusing on high performers, they found that having a single high performer in a group benefited that individual more than it did the team's performance. They refer to this as the 'superstar effect'. Sidney Mitchell and colleagues⁸⁶ found that when grouped homogeneously, students with 'low ability' tended to question the value of collaboration. Focusing back at the other end of the ability spectrum, Elizabeth Monk-Turner and Brian Payne⁸⁷ contribute to this debate by suggesting that high achieving students are less likely to see group working as favourable. Both of these two studies questioned the practice of isolating minorities.

Not only does group working lead to learner outcomes directly, Robyn Gillies⁸⁸ suggests that by implementing 'cooperative learning', the verbal behaviours of teachers themselves are changed. Instead of didactic instruction giving, teachers reverted to more facilitative styles 'encouraging student initiatives, helping students with their learning task, facilitating communication among students, giving feedback on task performance, and praising individual students' efforts' suggesting that teaching styles that enhance interaction among learners may act as a two-pronged approach to developing studio learning.

Furthermore, under cooperative learning conditions, teachers were seen to engage in more mediated-leaning interactions and to make fewer disciplinary comments than teachers implementing group work only. Learners were also observed to model these interactions, and to become more helpful towards their peers.

In this dimension we have only focused on the group element of the choice between group and individual activity. This is solely because we believe that it is not well-enough understood and not always well practised and we were keen to explore the degree to which the social skills of relating can be cultivated. Groups are made up of individuals and the research is clear that individuals benefit from working in groups; teachers need have no fear that it is a kind of cheating.

2.1.6 VISIBILITY OF PROCESSES – HIGH OR LOW?

⁸⁴ Abrami, Philip; Lou, Yiping; Chambers, Bette; Poulsen, Catherine and Spence, John (2000). Why Should we Group Students Within-Class for Learning? *Educational Research and Evaluation* 6(2): 158-179.

⁸⁵ Nihalani, Priya; Wilson, Hope; Thomas, Gregory and Robinson, Daniel (2010). What Determines High- and Low- Performing Groups? *Journal of Advanced Academics* 21(3): 500-529.

⁸⁶ Mitchell, Sidney; Reilly, Rosemary; Bramwell, Gillian; Solnosky, Anthony and Lilly, Frank (2004). Friendship and Choosing Groupmates: Preferences for teacher-selected vs student-selected groupings in high school science classes. *Journal of Instructional Psychology* 31(1): 20-32.

⁸⁷ Op. cit

⁸⁸ Op. cit

Buildings used to hide their central heating ducts and lighting cables until the Pompidou Centre in Paris made a feature of them. Well-made plays used to pride themselves in hiding all aspects of stagecraft from the audience. And teachers used to think that they should keep many of the processes and methods of learning hidden and focus on the content and subject in hand. Until recently that is. For in the last decade study after study have made explicit connections between more learners who really understand the processes of learning and the development of successful learning dispositions.

Yet we have known for fifty years that understanding more the processes of our learning, sometimes called meta-cognition or meta-learning, was potentially a useful thing for learners to do. Intelligence expert Robert Sternberg creator of the concept of 'successful intelligence', has developed a theory that makes explicit the links between intelligence and meta-cognition. As he puts it, metacognition is the executive process which people use for 'figuring out how to do a particular task or set of tasks, and then making sure that the task or set of tasks are done correctly'⁸⁹. David Perkins has similarly honed in on this executive process which is capable of turning a thought into an action, or skill into a disposition with the phrase 'reflective intelligence'⁹⁰. We need to be able to recognise occasions on which we can deploy certain kinds of thinking skills, to be sensitive to the occasion. We have also explored this capacity for learners to be their own coach, having the presence of mind to select the most appropriate method for the task in hand under the heading of strategic intelligence⁹¹.

Many decades ago, John Flavell linked visibility of metacognitive processes to a range of learning dispositional outcomes including problem solving, self-instruction, and comprehension, both orally and in reading⁹². More recently, Chris Watkins has linked understanding of learners' 'learning orientation' with use of better self-motivating strategies⁹³. The really good news is that learning to think about learning not only helps students become more effective learners; it also enhances performance on tests and helps them to do better in examinations. Reviewing evidence from several decades, Watkins has shown⁹⁴ how learners with a more advanced conception of the processes of learning fare better in all three areas which we are exploring.

So far from keeping students in the dark about what is going on with minimal explanation of process, the research evidence is that we should actively engage them in understanding what is going on. We should invite them backstage so that they can see how the play in which they are the principal actor is unfolding.

The title of John Hattie's book, *Visible Learning*, already cited, speaks for itself. And he is explicit about his central contention in its early pages:

'It is critical that teaching and learning are visible. There is no deep secret called 'teaching and learning'; teaching and learning are visible in the classrooms of successful teachers and

⁸⁹ Sternberg, Robert (1986) *Intelligence applied*. New York: Harcourt Brace Jovanovich.

⁹⁰ Perkins, David (1995). *Outsmarting IQ: The emerging science of learnable intelligence*. New York: The Free Press.

⁹¹ Lucas, Bill and Claxton, Guy (2010). *New Kinds of Smart: How the Science of Learnable Intelligence is Changing Education*. Maidenhead: McGraw Hill Open University Press.

⁹² Flavell, John (1979). Metacognition and Cognitive Monitoring. *American Psychologist* 34(10): 906-911.

⁹³ Watkins, Chris (2010). Learning, Performance and Improvement. *Research Matters*, Summer Issue: London: The London Centre for Leadership in Learning.

⁹⁴ Watkins, Chris (2002). Learning about Learning Enhances Performance. *National School Improvement Network Bulletin*, No. 13: London: Institute of Education.

students....What is most important is that the teaching is visible to the student and learning is visible to the teacher.⁹⁵

Metacognitive awareness enables learners to vary their approach to dealing with tricky issues that the classroom throws their way. Helena Pedrosa de Jesus and colleagues⁹⁶ explored the extent to which particular modes of questioning are indicative of particular 'learning styles'. Pedrosa de Jesus' study found a relationship between students' questioning styles and their learning styles. Some, for example, tend to pose more 'what if' questions than any other sort of question. Other tend only to ask 'why' questions if they have time to reflect. Now, we know that traditional classroom environments are not always conducive to questioning by students, particularly those who are either less confident, or those who prefer to process thoughts before responding⁹⁷. The study demonstrated the benefits, to engagement and motivation, of teachers encouraging students, and providing opportunities for them to pose the right sort of questions.

2.1.7 THE ROLE OF THE LEARNER – SELF-MANAGED OR DIRECTED?

Our final dimension, as the last quotation from Hattie reminds us, is the flip-side of our first one concerning the role of teachers. In the studio we envisage that young designers and makers have considerable scope for self-management and that this will be beneficial to the development of their resourcefulness and ability to reflect. Accordingly, we imagine, students will be better able to play a meaningful role in determining the way their own learning proceeds.

Just as we placed large caveats around the opposition between facilitative and didactic styles, so we must do the same here before anyone assumes that self-managed learning needs no direction from the teacher who can, therefore, put his or her feet up and read a newspaper. It's just that it is a different kind of direction which is needed. Crisp interventions, with a constant expectation that the default setting on which all learners will operate is to 'see if they can sort things out for themselves before asking for help rather than the other way round', fit well with the creation of a culture in which the emphasis is largely on students managing their own learning. Roger Harrison⁹⁸ described the self managing learner as 'one who is self-aware, capable of exercising choice in relation to needs, of taking an active self-directing role in furthering his or her own learning and development'.

In strongly emphasising the importance of learners taking more responsibility for their own learning, we are drawing on recently reviewed empirical evidence from a decade of work in schools using the Building Learning Power materials⁹⁹. More than a thousand schools in England now use a range of strategies to cultivate the kinds of dispositions we focused on in this study¹⁰⁰. Our seven dimensions of studio learning essentially cast light on the 'ecology of learning' within the classroom, with the seventh explicitly exploring the changed role of learners we anticipate. Precisely what the factors of a more self-managed or learner-centred classroom or workshop might be has been extensively explored by Barbara McCoombs¹⁰¹. In 1990 McCoombs coordinated a major exploration by the American

⁹⁵ Op. Cit

⁹⁶ Pedrosa de Jesus, Helena; Almeida, Patrícia and Watts, Mike (2004). Questioning Styles and Students' Learning: Four case studies. *Educational Psychology* 24(4): 531-548.

⁹⁷ Shachar, Hanna and Sharan, Shlomo (Op. cit)

⁹⁸ Harrison, Roger (2000). Learner Managed Learning: Managing to learn or learning to manage. *International Journal of Lifelong Education* 19(4): 312-321.

⁹⁹ <http://www.tlold.co.uk/buildinglearningpower.php>

¹⁰⁰ Claxton, Guy; Chambers, Maryl; Lucas, Bill and Powell, Graham (Op. cit)

¹⁰¹ McCoombs, Barbara and Lynda Miller, Lynda (2007). *Learner-Centered Classroom Practices and Assessments: Maximizing student motivation, learning, and achievement*. Thousand Oaks, CA: Corwin Press.

Psychological Association of learner-centredness which reviewed many decades of research and produced a set of principles which, in 1997, were expressed as 14 statements which emphasised the 'active and reflective nature of learning and learners' and argued that the educational system would be improved most if it were redesigned with the primary focus on the learner.

Just what the shift in focus means in terms of the ecology of learning has been the subject of research by Ruth Deakin Crick and colleagues (including McCoombs)¹⁰². Two key findings are of relevance here. First, students' self-reported learning power was greater in classrooms where teachers were allowing greatest opportunities for learner self-management (as expressed in students' 'perceptions of their teachers' levels of learner-centred practices'). Secondly, students with the most learner-centred teachers had the highest levels of motivation and self-reported learning power. Furthermore, the study linked learning power to attainment.

Similarly, Barry Zimmerman¹⁰³ links 'self-regulated learning' with academic performance, and outlines a range of strategies successful students adopt:

- Self evaluating
- Organizing and transforming
- Goal-setting and planning
- Seeking information
- Keeping records and monitoring
- Environmental structuring
- Self-consequating
- Rehearsing and memorising
- Seeking social assistance
- Reviewing records.

That self-managed learning encourages the kinds of powerful learning dispositions we were seeking to cultivate has been attested in more finely grained studies into, for example, learner-generated questioning. We know that learners understand and remember new material better when they have had opportunities to interrogate it and elaborate on its content, in other words when they have actively engaged with it¹⁰⁴. We also know that the process of explaining things to other people promotes learning. And Alison King has shown how subtly it is possible to guide students to generate good questions (while leaving them considerable freedom to personalise and adapt them)¹⁰⁵.

Indeed it is at this level of subtlety that the precise details of the studio learning ecology needs to be understood and it was these kinds of insights that our study has sought to illuminate. In trying out our approach, we were prepared that some students would not warm to the reality of the expectations put upon the 'self-managing learner' and might struggle to engage. Tim Deignan's¹⁰⁶ investigation into

¹⁰² Deakin Crick, Ruth; McCombs, Barbara; Haddon, Alice; Broadfoot, Patricia and Tew, Marilyn (2007). The Ecology of Learning: Factors contributing to learner-centred cultures. *Research Papers in Education* 22(3): 267-307.

¹⁰³ Zimmerman, Barry (1989). A Social Cognitive View of Self-Regulated Academic Learning. *Journal of Educational Psychology* 81(3): 329-339.

¹⁰⁴ See, for example: Pressley, Michael; Wood, Eileen; Woloshyn, Vera; Martin, Vicki; King, Alison and Menke, Deborah (1992). Encouraging Mindful Use of Prior Knowledge: Attempting to construct explanatory answers facilitates learning. *Educational Psychologist* 27(1): 91-109.

¹⁰⁵ King, Alison (1992). Facilitating Elaborative Learning Through Guided Student-Generated Questioning. *Educational Psychologist* 27(1): 111-126.

¹⁰⁶ Op. cit

similarly 'loose', 'enquiry-based' and 'problem-based' learning approaches called into question the appropriateness of student-led methods for all learners, particularly those who lack an initial threshold level of problem-solving and interpersonal skills. To counter potential ill effects that may arise from initial frustrations at unproductive tangents, or loss of confidence when solutions are not immediately apparent, supportive tutoring is essential.

2.2 CHANGING ENGRAINED HABITS

We have looked in some depth at the literature underpinning each of the seven dimensions of studio teaching as we conceive it. Now we briefly explore five key elements underpinning any attempt at habit change of the kind we are attempting in *Making It*.

Changing any engrained pattern of behaviour is hard work. It requires a real understanding of what is to be changed, the ability to imagine the new way of behaving, the commitment to change, and lots of practice in different situations to help the shift to become engrained enough. For some while the 'new' way of doing something feels just that, new. And it is all too easy to slip back into old, familiar ways of doing things.

In creating our research project and, specifically, when designing the training intervention we tried to bear in mind these key aspects of habit change. Here we review a few of the more important considerations we sought to bear in mind.

2.2.1 BUILDING UNDERSTANDING

The more precisely the proposed habit change can be understood the more likely it will happen. All too often initiatives fail because the participants do not clearly understand exactly what they need to do, when they need to do it and how they can be supported through the process. And understanding needs to take place at both the theoretical level ('We are trying to create a studio learning environment because the research suggests that this may help to create better learners') and equally importantly at the practical level ('Three practical tips for giving feedback; look for what's going well, try and ask questions and don't tell people what to do').

The process of building understanding takes time and practice. Philippa Lally and colleagues¹⁰⁷ have found that it takes around two months of concerted practice before a simple habit change (eating a piece of fruit after lunch, say) becomes stabilised. Needless to say habit change in teaching style is more complex than regular fruit consumption!

2.2.2 USING IMAGINATION

Peter Gollwitzer and others¹⁰⁸ have shown that anticipatory 'implementation intentions' – imagining what you might do in a certain situation - significantly increase the likelihood of intentions being translated into actions. In other words the more you can imagine and anticipate a change in your behaviour the better. In terms of teacher training this might suggest role play and simulation activities

¹⁰⁷ Lally, Philippa; van Jaarsveld, Cornelia; Potts, Henry and Wardle, Jane (2009). How are Habits Formed: Modelling habit formation in the real world. *European Journal of Social Psychology* 40(6): 998-1009.

¹⁰⁸ Gollwitzer, Peter; Wieber, Frank; Myers, Andrea and McCrea, Sean (2010). How to Maximize Implementation Intention Effects. In: Agnew, Christopher; Carlston, Donal; Graziano, William and Kelly, Janice (eds.) *Then a miracle occurs: Focusing on behaviour in social psychological theory and research*. New York: Oxford University Press.

as well as more explicit visualisation of new experiences, all coupled with plenty of opportunities for recourse to the experiences and guidance of other colleagues.

2.2.3 DEVELOPING COMMITMENT

There are various well-known ways of building commitment. Writing things down helps. Signing up to something works, too. Just by becoming familiar with something it is likely that you will become positively engaged. Known as the ‘mere exposure effect’ and discovered by Robert Zajonc¹⁰⁹, we know that creating an atmosphere in which new ways of doing things can safely be experienced is a key element of successful habit change.

2.2.4 USING THE POWER OF SOCIAL SUPPORT

Alcoholics Anonymous, Weightwatchers and many other similar groups gather together precisely because they know that one person trying to change is much less likely to succeed than a group of people embarked upon a similar endeavour. The same is true of teachers where such groups are likely to be known by a variety of different terms of which ‘professional learning community’ is one of the most widely used. Research studies attest to the power of social support and social commitment in successful habit change¹¹⁰. Indeed, Nicholas Christakis and James Fowler have shown that our success at changing habits is hugely influenced – whether we know it, or intend it, or not – by the people we associate with¹¹¹. In an educational context the importance of learning communities and learning cultures has been well researched by, for example Dylan Wiliam¹¹² and by Louise Stoll and colleagues¹¹³.

2.2.5 TRANSFERRING LEARNING FROM TRAINING ROOM TO STUDIO CLASSROOM

Habit change of the kind we wanted to ask our teachers to undertake required them to undertake a kind of learning transfer. And we know, from the work of David Perkins and Gavriel Salomon¹¹⁴ that as well as extensive practice, ideally in different contexts, transfer can be assisted where there are clear theoretical models, where there is active self-monitoring of progress and where, at the point of first encountering the new methods as many connections as possible are made to the learner’s *existing* knowledge.

And, of course, when trying to facilitate any complex change – such as a shift from more traditional classroom practices to a studio pedagogy - it is important not to overwhelm those attempting to change habits of teaching which are likely to be well and truly engrained.

As Mark Twain memorably put it, ‘Habit is habit, and not to be flung out of the window by any man, but coaxed downstairs a step at a time.’

¹⁰⁹ Zajonc, Robert (1968). Attitudinal Effects Of Mere Exposure. *Journal of Personality and Social Psychology* 9(2, Pt. 2): 1-27.

¹¹⁰ See, for example: Sallis, James; Grossman, Robin; Pinski, Robin; Patterson, Thomas and Nader, Philip (1987). The Development of Scales to Measure Social Support for Diet and Exercise Behaviors. *Preventive Medicine* 16(6): 825-836.

¹¹¹ Christakis, Nicholas and Fowler, James (2010). *Connected: The amazing power of social networks and how they shape our lives*. London: HarperPress.

¹¹² Wiliam, Dylan (2008). Changing Classroom Practice. *Educational Leadership* 65(4): 36-42.

¹¹³ Stoll, Louise; McMahon, Agnes and Thomas, Sally (2006). Identifying and Leading Effective Professional Learning Communities. *Journal of School Leadership* 16(5): 611-623. See also Vescio, Vicki; Ross, Dorene and Adams, Alyson (2008). A Review of Research on the Impact of Professional Learning Communities on Teaching Practice and Student Learning. *Teaching and Teacher Education* 24(1): 80-91.

¹¹⁴ Perkins, David and Salomon, Gavriel (1988). Teaching for Transfer. *Educational Leadership* 46(1): 22-32.

In the educational context there is a large literature about change more generally, in the main concerning attempts by governments to improve educational systems or accounting for the impact of certain kinds of institutional leadership about which, for example, Michael Fullan¹¹⁵ has written extensively.

We acknowledge that there are many other issues which we might have explored, especially to do with the culture of schools, which fall beyond the scope of this research.

2.2.6 MAKING IT HAPPEN

Even without our subsequent empirical research (outlined in the next chapter) we believe that, in 2.1, we have usefully synthesised a body of knowledge into a practically useful and well-founded model of what we are calling ‘studio teaching’. Our evidence comes from across the curriculum and across the world and we are interested in the seven dimensions because the evidence would suggest that the studio approach could be a model for effective teaching in *any* subject.

There is at least some foundation for assuming that the studio learning opportunities which each of the seven dimensions afford students might go some way to allay the three concerns with which we began *Making It* in 1.1.

The literature we surveyed in 2.1 gave us clear lines of enquiry on which to focus as we looked for changes in dispositions to learn, motivation, and attainment. And the very real challenges of habit change, described in 2.2, helped us design the training and support with which we provided our teachers.

¹¹⁵ Fullan, Michael (1993). The Complexity of the Change Process. In: Fullan, Michael (ed.) *Change forces: Probing the depth of educational reform*. PA: Falmer Press.

3. RESEARCH DESIGN AND DATA ANALYSIS

'The empiricist assumption that dominated many branches of psychology for decades, the assumption that what we know is a direct reflection of what we can perceive in the physical world has largely disappeared. In its place is a view that most knowledge is an interpretation of experience'

Lauren Resnick¹¹⁶

3.1 RESEARCH QUESTIONS

Our research questions flow from the conception of studio teaching we have outlined in the previous chapter. But they were also informed by a growing belief that any mention of the word 'studio' all too easily gets linked only with arts subjects. We propose that the evidence suggests that if we are to develop powerful learners at the same time as improving engagement and attainment, then almost any areas of the curriculum would benefit from a studio teaching pedagogy. We hypothesise, that among many possible benefits of this kind of approach, there is the potential to minimise the corrosive impact of the 'academic versus practical' debate that still bedevils the UK's education system¹¹⁷. Our choice of Design Technology (DT) for the location of this research has already been explained, but a conscious attempt to move 'out' from the art studio into the rest of the school was also part of it.

We sought to design an experiment that would allow us to explore studio teaching where all students could experience the crafting of an object over time. We also wanted to work with teachers and students to whom the idea of studio teaching was unexplored territory but for whom the subject area (DT) was likely to be relatively unconstrained by the requirements of knowledge content, hence selecting DT.

Having identified the seven dimensions along which classrooms might vary, from formal, individualised and didactic at one end to collaborative and self-organized at the other, we wanted to apply this pedagogy to real life classroom situations. We envisaged that an exploration of how 'ordinary' teachers grappled with the challenges posed by this change would give new insight into successful adoption of the studio teaching style. With this in mind, we posed two research questions; designing a fieldwork phase, and incorporating mixed methods of data collection around these:

1. How do teachers perceive their teaching style to develop as a result of this studio teaching project?
2. How does studio teaching impact upon pupils' learning?

Over a period of between six and ten weeks, we observed the organization and interaction of lessons, recorded conversations with both teachers and students (and between students themselves), and administered a 'learning power questionnaire', (see Appendix 1), at beginning and end to see if there had been any changes in students self-reported levels on each of the groups of dispositions. We also compared students' levels of attainment, as judged by their finished products, with the levels of attainment that their teachers had predicted to gauge whether attainment was broadly on target, and

¹¹⁶ Resnick, Lauren (1991). Shared Cognition: Thinking as social practice. In: Resnick, Lauren; Levine, John and Teasley, Stephanie (eds.) *Perspectives on Socially Shared Cognition*. Washington, DC: American Psychological Association.

¹¹⁷ For a more detailed exploration of this tension see Lucas, Bill; Claxton, Guy and Webster, Rob (2010). *Mind the Gap: research and reality in practical and vocational education*. London: Edge Foundation.

no unexpected negative consequences in attainment would arise. Appendix 3 outlines the attainment targets for DT at Key Stage 3. To teachers, we administered a self-report 'teacher reflection grid' at the beginning and end of the project to record how their perception of their own practice altered. The training sessions, and research tools, are laid out in the following three sections.

3.2 A PROGRAMME OF TEACHER DEVELOPMENT

We recruited three inner London secondary schools, each with two Year 8 Design Technology teachers who were willing to try their hand at studio teaching (as defined in the previous chapter using our seven dimension model.) The development programme involved two separate all-day workshops, separated by a few weeks, at the University of Winchester; a number of individual school visits from the research team; two school based 'clinic' sessions at which practice could be shared and issues could be aired; and a range of face to face, telephone and e-mail support. In addition our field researcher visited each school many times to provide support, observe and film teaching and conduct interviews.

Teachers were asked to seek to align their teaching style more closely to our model of studio teaching. We explained that we were looking to see what effect studio teaching might have particularly on the development of certain learning habits of mind or dispositions in students, but also upon their engagement. We explained that we were also tracking attainment, to gauge trends across the project. This shift in practice involved, potentially, the amount of choice which they gave students, the degree to which out of lesson continuation was possible, the physical organization of the classroom, the balance of individual and collaborative learning and the degree to which learning processes were made visible.

We also introduced teachers to the 4Rs model of learning already introduced in Figure 1 on page 8 with its 16 major learning habits of mind grouped into resilience, resourcefulness, reflection and relating. They were encouraged to see if they could 'nudge' their students to become more aware of each of these.

In both the workshop days we adopted some of the features of the studio lessons we were asking the teachers to create. Once brief expert explanations had been given (by Claxton and by Lucas), we created opportunities for the teachers to become a community of practice whose role was to enquire into how best they might become studio teachers. This involved personal reflection on their current teaching style; work in groups to develop studio teaching approaches for DT classes; visualisation and simulation of imagined studio learning situations; exploring ways of prompting students; planning and then practising techniques; and the setting up of small group reflection sessions in which students would critique each other's work. (See Appendix 1 for some of the materials used.)

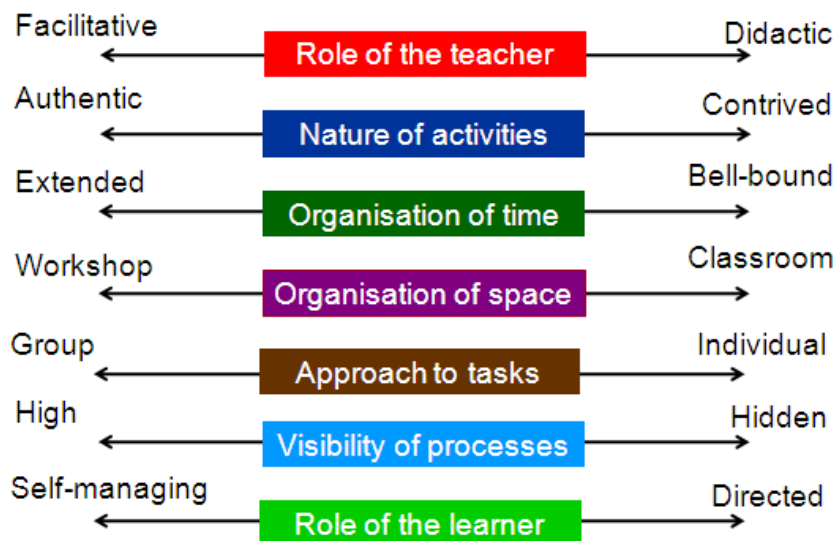
At the same time we explained the different ways in which the researcher would like to engage with them and with their students and sought their cooperation in planning methods which would be both as unobtrusive as possible and practically achievable in a busy secondary school class. To reinforce both the practical implementation and some of its theoretical underpinnings we gave each teacher a copy of Lois Hetland's *Studio Thinking*¹¹⁸ to read and return to throughout the project.

¹¹⁸ Op. cit

3.3 EXPLORING CHANGES IN TEACHERS' PRACTICE

In order to gauge how teachers perceived their teaching style to develop as the project progressed, we developed a teacher self-report tool; the 'teacher reflection grid'. This was designed to identify teachers' self-perceived change in practice across the seven dimensions of our studio teaching framework. Based on our review of the literature we anticipated that studio-style teaching would both depend upon, and enhance, the interactions with learners; the authenticity of activities; the period of time over which activities would be reflected upon and completed; the layout of the classroom in a way conducive to reflection, resourcefulness, and relating; the involvement of groups rather than individuals; the way in which the language of the processes of learning language was used explicitly; and the extent to which learners self-organized. During researcher-led training sessions, teachers were introduced to the seven dimensions, explored in depth in the last chapter, and shown below, again in Figure 2. They were also engaged in thinking through the ways in which, for the intervention to be successful, they need to develop particular teaching styles. Each teacher was asked to try and teach 'differently' with the group involved in our intervention.

Figure 2 The Seven Dimensions of the Studio Teaching Teacher Reflection Grid



Notwithstanding our earlier comment in 2.1. that studio teaching is not an either/or, and that good teaching involves a certain level of judgment about whether the left side is continually appropriate, we hoped that teachers would shift their practice towards the left-hand side of Figure 2. Through the teacher reflection grid we recorded teachers' perception at the beginning and end of the project. It is possible that teachers engaging in 'before' self-report questionnaires might tend to inflate their initial scores due to unfamiliarity with concepts. At the time of completion of 'after' questionnaires, teachers might be more familiar with the language of the seven dimensions. Teachers may even self-score more critically than is fair, and certainly more critically than initially. Indeed, the 'response shift bias' phenomenon as a source of contamination of self-report measures is well documented. George Howard and Patrick Dailey's study of self-report response validity found that 'self-reported measures of change that used retrospective pretests to remove response-shift bias demonstrated significantly greater validity than measures of change that used traditional self-report pretests'¹¹⁹. Similarly, a study

¹¹⁹ Howard, George and Dailey, Patrick (1979). Response-shift bias: A source of contamination of self-report measures. *Journal of Applied Psychology* 64(2): 144-150.

by Frederick Rohs found that ‘when employing self-report measures, the then/post approach provides a less conservative and more accurate means of assessing leadership skill development than would the traditional pretest/posttest approach’¹²⁰. With this self-report issue in mind, pre- and post-intervention teacher reflection grids were administered to teachers after the event to ensure that teachers themselves performed a sense check on the entries, re-considering their ‘before’ scores in the light of where they ‘now’ considered themselves. We also asked teachers to identify and note down why they perceived (or did not perceive) a change in their teaching style.

Exit interviews were conducted by the researcher with all teachers, in addition to occasional mid-project interviews, and informal discussions by the rest of the research team, and follow up telephone calls to clarify as necessary.

Interview questions were developed to tackle the two main research questions. Teachers were asked to reflect on the changes they noticed in their teaching style as a result of the project’s intervention. They were asked also to comment on the effects of the project upon student ‘learning power’, motivation / engagement, and attainment.

We approached the analysis interpretively; drawing from teachers’ comments their thoughts on (for example) *how* studio teaching motivated learners. We used the principles behind Hilary Radnor’s approach to prepare the semi-structured interviews for analysis¹²¹, and to interpret data, in order to answer the research questions. The approach ensured a highly rigorous and logical process of coding data, providing a clear audit trail back to the data. The approach, which we adapted for our purposes, takes the following steps:

1. Topic ordering.
2. Constructing categories.
3. Reading for content.
4. Chunking data under logical thematic headings.
5. Analysis to interpreting the data.

The following table outlines the approach to preparation of the interview data for analysis, and interpretation of data.

¹²⁰ Rohs, Frederick (1999). Response Shift Bias: A problem in evaluating leadership development with self-report pretest-posttest measures. *Journal of Agricultural Education* 40(4): 28-37.

¹²¹ Radnor, Hilary (2002). *Researching Your Professional Practice: Doing interpretive research*. Buckingham: Oxford University Press.

Table 4 Preparing Teacher Interview Data for Analysis, and Interpretation of Data

DATA PREPARATION STAGE	ACTION TAKEN
Topic ordering	❖ Interview transcripts were typed up in standard format. Transcripts and observation schedules were assigned an identifying number, organized into folders according to which round of interviews they fell into, and then into ‘teacher’ or ‘learner’ subfolders. The main research questions gave rise to a series of broad themes, upon which were based the interview questions. Themes were given an identifying name (e.g. effects of the intervention upon teachers), and became the backbone of the coding system.
Reading the transcripts	❖ This important stage brought the researcher close to the data allowing transcriptions to be checked for accuracy. Transcriptions were read through while simultaneously listening to audio recordings where unclear.
Constructing categories	❖ Upon reading each transcript through, further ‘sub-themes’ were created manually. These reflected emergent topics embedded implicitly within responses. For example, a sub-theme of ‘effects of the intervention upon learners’ might be ‘enhanced confidence’.
Coding	❖ Simultaneously with the previous stage: where sub-themes relating to emergent topics were created, each transcript was coded manually so that chunks of data from within it were assigned to the appropriate sub-theme heading. The same data chunk could also be coded to multiple sub-themes.
Interpretation of data	❖ The researcher looks at all the data relating to a particular theme and looks for patterns in the data, or ways of understanding it.

Validation of the findings from semi-structured interviews was designed into the study by further questioning teachers on each of the five interview themes using a post-project questionnaire. Teachers’ free-text comments were also analysed to draw out comments, which fell similarly under the same five themes.

Analysis was conducted on each qualitative data source by the same interpretive method. Comments relating to a particular theme were further grouped by which of the seven dimensions of studio teaching it related. By this method, similarities (and also any inconsistencies) could be seen clearly across the whole data set.

A final approach we took was to observe teaching sessions within each classroom. We made 23 classroom observations, logging activities that were taking place, and noting anything pertinent to the implementation of, or effects of, our studio teaching approach.

3.4 EXPLORING THE IMPACT OF STUDIO TEACHING UPON LEARNERS

We focus now upon our second research question: how does studio teaching impact upon pupils’ learning? To explore how the studio teaching approach affects pupils’ learning we took a mixed methods approach, using the tools shown in Table 5. The general processes we undertook in

interviewing, observing, and administering questionnaires, and the interpretive process of analysis of each data source was conducted in the same way for learner interviews as for teacher interviews, and has been described previously.

The three areas where we believed learners would benefit from studio teaching were: the development of dispositions associated with learning; their motivation and engagement; and (perhaps to a lesser degree over this short intervention) their attainment. Table 5 shows the range of tools used to explore the question of how studio teaching impacts upon pupils' learning.

Table 5 Data Sources Used in Exploring the Impact of Studio Teaching Upon Learners

Area of impact on learners	Quantitative data sources	Qualitative data sources
1. Dispositions associated with successful learning	<ul style="list-style-type: none"> ❖ Questionnaires administered to teachers at a post-project feedback meeting ❖ Questionnaires administered to learners to report their self-assessed 'learning power' (LPQs) 	<ul style="list-style-type: none"> ❖ Interviews with teachers; mid- and end-project ❖ Questionnaires administered to teachers at a post-project feedback meeting ❖ Interviews with learners ❖ Observations of classes
2. Motivation / engagement		<ul style="list-style-type: none"> ❖ Interviews with teachers; mid- and end-project ❖ Questionnaires administered to teachers at a post-project feedback meeting ❖ Interviews with learners ❖ Observations of classes
3. Attainment	<ul style="list-style-type: none"> ❖ Teacher records of learners' predicted, and actual, end-of-project attainment grades 	<ul style="list-style-type: none"> ❖ Interviews with teachers; mid- and end-project

To explore the relationship between studio teaching and learning dispositions, we designed a 'learning power questionnaire' (LPQ). The questionnaire (reproduced in the Appendices) contained sixteen statements based on the four aspects of learning power we selected: resilience, resourcefulness, reflection and relating. Students were asked to assign a ranking between 1 = rarely (or never) and 5 = very often (or always). Side by side, 'before' and 'after' LPQs showed us learners' self-reported perceptions of their own learning dispositions. Given the ongoing emphasis on learning language, we expected that over time, learners would enhance their own learning dispositions and, thus, LPQ scores would increase. We calculated the perceived change reported by each child, and then for the whole data set so that we could chart an overall picture. Students were given a questionnaire in the first and last weeks of term to assess the development of their 'learning power', as they perceived it.

To explore the relationship between studio teaching and learner motivation and engagement, we conducted semi-structured interviews with teachers, mid- and end-of-project, and with learners; both in groups and alone. Through this qualitative data tool, we explored *how* learners benefitted from the intervention, as well as exploring factors that inhibited its positive effects. For example, is it possible that certain types of pupil did not grasp the intervention’s concepts in the time available; did teachers perhaps fall short at times in making the intervention’s language visible?

We have mentioned interviews with teachers, and questionnaires. Through a series of semi-structured interviews we also asked learners for their own thoughts. Interviews were conducted at two points during the intervention with one fifth of learners in the classes concerned. More detail on this data set is given in Appendix 2. Interview questions probed pupils about how they felt about the new approach to DT lessons; how it was different from before, what ‘worked’ for them, and how it affected their learning. Interviews were conducted in the classroom during lessons and filmed interviews took place in video diary rooms, where available, or in the classroom itself. The purpose of the video diary room, which was labelled as such, was to provide privacy away from the rest of the class. All interviews were conducted from the same script.

As with teacher interviews, an interpretive approach was taken to draw from each interview the key themes, or trends. A rigorous process of data sorting ensured that the same set of themes was drawn from each interview, as appropriate. The interpretive approach allowed themes to ‘emerge’ from the transcribed interview. As an example, we found that as learners discussed the impacts of the project upon their learning, they also elaborated upon, or implied, how certain factors acted to the detriment of the project’s benefits. We called this theme ‘inhibitors’ as we further analysed the data searching for patterns.

As highlighted in our review of the literature, a studio teaching approach has been linked with improved attainment. Our study sought to monitor trends in attainment by collecting both predicted and actual attainment data from teachers.

Table 6 shows the multiple data sources used to respond to our two research questions, and each interview or questionnaire was scrutinised for evidence relating to these questions.

Table 6 Data Sources Responding to Each Research Question

Research question	Qualitative data source
1. How do teachers perceive their teaching style to develop as a result of this studio teaching project?	<ul style="list-style-type: none"> ❖ Teacher interviews ❖ Observations ❖ Teacher questionnaires
2. How does studio teaching impact upon pupils’ learning?	<ul style="list-style-type: none"> ❖ Teacher interviews ❖ Observations ❖ Teacher questionnaires ❖ Learner interviews

4. FINDINGS

'I was teaching them like I taught A level students, not school children, letting them go out there and figure out what they wanted to do, and only if they get stuck come back, and then you have a discussion about how to move forward, and me not actually saying 'this is what you must do' ... that's not how it is. I'm definitely going to use [this approach in my other classes] because you have year 9 going into GCSE, and it's preparing them well to think on their own; to think by themselves; to get them to grow confident, and they're learning more depth of the subject because they now know the components by name, and by sight. It's exciting; very exciting.'

Making It teacher

'In the future we're not always going to have someone to be there to tell us what to do; we're going to have to try and work by ourselves and be independent.'

Making It student

As described in 3.2, our first meetings with teachers involved sharing two related sets of ideas: how do teachers perceive their teaching style to develop as a result of this studio teaching project; and how does studio teaching impact upon pupils' learning? Through the next few pages we show our findings in relation to each of these two research questions. In relation to changes in teachers' teaching style, we first explore how teachers responded to the change.

4.1 IMPACT ON TEACHERS' TEACHING STYLE

4.1.1 TEACHERS' UNDERSTANDING OF THE APPROACHES

Conceptually we had no difficulty in making a compelling case for either the wider learning skills represented by the 4Rs or our seven dimensional model of studio teaching. Given the importance of various 'craft' skills in DT, teachers found the wider skills encompassed by the 4Rs easily applicable to approaches with which they were already comfortable. And, because of the relatively fluid nature of DT workshop teaching practices, studio teaching seemed at first simply to be an extension of familiar ways of working.

Two aspects of what we proposed were difficult to grasp, however, and one objection to the whole studio teaching approach surfaced early on. Dealing with the objection first, all teachers expressed a worry that, while they could see the advantage of cultivating more independently resourceful learners, the pressure of producing a product at the end of the module made them fearful of having too little time for this studio-like style of teaching.

Difficulty Number 1 was the practical organization and setting up of regular small group critique sessions for the students to review their work in progress (and there were also practical storage issues here, too). Done too early in a lesson and they worried that the flow of the students' working would be interrupted. Done too late and it was difficult to ensure that the timing of the critique session naturally led to a well-ordered lesson close.

Difficulty Number 2 was the new role we were inviting them to play. Specifically it concerned the combination of being facilitative (teaching less and getting students to teach and coach each other

more), with being more explicit about the processes of learning. See Appendix 1 for examples of the kinds of prompts we offered them and subsequently role played and practised together.

In terms of our expectations with regard to teacher habit change (summarised in 2.2), and notwithstanding the difficulties just noted, we experienced a number of successes:

- it *was* possible to build sufficient understanding of studio teaching
- we *did* manage to engage teachers in imagining what unfamiliar approaches might look and feel like
- there *was* a level of commitment in all of the teachers (variable; from highly engaged, to professional involvement in a project)
- the group; a small professional learning community, with help from the research team and its external critical friend Louise Stoll, *was* a source of real social support conveyed through meetings, e-mails and telephone calls, and
- we *were* able to provide models, orchestrate practice sessions and make connections to the existing experience of our teachers.

We found that a range of factors, discussed in detail a little further on, impacted upon the benefits of the studio learning approach. At this point in our narrative, however, we will comment briefly on the importance of the developmental workshops we offered. The teachers told us that, through our collaborative coaching, they felt well set up to help their pupils experience studio learning. They liked the level of input they were given and appreciated that they were invited to contribute to the project's development, able to share ideas with like-minded practitioners as well as to receive support, feedback, and input from the project team. But in two days it is only possible to cover so much ground.

4.1.2 HOW TEACHERS INTERPRETED THE 'STUDIO TEACHING' APPROACH

We found, both through observation, and through discussion with teachers, that teachers made a number of changes in their classrooms as a result of our project's intervention. We were looking to alter practice across the seven studio teaching dimensions. Tying together our observation and interview evidence with the reflection grids completed by teachers, we noticed that where teachers made the most tangible alterations within the classroom, it was here that they also believed they had altered their practice the most. While teachers are, of course, *more likely* to discuss those actions that are more commonly occurring (for example, those that fall naturally within what we have called the 'self-managing' category) this evidence is also indicative of the varying ease with which teachers interpreted and employed each of the dimensions.

In trying to develop each of the seven areas of studio teaching, a range of good practices emerged, not all of which were undertaken by all teachers. Through use of our self-report tool, through observation, and through interviews confirming findings, we learned about how teachers changed their practice.

In trying to promote the ideal of the *self-managing* learner, for example, teachers provided access to tools and resources. We noticed one of our teachers setting up a table, on which he arranged a range of tools, so that learners did not need to ask for them. Although not always easy, teachers also refrained from giving guidance upfront. They allowed learners to make their own decisions and the idea of learners experimenting with solutions arose a number of times; they encouraged learners to create and manage their own learning-plans; and they encouraged learners to reflect on their work in

progress, and to seek alternative solutions to problems before consulting the teacher. We noticed one of our teachers pose questions back to pupils in a way that encouraged them to reflect, and all teachers attended to developing class reflection before decisions were made about 'next steps'.

Peer teaching and mutual support were encouraged by teachers drawing attention to and commending behaviours that were desired and valued; encouraging learners to help one another; instructing learners to teach one another; allowing learners to self-select peers to interact with.

Teachers worked to become more *facilitative* by keeping their instruction time to a minimum. One of our teachers adopted a 'boardroom'-style gathering during which learners discussed progress and next steps. Teachers responded to learners with a question rather than giving them all the answers, drawing attention to the idea that learners ought to be working things through in their own minds and not relying on the teacher's experience. They showed physical examples of others' work: one teacher used particular pieces to demonstrate how different tools were used to ensure joints fitted snugly together, before allowing learners to try for themselves. One of our teachers was observed to send learners around to view the work of peers, and to comment, thus refraining from giving feedback himself, and simultaneously giving credence to peer comments. Modelling good, or bad, practice was another way teachers avoided direct instruction. We observed one teacher guiding his class through a reflection exercise and stimulating their responses throughout the process. In helping to facilitate learning, one of our teachers commented that settling learners into activities promptly helped them to become engrossed and to avoid distraction.

The *studio environment* dimension was interpreted similarly by all teachers, and implemented to varying degrees. Classroom rearrangement generally meant that tables were grouped, where possible, to enable two things: group interaction was made easier as those around individual tables could talk; and development of ideas and peer-to-peer interactions could be made simpler if space between tables allowed them to move around and reflection on one another's work without impediment. Tools were made as accessible as possible, within the boundaries of health and safety, to allow children to experiment with the making process.

In trying to make learning more *visible*, teachers made expectations clear from the start; they made the intervention and its language overt; and they gave constant reminders about language and expectation. It was clear from our support sessions that for some teachers the idea of making learning principles more explicit - 'visible learning' – came less easily to them.

Extended working was less overt. Some teachers encouraged it by making the DT rooms available to learners after hours or during lunch breaks, or even detention, where possible.

4.1.3 REFLECTIONS ON REAL SHIFTS IN TEACHING PRACTICE

Overall, our teachers reported that they *had* found it possible to shift their 'normal practice' in the direction of a more studio-like experience. Before the intervention, our six teachers professed to have different levels of familiarity with the studio teaching concepts. Their level of (self-assessed) enthusiasm for our concepts (once explained) was, with the exception of one teacher, generally high. The table below shows a general pattern that knowledge of studio teaching concepts tends to be accompanied by enthusiasm for those concepts.

Alongside familiarity and enthusiasm measures, Table 7 indicates the extent to which teachers perceived their practice to change during the course of the project, and also between the start of the project and six months after the end, when we met with teachers to revisit their responses.

Teacher 3, our ‘reluctant’ teacher provides an interesting ‘outlier’. His self-assessed familiarity was lower than both teachers 2 and 4 (his 5/9 against their 8/9 and 7/9), but yet he scored his practice at the beginning of the project higher (6/9) than either of those two teachers scored their own (5.86/9, and 4.43/9 respectively). Teacher 3 perceived that the changes brought about by the project did not endure (as a whole) beyond its end. Yet far from being an indication that the reluctant teacher cannot change, he told us it had made him look closely at his teaching style and encouraged him to incorporate more space for pupils to experiment. He told us, however, of a number of barriers, external to his own attitudes, which had prevented the change from enduring. He had, for example, moved from teaching DT to electronics, and found that the amount of subject knowledge needed necessitated a certain level of didactic teaching before pupils could begin to experiment. We pick up on these barriers again in 4.3, where we discuss emergent findings.

Of the remaining teachers, we might conclude that those professing least familiarity with the concepts (teachers 5 and 6 in particular) saw more of a change in their own practice than did others. This is perhaps unsurprising, as they had the most scope for change on our scale. Even so, the fact that those teachers considering themselves both ‘knowledgeable’ and ‘evangelist’ were able to report such positive, enduring, changes in their practice suggests that this project gave them fruitful ideas they could carry forward even beyond its end.

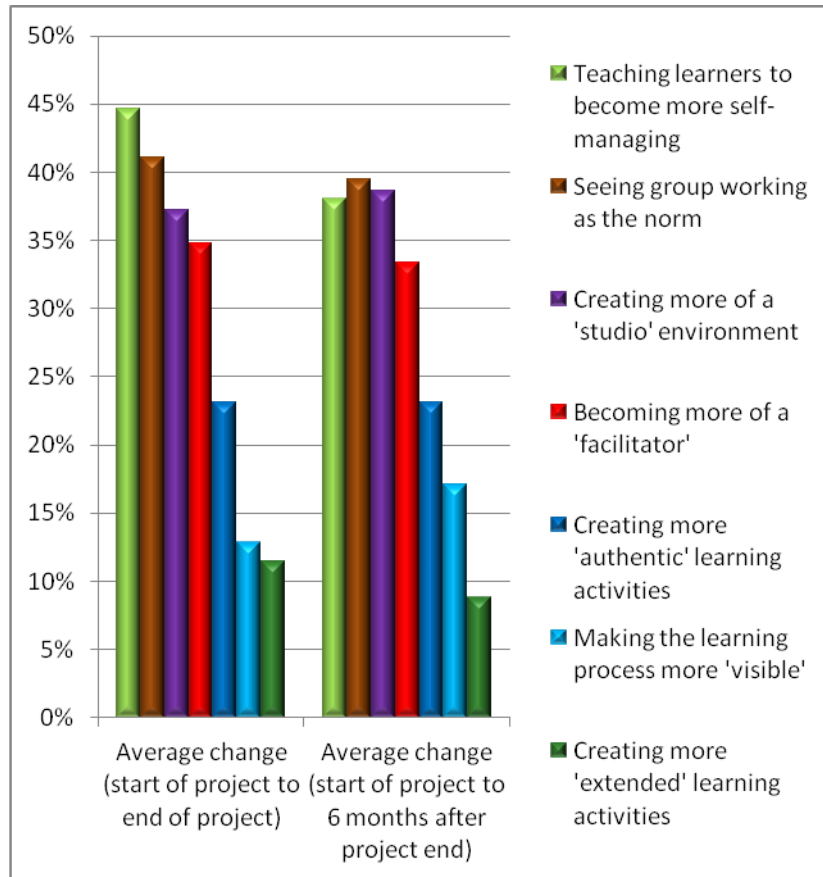
Table 7 Teachers' Familiarity With, and Enthusiasm for, Studio Teaching Concepts

School	Teacher	SELF-SCORED ENTHUSIASM ←LOW (Reluctant) (Evangelist) HIGH→									Average 'before' score for teaching style (out of 9)	% change in teaching style from start to end of project	% change in teaching style from start to 6 months after end
		SELF-SCORED FAMILIARITY ←LOW (Unfamiliar) (Knowledgeable) HIGH→ (out of 9)											
1	1									8	7.29	2%	5%
										8			
1	2									8	5.86	24%	20%
										8			
2	3			3							6.00	24%	0%
					5								
2	4									8	4.43	52%	68%
										7			
3	5									7	3.00	152%	148%
					4								
3	6									6	2.50	120%	140%
					3								

The findings from our post-project teacher questionnaire show a noticeable shift in teaching-style, both during the intervention, and beyond it. Figure 3 averages teachers’ self-reported perceptions of how they saw the project affecting their teaching style. The first cluster of bars shows the average change teachers perceived between the start and end of the project. We asked teachers for their perceptions six months after the project, and the second cluster of bars in Figure 3 shows the extent to which teachers believed the changes in their teaching style to be enduring beyond the project. Naturally, an intervention designed to impact upon seven specific teaching-style dimensions would be expected to have some effect upon those dimensions. Nevertheless, our research demonstrates that with a small amount of input from the research team, in the form of two days’ training, a group of teachers with varying levels of self-professed prior knowledge and enthusiasm can change their

behaviour. Shari Tishman and colleagues¹²² discussion on enculturation demonstrates that giving teachers a choice of teaching models is insufficient for change to happen; their philosophy must be transformed. Through repeated ‘cycles of reflection and practice’ educators can alter their deeply rooted conceptions of best practice.

Figure 3 Teachers’ perceptions of the impact of studio teaching project on their teaching style



Although changes were seen in all seven of the teaching-style dimensions, there were clear variations in magnitude. Putting the seven dimensions into practice involves not only a certain level of self-awareness, but an investment of initial thought and continued re-enforcement. In respect of those dimensions encountering the smallest transformations, there may be some reasons we can propose as we run through the findings with regard to each of the seven dimensions.

4.1.3.1 CREATING MORE ‘EXTENDED’ LEARNING ACTIVITIES

Teachers perceived a change in *all* aspects of studio teaching. That which changed least – ‘creating more extended learning activities’ – nevertheless increased by over 11% during the project (falling to just under 9% six months after its end). Regarding this dimension, perhaps because of the pressures of busy result-conscious schools or the fact that we were working in three schools which followed traditional lesson structures, it proved very difficult to extend learning beyond the allocated times. Although teachers commented on a few occasions that pupils made use of the DT facilities outside of

¹²² Tishman, Shari; Jay, Eileen and Perkins, David (1993). Teaching Thinking Dispositions: From transmission to enculturation. *Theory Into Practice* 32 (Summer 1993): 147-151.

lesson times, we might propose that DT is a subject where projects have, historically, tended to fall across a number of sessions. So, while lessons continued to be bell bound to fit with school timetabling, the idea of a project running over several weeks was perhaps nothing new in the mind of the DT teacher, which contributed to its lower score. One of our teachers commented that use of a project-based curriculum with linked activities across a number of weeks was no change for him.

Creating more 'extended' learning activities involves organizing lessons into periods of unbroken time that allow learners 'to enter into their work deeply', as Lois Hetland and her team saw in their studio learning project.¹²³ Indeed, when talking about encouraging extended working, teachers' frame of reference was 'time'. Several teachers encouraged pupils to come back during the lunch break or after school. Counteracting this, however, 'time' also arose as the greatest obstacle to success in this intervention. More significant than short lessons was the outcomes-led nature of the subject area as a limiting factor. Teachers had to hurry through each lesson, often allowing less time for reflection than desirable. On the other hand, teachers self-scored highest on the extended learning dimension to begin with, so there was less room for manoeuvre than on other dimensions.

4.1.3.2 MAKING THE LEARNING PROCESS MORE 'VISIBLE'

The next and perhaps most significantly difficult aspect of the project was 'making the learning process more explicit and visible'. Here there was only a very small shift in practice (13%). We suspect that this aspect of classroom discourse may be one that needs greater training and coaching, especially for teachers for whom this is unfamiliar, but note that visible learning was something teachers continued to consider. Six months beyond the project, they reported an average increase of 17% from their initial scores. Teachers commented to us that the ethos of the project took time to embed within their classrooms, particularly in terms of using the right language to make learning 'visible'. Constant re-enforcement of the learning language was required for teachers to make the learning process more visible. Teachers were able to embed the language to different degrees, some finding it easier than others.

We held a de-briefing session with teachers, six months after the end of the project. One teacher's comment illustrated the need for embedding the language over time: 'if you throw something into a machine that's already run in a certain way, you're not necessarily going to get that result so quickly. [Studio teaching] works from making mistakes. [Learners] have to build themselves up instead of being supported all the time. All we've seen is that little bit of a build up but not actually getting back to [their full potential]'.

4.1.3.3 CREATING MORE 'AUTHENTIC' LEARNING

Teachers discussed this dimension of studio teaching very little. The nature of DT itself brought forth a couple of problems for teachers trying to make the task authentic. We discuss the 'outcomes led' nature of DT a little later on, but it was cited by three teachers in relation to making learning more authentic. The tight focus on an end product meant that learners' opportunity to develop the project in a new direction was somewhat limited. What they chose to produce was bounded by a set of outcome requirements and, in this respect, the authenticity of pupils' projects was limited.

Creating more 'authentic' learning entails putting together activities that mean learners are, as David Perkins commented, 'playing the whole game'¹²⁴, and not focusing purely on content. This idea of the

¹²³ Hetland, Lois et al. (Op. cit)

¹²⁴ Op. cit

‘whole game’ did not emerge from interviews with teachers. While it may seem logical to assume that DT would be conducive to authentic learning in any case (in the form of real, tangible, end products), teacher pre-intervention self reflections did not rate this area as anything other than average. There was certainly additional room for manoeuvre in teachers’ self-scored rankings. It is possible that some teachers did not grasp the concept as readily as others. Maybe they remained too formulaic in their approach to project selection; allowing only limited room for choice.

4.1.3.4 BECOMING MORE OF A ‘FACILITATOR’

The intervention gave teachers pause for thought and they professed an increased awareness of the teaching style they chose to adopt each lesson. On the whole, teachers became more conscious of the level of direction they gave to learners and, although a struggle in some instances, were able to stand back and allow learners to think for themselves, and also for one another. In putting their role as ‘facilitator’ into practice, teachers became more creative in their approach with learners, refraining from answering learners’ questions without being met at least half way. One teacher, for example, commented on how he encouraged learners to take more ownership of their own learning using ‘a range of ways other than the usual ones’. For others, this included use of new incentives, or affirming language.

4.1.3.5 CREATING MORE OF A ‘STUDIO’ ENVIRONMENT

The teachers appreciated being encouraged to create a more studio-like environment, and a significant majority indicated an intention to retain and build on the studio teaching approach in the future. Teachers found lack of time or lack of space to be limiting factors when it came to setting up the environment before lessons. For one teacher, lack of fully operational machinery additionally prevented the studio from working as he had envisaged. In an ideal studio environment, freely available tools and materials make experimenting the norm. The high cost of materials, and possible health and safety issues with tools, however, meant that the studio had to be supervised fairly tightly to ensure materials were not wasted or used incorrectly.

4.1.3.6 SEEING GROUP WORKING AS THE NORM

Teachers found group working and reflections easy to build into the classroom environment so that the project had a strong impact upon the amount of group work and peer coaching that was carried out. Although pupils worked on their own projects, teachers changed their own approach to designing tasks, and whole-class reflections became the norm for some classes.

4.1.3.7 TEACHING LEARNERS TO BECOME MORE SELF-MANAGING

The greatest change brought about by the project was the extent to which teachers put the emphasis for learning onto learners. The learners themselves were particularly conscious of how much of the teachers’ time prior to the intervention had been taken up answering constant questions. A clear benefit of this intervention for teachers was the noticeable freedom of time that they could create for themselves, and for assisting those learners experiencing genuine difficulties.

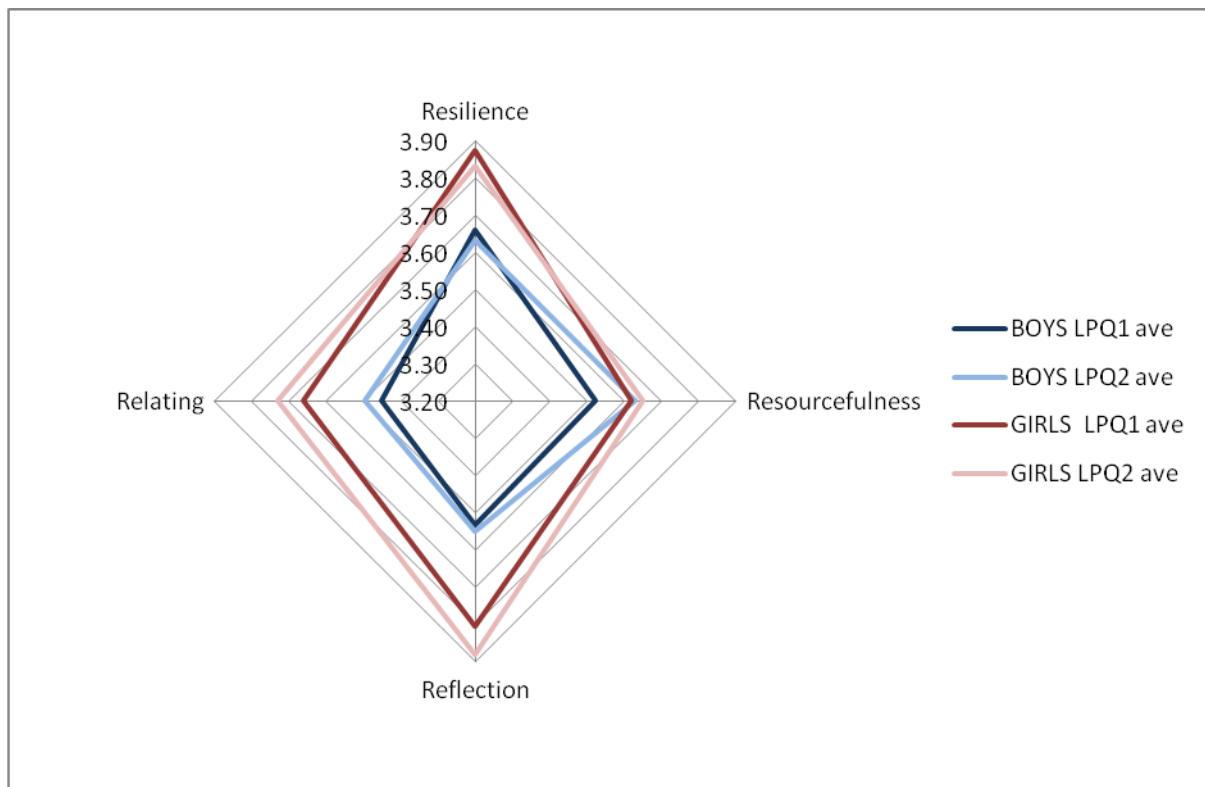
4.2. IMPACT ON LEARNERS

4.2.1 DISPOSITIONS

Teachers were vocal about the benefits of taking a more facilitative role with their class, and a range of examples are indicative of teachers' perceptions. Learners' confidence and resilience increased as they were allowed to make decisions for themselves, and as they were given the opportunity to 'stick at it' until they had mastered whatever issue arose in the project. Structured reflections, where learners offered one another positive suggestions, developed their thoughtfulness and ability to take advice 'on board'.

In terms of the self-report questionnaire (in which each of the 16 questions could be self-scored 1-rarely/never to 5-very often/always), girls generally rated themselves higher than did the boys on all of the '4 Rs' (resilience, resourcefulness, relating, and reflection). This can be seen in Figure 4; girls' average scores are shown in red (LPQ1) and pink (LPQ2), and are visibly higher than boys' average scores, shown in navy (LPQ1) and blue (LPQ2). By the end of the project, the girls showed suggestive increases in their subjective 'reflecting' and 'relating', while the boys showed a greatest increase in their 'resourcefulness'. Though the effects are not strong, we see some evidence of shifts in students' perceived 'learning power' as a result of the more studio-like method of teaching. Interviews with both teachers and students support the view that the intervention had had a positive effect on students' learning dispositions. Shifts in learners' self-scoring of their dispositions at the beginning (LPQ1) and at the end (LPQ2) of the intervention are shown in Figure 5.

Figure 4 Change in Learners' Learning Power Questionnaire (LPQ) Scores



Interviews with both learners and teachers provided supporting evidence for increases in resilience, resourcefulness, reflection, and relating. Teachers confirmed to us via the final questionnaire that the project had enhanced their pupils' resilience and task focus. One of our teachers observed that the project caused pupils to become more resilient at staying on task; they spent longer in a state of task focus than otherwise, and one student in particular was said to be focusing on task in a way that was 'far superior' than ever before, and in fact 'the most creative and engaged I've seen him'. Another teacher had noticed that his students were, unusually, 'pretty much engrossed' in their work by ten o'clock. Learners were also noticed to take initiative for their own learning; progressing with their projects without prompting by the teacher. Whether their piece of work progressed, and was unique, mattered to them and a good number of them were seen to work in their own time to achieve this.

In some cases the studio environment seemed to make pupils more creative; a subset of 'resourcefulness'. One teacher commented that, through the project, he had allowed children to spend more time using their creativity; thinking of their own ideas rather than copying down his instruction. We heard several learners in one class comment about how they now wanted their project to be unique, and had creatively altered their plans accordingly.

Reflection and relating were both enhanced particularly strongly through the emphasis on group working. As the project continued, we observed pupils asking for help from one another and not from the teacher. Learners were seen to teach one another; to seek out help from 'expert' peers, to encourage one another and, furthermore, to enjoy the new-found sense of pride and confidence this brought.

The approach teachers took to studio teaching tended to place pupils outside of their usual friendship groups, which contributed to a number of effects upon pupils' dispositions. A recurring observation was the way that structured peer working with groups of unfamiliar individuals helped learners to concentrate. The temporary bond formed between individuals instructed to comment upon one another's work (rather than being sanctioned for talking) meant that honest, constructive, feedback was given, in a bid to improve the 'performance' of their 'team'. They learned from one another's experiences as well as their own; they had the opportunity to teach others, thus reflecting on, and reinforcing, their own experience; they increased the amount of considered feedback they gave to one another; they secured honest, useful, feedback from peers, rather than the usual disinterested responses friends tended to give to one another; and they used the feedback that was given to them, taking it on board in a thoughtful way. Teachers found that by allowing one pupil to make a mistake, not only did the student benefit from the lesson but, by drawing attention to the lessons learned, the rest of the class could avoid the same mistake. Having spent time in one lesson being required to teach one another rather than approach the teacher, pupils in one class approached one another much more readily than before.

Given the ongoing emphasis on language which describes the processes of learning, it could be hypothesised that over time, learners would enhance their own learning dispositions and, thus, LPQ scores would increase significantly. The effect seen from analysis of LPQ scores, however, was not as great as anticipated, and the 'response shift bias' we discussed earlier might have a part to play here. We considered that unfamiliarity with concepts might have made it highly likely that learners engaging in first round self-report questionnaires might inflate their initial scores. We anticipated this same effect with our teacher reflection grids. At the time of completion of second round LPQs, learners would be more familiar with the four habits of mind, and the language through which those habits were operationalised for the purposes of the questionnaire.

4.2.2 MOTIVATION & ENGAGEMENT

The most overt change that we noticed in learners was an enhanced level of independent decision-making. When granted authority from the teacher, learners were able to choose their own solution, safe in the knowledge that they would not be penalised for failing to seek permission. In interviews, many students talked of rising to the challenge of being given more responsibility, and of being left to solve problems with each other, rather than being quickly ‘rescued’ and corrected by the teacher. They valued the opportunity to seek help from their peers. One student commented: ‘When we go into other groups it’ll be really good because now we’ve worked together, we’ll refer to each other more’. Although teachers initially found it difficult to step back and give the students time to work things out for themselves, one initially rather traditional teacher realised that ‘students become more confident when they are allowed to manage their own learning’.

They also recognised the importance of being able to question for themselves, and saw its significance for their adult lives. One student, for example, commented: ‘In the future we are not always going to have someone there to tell us what to do; we are going to have to try and work by ourselves and be independent’.

Finding creative ways to encourage learners to self-manage was credited by teachers with creating enthusiastic, co-operative, motivated, and confident learners. One teacher believed that both independence, and the ability to work in teams, were developed through his continued focus on developing their ability to self-manage.

A group of learners in one school told us that allowing them to move onto the next aspect of their work, rather than to halt and wait for others to catch up, helped them to focus on the task in hand.

An initial worry, expressed by both teachers and learners, was that the apparent lack of structure perceived to arise from giving learners more responsibility, may have left less focused learners with no finished product. On the whole, this situation did not materialise for most teachers although, where creating an end product is the goal, a balance must still be struck between the practical and written work. The two who still showed these concerns at the end were the same two who self-scored the lowest for level of ‘prior enthusiasm about working to improve learners’ learning power’ and were, perhaps, the most anxious about the intervention.

In designing an extended learning activity, careful classroom management is required to ensure that all learners have something to focus on before they will attend happily to the needs of others. In a situation where learners planned their work at different speeds, the need to wait for others before practical work led to boredom in some learners. Anxious to progress, they were not motivated to help others catch up.

The ‘visible learning’ dimension is noticeable by its absence. Students were often unable to relate interview questions to their actual experience in class, in part because there was some level at which learning was not as ‘visible’ as we may assume. Two of our students did not relate the notion of ‘team working’ with the way they had been encouraged to work as a table and to use their own bank of resources rather than relying on the teacher for assistance. They said ‘we haven’t worked as a team in DT’ but, when questioned, proceeded to affirm the virtues of critiquing one another’s’ work. Perhaps they were ‘thrown’ by our use of the value-laden word ‘team’ when the teacher may instead have used words such as ‘collaborate’, ‘discuss’, or ‘work together’. Similarly, when asked about ‘working things out for themselves’, they did not see how they had been given the opportunity to do this,

commenting that '[the teacher] gave us work and he told us what to do'. In apparent contradiction, they agreed with the interviewer that when they solved a problem using their own resources they felt '[empowered or positive]'.

4.2.3 ATTAINMENT

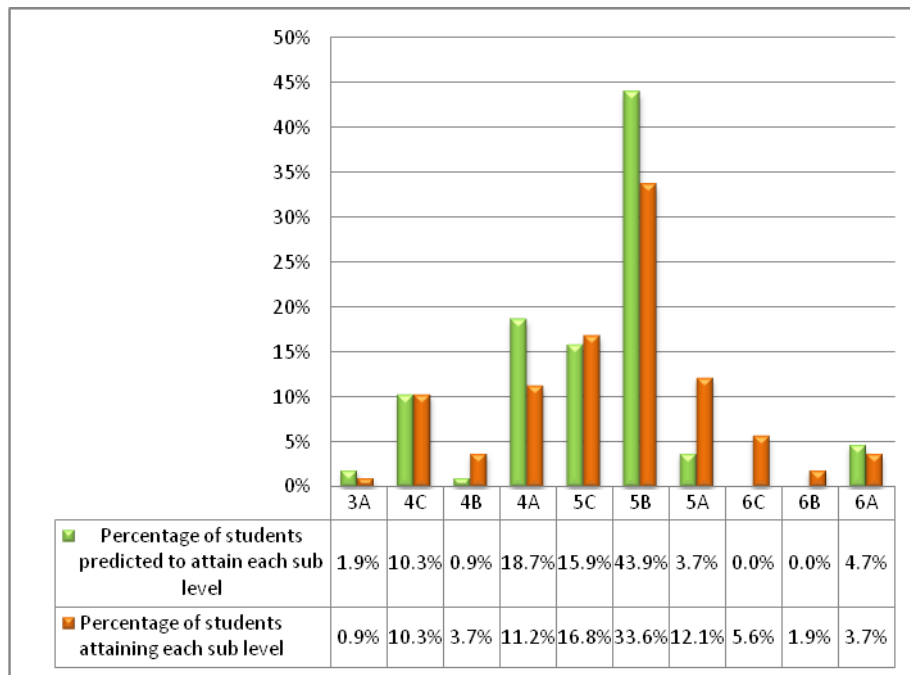
On the whole, while noting that causality is hard to infer, we found that when taught in this way, students' attainment outperformed teacher expectation, with over a third of students attaining higher grades than their teachers had expected. This effect was greater for particular types of lower-achieving students; the ones who, under 'normal' circumstances, were, according to teachers, distracted easily. While only a small scale study, this pattern of exceeding teacher expectation was supported by the perceptions of both teachers and learners.

Figure 4 shows a trend of performance above expectation. The pattern should be viewed as a whole, rather than making judgments about individual sub-levels, because numbers are small. Nevertheless, the distribution line for the 'actual' (orange) bars sits noticeably above the line for the 'expected' (green) bars.

Learners followed a 'carousel' movement between Technology subjects, which meant teachers were not immediately familiar with learners, and this made grade predictions more difficult. In one school, teachers explained to us that they tended to apply a standard mechanism for grade predictions which, for some, was overly optimistic for internal political reasons. Judgments were 'global', based on performance in SATs and CAT scores, but not on past performance in DT. In these circumstances, we would expect a number of students to be given final attainment grades lower than predicted. Those attaining *above* expectation were, in these cases of higher than realistic prediction, performing particularly well. In another school, teachers expected attainment increases of two sub-levels a year and would expect one sub-level over the course of this project.

The major benefit of a studio teaching approach, for the lower attaining learners especially, was that it helped them to focus more closely on their own developing product, and provided them with what one student called the 'thinking space' to be more creative. Their work also seemed to benefit when they were working in groups different from their usual friendship groups.

Figure 5 Comparison of expected and actual attainment for all students (each sub level)



In a few cases, however, lower achieving students seemed to be somewhat ‘thrown’ by the unaccustomed level of responsibility. Lower attaining learners initially required more guidance prompts than their higher achieving peers, but in most cases appeared to develop greater confidence as the project progressed. We found that learners who tended to make mental, rather than written, plans found it harder to consider creative alternatives. In these cases, teachers believed that more time would be needed to embed the practice, and to ‘settle’ learners in order for them to benefit from the new way of working. Teachers need to pay particular attention to the ‘risk areas’: lower-end learners taking the opportunity to do nothing (which was noticed in one case), and faster learners running out of work and being less motivated to help others.

The general trend (irrespective of gender) was similar for particular levels of learner: below a Level 5A¹²⁵, learners tended to outperform expectation; above a 5A, predictions tended to be higher than actual attainment.

Most noticeably, each time girls outperformed expectation they did so marginally more than did boys. This trend for girls to outperform boys is not unexpected - D&T has ‘continued to evolve from what were predominantly male dominated activities to its current position...A consistent pattern of success for girls began to emerge during the early 1990s’ with girls achieving higher standards when working with resistant materials, textiles and food, although lower with systems and control activities¹²⁶. Similarly, David Spendlove cites a study by APU finding that ‘with reflective activities in D&T, boys were more able to get to grips with these aspects of capability when they are practically engaged in

¹²⁵ National attainment targets are detailed on <http://curriculum.qcda.gov.uk>. See also Appendix 3, outlining attainment targets for DT at Key Stage 3.

¹²⁶ Spendlove, David (2002). Raising the Attainment of Boys in Design and Technology. In: Owen-Jackson, Gwyneth (ed.) *Teaching Design and Technology in Secondary Schools: A reader*. London: RoutledgeFalmer.

developing solutions, whilst with aesthetics and people contexts girls showed more understanding than boys in almost all tests¹²⁷.

4.3 EMERGENT FINDINGS

We have explored data related to both research questions, exploring the impacts of the studio teaching project on both teachers' teaching style, and on students. Now we look briefly at other factors impacting upon studio teaching which emerged in teacher observations. These included comments about pupils' attitudes, and how particular mindsets helped pupils benefit from the studio learning approach. Teachers' comments also showed us how the school's own environment, or priorities, supported or mitigated against the studio-style changes.

The interpretive process of analysis enabled us to analyse what was happening when studio teaching went well, or less so, and to make recommendations for its future adoption. We thus lay out a number of factors to bear in mind for teachers and schools wishing to adopt a studio teaching approach.

4.3.1 YOUNG PEOPLE'S MINDSET

The attitudes young people bring to class were said to have bearing on their own experience. The ability to co-operate, for example, enabled students to benefit fully from group approaches to learning, which one teacher credited with drawing out learner's creativity and motivation.

A small number of students, typically characterised by their lack of ability to focus, were picked out by teachers as being 'surprise' successes. Our studio learning approach was seen to give these learners the freedom to make their own decisions, which they found particularly motivating. These individuals attained above prediction.

Two of our teachers commented that enthusiastic learners fared well, working outside of the timetabled slot to complete their project. But clear from their comments was also the way that the studio learning approach, and the freedom it gave to learners, motivated some young people to work harder than usual.

Looking back over the project, however, it was interesting to see that teachers did not cite students' behaviour or attitude to learning as an inhibiting factor. This was despite a number of comments throughout the project, particularly from the teachers at a school where behaviour and attitude tended to produce problems generally.

4.3.2 YOUNG PEOPLE'S SUBJECT KNOWLEDGE

A lack of sufficient subject-related knowledge in learners meant that teachers could not always allow learners the time and freedom to experiment. Some technical processes, such as vacuum-forming, required expert tuition rather than peer demonstration. Teachers had to be attentive to learners; often more so than they would consider ideal, to ensure the impossible was not being attempted. The idea of studio learning is not something that involves an initial push from the teacher, who can then sit back and relax.

¹²⁷ Spendlove, David (2000). Gender Issues: Assessing boys as underachievers. *The Journal of Design and Technology Education* 6(3): 202-206.

On the contrary, teachers had to work to remind students of the learning language; to reinforce the 'habits of mind' they were trying to develop in learners; and to re-tune learners into the importance of learning strategies. The 'loose' nature of studio learning took some getting used to and that initial lack of familiarity was, perhaps not unexpectedly, a hurdle for both teachers and some students. We only had one student who really did not engage with the project. A generally disinterested student, her teacher believed she had fallen by the wayside. The freedom that other learners relished and thrived on, she found allowed her to sit back and 'get away with' dropping her efforts.

4.3.3 SCHOOL ENVIRONMENT AND PRIORITIES

DT rooms had limited scope for the moving of furniture and equipment, meaning that teachers had less control over the layout of classrooms than they did over their own behaviour. They thus gave little credit to a studio-style layout for the changes in their learners. The project's emphasis on studio layout meant that teachers at least tried to make it work. Since the experiment, one of our teachers relocated to a school with a more 'craft-oriented' style. This school environment, more inherently 'studio-style' than he was used to, was a key influence on his teaching practice. He adopted a style that favoured group working over individual tasks, and studio layout over classroom style.

The significance of the school's own environment, or priorities, in impacting teacher practice was touched on in terms of one other studio-learning element: that of visible learning. One of our teachers told us how the school-wide requirement for pupils to develop 'personal learning and thinking skills' supported him in focusing on making learning visible throughout and beyond the project.

At two of our three schools, teachers considered that the lack of time to embed the changes was the strongest factor inhibiting their development as studio teaching practitioners. It is worth noting that this was not for want of prior knowledge of studio learning, or enthusiasm for its ideals. Teachers believed that enduring change required only more time.

4.3.4 THE NATURE OF DESIGN TECHNOLOGY

A particular sticking point was the perceived outcomes-led nature of the subject area. We chose DT as the site of our study because we supposed that the crafting of a physical object over time would be engaging to some students. Our choice of DT in this respect provided a mixed blessing, however. Regardless of teachers' desire for students to learn about the process; to learn from their mistakes, and to evaluate failures as well as celebrate successes, this very tangible outcome of DT can mean that students have a propensity to focus on the end product sometimes to the detriment of quality and the learning process. Teachers also felt the pressure of time and although through the studio set up they provided freedom with resources, as one of our teachers commented, the requirement for outcomes often meant that the processes teachers offered to students to achieve the end result, say – a wooden box – were often circumscribed. Learners were, in effect, fairly limited in their choices.

DT tasks in schools, and DT tasks in industry may have similar outcomes but the purpose behind these outcomes is fundamentally different. For the industrial professional context the purpose is to achieve a workable product or system; in an education context it is to achieve learning. What for DT learners, and their teachers, is the role, status and purpose of an artefact? In their lives outside school the purpose may be clear but in a learning setting artefacts have other purposes. If these different purposes are not clear then at best the result is hybrid activity, at worst it is deeply confused. Assessment in DT, which should be focused on the processes of learning (the artefact is only a means to prompt and test that learning) is frequently subverted to focus on the outcome of the activity; the

artefact. At worst, the assessment criteria are craft inspired and we are back to the days of handicrafts. Put plainly, ends (learning) and means (artefact) are interchanged. Perhaps this duality of purpose within DT points us to a wider issue: that of allowing a broader scope of possibility from within which learners can be truly creative.

5. STUDIO TEACHING IN THE REAL WORLD OF SCHOOLS

'Knowing that is different from knowing how. But in the model of learning that dominates teacher professional development (as well as most formal education), we assume that if we teach the knowing that then the knowing how will follow....For the most part this is simply not the case. The last 30 years have shown conclusively that you can change teachers' thinking about something without changing what those teachers do in classrooms.'

Dylan William¹²⁸

Clearly if we are to make a sustainable impact on the concerns with which we began this report we will need to change both teachers' thinking and their practice. In this final chapter we take stock of our findings and consider how they might be of use to schools, for those involved in the initial training and professional development of teachers, for other researchers and for policy-makers today.

5.1 OVERVIEW OF FINDINGS

5.1.1 STUDIO TEACHING

In the US and in Australia (and to a lesser extent in England via the Studio Schools movement¹²⁹) there has been some specialised interest in the idea of studio teaching, studio learning and studio thinking. This has been located primarily in arts subjects and explored by engaging committed and expert teachers in these areas in various reflective practices.

For the first time we have taken these ideas into the real-world of ordinary English secondary schools and sought to put them into practice with teachers who have no history of this kind of teaching.

Through a combination of rigorous exploration of the literature and carefully designed mixed method research we have both articulated a bolder vision of studio teaching (and studio learning) and begun to validate our studio teaching model. Teachers understand the studio teaching model and, in a relatively short time, can change their practice to incorporate most aspects of it.

We believe that our seven dimensions offer a real chance of cultivating the kinds of wider skills (our 4Rs) that will be needed in complex and uncertain times, while at the same time improving engagement and, tentatively, attainment.

We suggest that our conception of studio teaching may also be an important way of moving an old debate between academic and practical subjects into a richer discussion of the kinds of pedagogical approaches that will serve learners best in the 21st century.

¹²⁸ William, Dylan (2008). Changing Classroom Practice. *Educational Leadership* 65(4): 36-42.

¹²⁹ <http://studioschoolstrust.org>

5.1.2 THE WIDER SKILLS OF LEARNING

The 4Rs and their sixteen dispositions or learning habits of mind encompass some of the wider skills which all learners will need, in addition to the subject knowledge they acquire in school, if they are to thrive in the 21st century. Our intervention showed that these dispositions are readily understandable, perceived as relevant by teachers and quite possible to situate within the context of DT. Perhaps unsurprisingly, those teachers least familiar with the approach took longer to feel comfortable with it.

5.1.3 IMPACT OF STUDIO TEACHING ON TEACHERS

With a combination of professional development, expert support and in the context of a small professional learning community it *is* possible for teachers to shift their practice and adopt studio teaching methods. This held true for teachers who were both initially enthusiastic and initially sceptical.

5.1.4 IMPACT OF STUDIO TEACHING ON STUDENTS

We found positive impacts on all three of the concerns with which we began our report.

There were noticeable improvements in terms of our first concern, levels of learner engagement, with less off-task time and fewer behaviour problems noticed, along with the enjoyment of responsibility and the confidence to tackle things previously not tried. This did not apply to one or two students whose level of self-regulation and current behaviour patterns meant that any intervention would be unlikely to touch them in a short period of time.

Perhaps most notably there would appear to be a significant impact on the second of our three concerns, levels of attainment. A third of the students who took part in this intervention outperformed their teachers' expectations. Studio teaching contributed to increased attainment in our small-scale study. Despite initial concerns from teachers, students did complete their DT products within the time allocated.

In terms of the development of wider skills or learning dispositions, the 4Rs, we found progress in each one of these.

- Resourcefulness – students became more responsible and more flexible and took more responsibility for managing the tools available to them.
- Resilience – students became more confident and able to tackle problems.
- Reflection – students became better able to think about and improve their work in progress.
- Relating – students adopted peer learning approaches and were happy to help and coach one other.

We need to add a note of caution here. While we found evidence of changes in behaviour in each of our 4Rs, we cannot be certain that such shifts have become truly embedded and dispositional. Neither were our students better able to articulate the wider skills which they were learning.

5.1.5 DIFFICULTIES AND CONCERNS

We noted a number of areas which require further exploration. These include:

- The difficulty which both teachers and students found in using more explicit and precise language to describe learning processes. We noted a possible connection between this and the broader culture of the school. Given the strong evidence base connecting visibility of learning processes to improvements in attainment cited in 2.1.6, this gives us cause for concern.
- The difficulty of setting up small group reflection and critique sessions even in DT where informal noticing of others' work in progress tends to happen as part of the pattern of a more traditional DT lesson.
- The pressure even in DT to complete products and the concomitant lack of attention to the all-important learning and DT skills being acquired.
- A lack of flexibility in room layout and a lack of storage space for work in progress.
- A lack of opportunity for more extended engagement by students in their projects.

5.2 IMPLICATIONS FOR POLICY AND PRACTICE

In general, we conclude that, even in inner-city schools where staff feel that discipline and control need to be quite tight, there is scope to introduce more studio-like ways of working, and that these are both positively perceived by teachers and students, and bring benefits in terms of engagement, achievement and the development of transferable attitudes to learning.

5.2.1 SCHOOLS

Given the benefits of studio teaching we have identified, there is a strong argument for schools adopting the approach into DT.

While we chose to site our project in an area – Design Technology – where studio-like ways of working might be more familiar than in some more 'academic' parts of the curriculum, our results suggest that it would be valuable to look for ways in which studio-type learning might also be introduced more broadly across the curriculum.

Schools need to develop whole school policies and practices for the 'language of learning' to ensure that the processes of learning are clearer, more precise and more visible.

Ensuring that classroom and workshop design enables studio teaching and especially that it allows work in progress to be stored effectively needs to be made a priority in all areas which create physical products.

Schools need to make the notion of extended learning, out of timetabled lessons, a reality if the well-documented benefits of extended learning are to be realised.

5.2.2 TEACHER DEVELOPMENT

Given the successful shifting of teachers' practice achieved in a relatively short time using a blend of professional development, expert input and the establishment of a professional learning community, we recommend that this style of 'developed with' rather than 'done to' professional development is a fruitful one for curriculum and pedagogical and professional development in schools.

We hope that this will spur more in-depth teacher enquiry into those elements of culture and pedagogy already highlighted by *Making It* to enable teachers and learners to be much more proactive about how to focus their efforts to become effective in all of the communal learning activities they will face throughout their lives.

5.2.3 THE RESEARCH COMMUNITY

The positive benefits of studio teaching and studio learning we have found merit further validation and research both in DT and in a *much broader* range of subjects.

5.2.4 POLICY-MAKERS

Project working and studio learning are core elements of a number of current initiatives: Studio Schools, University Technical Colleges and the new A level projects. The *Making It* project has begun to delineate the elements of a studio learning pedagogy, which can now form the basis of a more specific pedagogy for these and other initiatives.

There are significant implications for government in improving student engagement, raising levels of attainment and developing students with the wider skills necessary to thrive today.

And we wonder whether studio teaching methods might be a powerful way of reducing the gap between 'academic' and practical learning.

APPENDIX 1 - A SELECTION OF PROFESSIONAL DEVELOPMENT MATERIALS

POWERFUL LEARNING DISPOSITIONS

Centre for Real-World Learning Studio Teaching Project

These descriptions of the powerful learner can be used to underwrite a variety of tools and prompts:

- a. a self-report questionnaire suitable for KS2/3
- b. an observation schedule for use by teachers and researchers
- c. a basis for identifying linguistic prompts and nudges used by teachers and mentors
- d. a basis for identifying focused interventions designed to develop each disposition

The 16 characteristics below are based on teachers' judgments about the 'habits of mind' that, together, seem to constitute the mindset of a 'powerful learner'.

RESILIENCE – emotional strength

1. **Inquisitive:** has a questioning and positive attitude to learning
2. **Adventurous:** willing to risk and 'have a go'; up for a new challenge
3. **Persistent:** stays determined and positive in the face of difficulty or mistakes
4. **Focused:** concentrates, ignores distractions, becomes engrossed

RESOURCEFULNESS – cognitive capability

5. **Imaginative:** comes up with creative ideas and possibilities
6. **Connecting:** looks for links and relationships; likes to 'hook things up'
7. **Crafting:** keen to work on improving products and developing skills
8. **Capitalising:** makes good use of resources, tools and materials

REFLECTION – strategic awareness

9. **Methodical:** well-organized; thinks things through carefully
10. **Self-evaluative:** makes honest and accurate judgments about 'how it's going'
11. **Self-aware:** knows their own strengths, styles and interests as a learner
12. **Transferring:** looks for other applications and lessons for the future

RELATING – social sophistication

13. **Independent:** articulates and defends their own thoughts and ideas in discussion
14. **Leading:** shows initiative; willing to take a lead in learning and problem-solving
15. **Open-minded:** Asks for, accepts and makes good use of feedback, advice and support
16. **Empathic:** good at understanding others, and offering helpful feedback and suggestions

LEARNING POWER QUESTIONNAIRE (LPQ) FOR STUDENTS

This is a quiz to find out how you see yourself when you are trying to do things that are new or difficult. There are 16 statements. Look at each one and think how true this is of you when you are learning new things. This includes things you are learning for your own interest out of school, as well as in lessons. Of course we all vary, but try to choose the answer that is closest to you in general. If you think a statement is rarely or never true of you, circle the 1. If it is occasionally true, circle 2. If you think it is sometimes true, circle 3. If you are quite often like that, circle 4. And if the statement is true very often or always, circle 5.

Remember:

- 1 = rarely (or never)
- 2 = occasionally
- 3 = sometimes
- 4 = quite often
- 5 = very often (or always)

Date.....

Name.....

Class.....

- | | | | | | |
|---|---|---|---|---|---|
| 1. I think I can learn most things if I try | 1 | 2 | 3 | 4 | 5 |
| 2. I'm willing to have a go at something new | 1 | 2 | 3 | 4 | 5 |
| 3. I'll stick at something difficult till I've got it | 1 | 2 | 3 | 4 | 5 |
| 4. I get completely absorbed when I'm trying to master new things | 1 | 2 | 3 | 4 | 5 |
| 5. My brain comes up with lots of creative ideas | 1 | 2 | 3 | 4 | 5 |
| 6. I like making links between things in my head | 1 | 2 | 3 | 4 | 5 |
| 7. I enjoy working on improving what I've done | 1 | 2 | 3 | 4 | 5 |
| 8. I make good use of things around me to help me learn | 1 | 2 | 3 | 4 | 5 |
| 9. I am well-organized and careful when I'm learning | 1 | 2 | 3 | 4 | 5 |
| 10. I'm honest with myself about how well I'm doing | 1 | 2 | 3 | 4 | 5 |
| 11. I'm well aware how I learn best | 1 | 2 | 3 | 4 | 5 |
| 12. I like to think how I can apply what I'm learning elsewhere | 1 | 2 | 3 | 4 | 5 |
| 13. I'm happy to stick up for what I think in a discussion | 1 | 2 | 3 | 4 | 5 |
| 14. I'll take the lead when a group is working together | 1 | 2 | 3 | 4 | 5 |
| 15. I'm ready to accept feedback and advice from others | 1 | 2 | 3 | 4 | 5 |
| 16. I help others see how they could improve | 1 | 2 | 3 | 4 | 5 |

LPQ OBSERVATION SCHEDULE FOR TEACHERS AND RESEARCHERS

Teacher's name / initials.....

Student name.....

Class.....

Date.....

For each student, please give a rating, 1 – 5, on each of the 16 qualities of mind listed below. Especially think about the student when they are facing something new or challenging.

1 = they are *rarely or never* like this

2 = they are *occasionally* like this

3 = they are *sometimes* like this

4 = they are *quite often* like this

5 = they are *very often or always* like this

1. **Inquisitive:** generally shows a questioning and positive attitude to learning
2. **Adventurous:** is willing to risk and 'have a go' when facing a new challenge
3. **Persistent:** stays determined and positive in the face of difficulty or mistakes
4. **Focused:** concentrates, ignores distractions, and quickly becomes engrossed
5. **Imaginative:** easily comes up with creative ideas and possibilities
6. **Connecting:** looks for links and relationships, likes to 'hook things up'
7. **Crafting:** is keen to work hard on improving products and developing skills
8. **Capitalising:** makes good use of resources, tools and materials to support their learning
9. **Methodical:** is well-organized and thinks things through carefully
10. **Self-evaluative:** makes honest and accurate judgments for themselves about 'how it's going'
11. **Self-aware:** knows their own strengths, styles and interests as a learner
12. **Transferring:** shows evidence of looking for other applications and lessons for the future
13. **Independent:** articulates and defends their own thoughts and ideas in discussion
14. **Leading:** shows initiative and is willing to take a lead in group learning and problem-solving
15. **Open-minded:** asks for, accepts and makes good use of feedback, advice and support
16. **Empathic:** is good at understanding others, and offering helpful feedback and suggestions

LEARNING DISPOSITIONS - TEACHER PROMPTS

Below are some illustrations of ways of prompting and ‘nudging’ students towards using and developing the 16 qualities of mind during classroom activities to be used as you help students with their work.

Inquisitive: ‘That’s curious’, ‘What’s odd about that?’, ‘What does that make you wonder?’, ‘What do you want to find out?’

Adventurous: ‘Just give it a try’, ‘How could you make that more interesting / exciting / risky?’, ‘Choose a topic that is going to stretch you’

Persistent: ‘Don’t give up’, ‘You can do it if you try’, ‘This is hard; it will take time to figure it out’, ‘Nothing worthwhile is easy’

Focused: ‘Don’t mind what they’re doing’, ‘Really get into it’, ‘What would help you concentrate more?’

Imaginative: ‘How else could you do that?’, ‘Free up your imagination a bit’, ‘Just let your brain bubble up with ideas for a minute’

Connecting: ‘What does that remind you of?’, ‘What do you know that might help?’, ‘What would be a good analogy for that?’

Crafting: ‘What do you need to practise a bit more?’, ‘What would you need to do to improve that?’, ‘What could you tinker with?’

Capitalising: ‘What could you use to help with that?’, ‘What could you use as a tool to help you?’, ‘What are you going to need?’

Methodical: ‘What would it be useful to think about before you start?’, ‘What would happen if you did that?’

Self-evaluative: ‘Tell me about that’, ‘What are you not so pleased with?’, ‘What do you like best about that?’, ‘How would you do it differently next time?’, ‘What would ‘even better’ look like?’

Self-aware: ‘Does this way of working play to your strengths?’, ‘How could you organize things to help you learn better?’, ‘What ‘qualities of mind’ would it help you to strengthen?’

Transferring: ‘Where else could you make use of that?’, ‘Where could you apply what you’ve just learned?’, ‘Could you use that in a different subject?’

Independent: ‘Stick to your guns’, ‘Tell them what you are trying to achieve’, ‘Can you explain that a bit more clearly?’, ‘You don’t have to go with the crowd’

Leading: ‘How could you help the group work better?’, ‘What would you suggest if you were in charge?’, ‘If you were to take the initiative, what would you do?’

Open-minded: ‘Who would you like to give you feedback on that?’, ‘How are you going to make use of that advice?’, ‘Just think about what Eric said...’

Empathic: ‘Can you tell Ruby about her work in a way she can hear?’, ‘How do you think Josh is feeling about his work?’, ‘What would it help Holly to ask her about?’

Student feedback and critique sessions

Please adapt and interpret these short notes as you think fit.

Possible set-up:

- Teacher role plays receiving feedback and asks class how they would feel
- Students have a practice 'go' with minimal input and are asked to reflect on how it was for them....

In general

1. 5-10 minutes every lesson in groups of 3 or 4
2. Timekeeper makes sure each person has a turn to have their work critiqued

When students are giving feedback:

- Look for what's going well
- Try and ask questions
- Don't tell people what to do!

When students are receiving feedback:

- Use the opportunity to help you
- Listen carefully
- Try not to be defensive!

APPENDIX 2 - PARTICIPATING SCHOOLS, TEACHERS, AND PUPILS

The three schools we recruited were all inner London secondary schools.

The first was a grant maintained 11-19 mixed comprehensive community school with around 1,600 pupils, also including around 400 in the Sixth Form. The proportion of pupils with learning difficulties and disabilities was close to the national average, and many students had English as an additional language. Last inspected fully by Ofsted in 2007 an interim assessment in 2010 confirmed its 'good' performance had been sustained. Ofsted advised that pupils between Years 7 to 11 could progress even more if the work set was consistently matched to pupils' learning needs, and if pupils were involved more in self-evaluating their own progress.

Our second school was a voluntary-aided 11-18 mixed secondary school in the Diocese of London. It served around 1,400 pupils, including 400 in the Sixth Form. Last inspected fully by Ofsted in 2007, an interim assessment in 2010 confirmed performance had been sustained on a number of measures. The proportion of students with learning difficulties or disabilities was low. Teaching and learning were graded as 'good' by Ofsted, who advised that good teaching and learning practice needed to be shared across all subject areas so that pupils participated more actively, developing greater independence and reflective learning.

Our third set of participants was from an 11-16 mixed secondary community school with around 800 pupils. Its pupils were from culturally diverse backgrounds with around half speaking English as an additional language, and around two thirds having learning difficulties or disabilities. Last inspected fully by Ofsted in 2008, an interim assessment in 2011 reported that its performance had been sustained. Teaching and learning was 'good', but Ofsted advised that pupils should be given more opportunity to become involved in their own learning, including through self-assessment. Attendance was highlighted to pupils as an area they could improve upon.

All pupils present in class at the start and end of the project completed Learning Power Questionnaires (LPQs). Only complete, viable, pairs of 'start' and 'end' LPQs were used as data sources. Pupils taking part in interviews sessions did so mainly in small groups, with each group being interviewed at the start and end of the project. The table below details the total data set. Of 122 named pupils, we gathered usable attainment data for 107. This included 'pre', 'predicted', and 'actual' attainment grades. Pupils for whom we gathered both LPQ and attainment data numbered 82.

Table 8 Pupils Interviewed (at Project Start and End) and Pupils Completing LPQs

School	Teacher	Class size	Pupils interviewed	Pupils completing LPQs	Percentage of pupils interviewed	Percentage of pupils completing LPQs
1	1	28	4	20	14%	71%
1	2	27	6	20	11%	74%
2	3	20	3	17	15%	85%
2	4	17	7	15	41%	88%
3	5	16	2	10	13%	63%
3	6	14	3	12	21%	86%
Total	6	122	25	94	20%	77%

APPENDIX 3 - ATTAINMENT TARGETS FOR D&T AT KEY STAGE 3

Figure 6 Attainment targets.

Level 3

Pupils generate ideas and recognise that their designs have to meet a range of different needs. They make realistic plans for achieving their aims. They clarify ideas when asked and use words, labelled sketches and models to communicate the details of their designs. They think ahead about the order of their work, choosing appropriate tools, equipment, materials, components and techniques. They use tools and equipment with some accuracy to cut and shape materials and to put together components. They identify where evaluation of the design and make process and their products has led to improvements.

Level 4

Pupils generate ideas by collecting and using information. They take users' views into account and produce step-by-step plans. They communicate alternative ideas using words, labelled sketches and models, showing that they are aware of constraints. They work with a variety of materials and components with some accuracy, paying attention to quality of finish and to function. They select and work with a range of tools and equipment. They reflect on their designs as they develop, bearing in mind the way the product will be used. They identify what is working well and what could be improved.

Level 5

Pupils draw on and use various sources of information. They clarify their ideas through discussion, drawing and modelling. They use their understanding of the characteristics of familiar products when developing and communicating their own ideas. They work from their own detailed plans, modifying them where appropriate. They work with a range of tools, materials, equipment, components and processes with some precision. They check their work as it develops and modify their approach in the light of progress. They test and evaluate their products, showing that they understand the situations in which their designs will have to function and are aware of resources as a constraint. They evaluate their products and their use of information sources.

Level 6

Pupils draw on and use a range of sources of information, and show that they understand the form and function of familiar products. They make models and drawings to explore and test their design thinking, discussing their ideas with users. They produce plans that outline alternative methods of progressing and develop detailed criteria for their designs and use these to explore design proposals. They work with a range of tools, materials, equipment, components and processes to show that they understand their characteristics. They check their work as it develops and modify their approach in the light of progress. They evaluate how effectively they have used information sources, using the results of their research to inform their judgments when designing and making. They evaluate their products as they are being used, and identify ways of improving them.

Source: <http://curriculum.qcda.gov.uk>

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Making It

Can teachers rethink the way they organize their classrooms so that the spaces are more like studios, in which students as makers engage in extended projects with the reflective collaboration of their peers? If they do, will students' engagement and attainment improve? And, perhaps more importantly, will learners in this kind of situation tend to develop the kinds of habits of mind they need for a lifetime of practical learning?

Making It provides an overview of the literature in this important area, and offers a promising new model of pedagogy for studio teaching.

In a small-scale study in London schools, teachers of design technology demonstrated that it is possible for their teaching methods to become more studio-like, and that the impact on both teachers and learners is significantly beneficial.

The findings from *Making It* will be useful to school leaders, teachers, researchers and policy-makers interested in how approaches to 'making' in a wide range of subjects can be taught in more effective and engaging ways.

About the authors

Guy Claxton is Professor of the Learning Sciences and Co-Director of the Centre for Real-World Learning at the University of Winchester. Guy is a Fellow of the British Psychological Society and an Academician of the Academy of the Social Sciences. He is the creator of Building Learning Power and the author of many widely respected books on the creative learning mind.

Bill Lucas is Professor of Learning and Co-Director of the Centre for Real-World Learning at the University of Winchester. Bill is also Chairman of the UK's Talent Foundation and a Patron of the Campaign for Learning (where, as Chief Executive, he led the first systematic research into learning to learn in English schools). He is the author of many books on learning, the mind and change.

Dr Ellen Spencer joined the Centre for Real-World Learning as a researcher, having spent three years with Deloitte since completion of her ESRC funded MA and Ph.D at the University of Warwick. Much of her research work involves the development and monitoring of teacher-led inquiries into classroom practices that cultivate positive learning dispositions in pupils.

