



**Project Title:**  
**Researching beginning science, maths and English teachers' pedagogies. Applying learning theory to inform enriched planning and practice.**

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**Interim report of progress of project**

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## ***Summary of project***

### ***Title***

How do science, maths and English trainees conceptualise pedagogy? Application of learning theory lenses to analyze planning and practice intentions can proffer interesting contrasts. This project is designed to explore differences in the ways that novice teachers understand their teaching and organize for learning in their particular subject disciplines?

Key words : mathematics, science, English, teaching, learning, pedagogy, practice

### ***Aims of the project***

*3 main aims:*

1. To explore how do maths, science and English trainees differ in the way that they conceptualise their teaching?
2. To scrutinize trainees assignments and practice to draw out what appear to be common components (across subjects) of novice pedagogy applied to support learning?
3. To consider whether there are there implications for the ways that pedagogy development (across and within subjects) can be better nurtured and supported in HEI's?

### ***The research questions***

1. How do maths, science and English trainees differ in the way that they conceptualise their teaching?
  - a. What kinds of learning experiences do they consciously organize for?
  - b. How closely are intentions (evidenced by planning) enacted in practice?
  - c. Is one kind of learning more prominent in a subject discipline than another?
2. What appear to be common components (across and within different subjects) of novice pedagogy applied to support learning?
3. Are there implications for the ways that pedagogy development (across and within subjects) can be nurtured and supported in HEI's?

## ***Progress toward answering the research questions***

### *Data gathered*

We have gathered the copies of the maths, science and English trainees final assignments.

Observations of 15 trainees in-action (5 in maths, 5 in science, 5 in English) have been carried out. These notes and the lesson plans are being scrutinized to triangulate the intentions of the lessons plans against actual pedagogic practice.

Scrutiny of some plans has been carried out and some further analysis has to be carried out to map the enactment of the trainees against their intentions (as evidenced through the plans).

The video of a maths trainee is also being analysed. This is to check how closely and accurately the planned activities are reflected in enactments of lessons. This therefore should suggest the confidence level with which we can judge pedagogy through planning documents.

The videos of the trainees in science and English were unfortunately disrupted because of the OfSTED inspection in June. These are re-scheduled for October.

### *Analytical framework devised*

We have devised the analytical framework (see Appendix 1,2 and 3) to apply to these assignments. The researcher is currently working on this. We are processing the evidence about the nature of learning planned for by the English, maths and science PGCE students trained September 2009 – July 2010 at Wolverhampton University.

The following characteristics of the four theories of learning have been developed to analyze trainees' planning and practice.

	Key features of analytical framework to scrutinize trainees lesson plans
Behaviourist	Teacher telling/repeating information Teacher giving instructions Teacher modeling expectations

	<p>Students mimicking or repeating expected behaviours</p> <p>Students watching expert-in-action</p> <p>Lack of acknowledgement of cognitive processing</p>
Constructivist	<p>Teacher presents tasks that individuals should do</p> <p>Teacher asking directed questions (to individuals)</p> <p>Teacher expecting students to figure out answers individually</p> <p>Teacher asks challenging questions</p> <p>Individuals expected to think about phenomena or observations made</p>
Social Constructivist	<p>Teacher asking questions of groups or collective</p> <p>Teacher asking more open questions</p> <p>Teacher encouraging student to share and discuss ideas in groups</p> <p>Teacher presents tasks and learning activities that requires active participation</p> <p>Teacher nurturing co-operative and supportive learning environment</p> <p>Teacher expects learning to arise through interaction with others</p>
Socio-culturalist	<p>Teacher promotes collaborative learning through novice and expert working together</p> <p>Encourages collective responsibility for learning</p> <p>Anticipates learning as an apprenticeship</p>

Three examples of lesson plan analyses (Autumn 09; Spring 10 and Summer 10) are included in the appendix of this report to illustrate how the remainder of the plans are being scrutinized. These are indicative of progression we are looking for in the way the trainees organize the learning for their students.

*Initial indications*

Initial indications , from an early sample of plans, are that there appear to be more episodes of social constructivism in

English lessons and more episodes of constructivism in maths and science lessons.

***Milestones still to achieve***

- 1) Complete analysis of the lesson plans of all trainees.
- 2) Complete analysis of videos and associated lesson plans.
- 3) Draft lesson plan analysis findings.
- 4) Draft whole report.
- 5) Finalise whole report.
- 6) Disseminate findings at Escalate conference; various subject (mathematics education; science education; English education) associations; the School of Education annual research conference and BERA (British Educational Research Association conference).
- 7) Publish findings and recommendations in Journal of Teaching and Teacher Development and the education journals for each of the three (mathematics, science and English) subject associations.
- 8) Review current teaching approaches and consider how to (re)develop and communicate appropriate recommendations within the School of Education and University wide. Develop teaching materials from the video-clips of trainees in-action and research analysis.

Appendix 1 : Sample analysis of trainees lesson plan – Autumn 2009

Appendix 2 : Sample analysis of trainees lesson plan – Spring 2010

Appendix 3 : Sample analysis of trainees lesson plan – Summer 2010

Lesson plan analysis of teaching strategies (December 09):

Trainee ..... School: ..... Year Group:10 No pupils: 22(14m/8f)T opic:Drugs & effects Date: 7.12.09

**Structure and sequence** (Normally this should include entrance and /or starter activity at the beginning of the lesson and a plenary session at the end.)

Sub-headings (with timings)	Teacher activities (and AOT if available)	Pupil activities	Tutor observation notes & analysis of actual teaching strategy applied
12.15-12.20	GC to take register. <u>Introduce objectives</u> and discuss last lesson.	All learners to answer the questions they can on question sheet which will be used later. Pass back to front. <b>LO1</b> achieved through ability to answer the question which relates to the drug they have researched.	<b>Constructivist Activity –</b> (individual response to questions)
12.20-12.24	GC to instruct class to get into new groups and give out instructions for class discussion.	Class to discuss in groups the drugs they have researched. Class are to argue their case for ‘Britain’s worst drug’ describing the physical and social effects to the rest of their group using their visual aid. Miss Morgan to assist. <b>LO2</b> achieved through taking notes on the other drugs they are being taught about.	<b>Social Constructivist activity</b> (Pupils working collaboratively on task)
12.24-12.40			
12.40-12.45	GC to bring class back together to review what has been discussed and to <u>review objectives</u> .	Class to vote on which is the worst drug following group discussion.	<b>Social Constructivist activity</b> (Pupils share opinions)
1.15-1.30	GC to describe the outcome of the vote and begin whole class discussion about their opinion about ‘Britains worst drug’.	Class to vote again on which is ‘Britain’s worst drug’ <b>LO3</b> achieved through discussion of each drug’s effects and deciding on the worst.	<b>Social Constructivist activity</b> (Pupils share opinions)
1.30-1.33			
1.33-1.40	Plenary activity. <u>Review objectives</u> .	Class to complete question sheet again and should now be able to answer all questions relating to all drugs and peer asses.	<b>Constructivist Activity –</b> (pupils completing ws)  <b>Bell goes mid way</b>
Extension: 1.40-1.45		Class to write a headline and first few sentences of a newspaper article entitled ‘Britain’s worst drug’ and describe why it is the worst drug.	
<b>Homework</b> (This should be set at the most appropriate point in the lesson, not necessarily at the end. Include date for completion.)			

	Behaviourist activities	Constructivist activities	Social constructivist activities	Socio-cultural activities
Number of different learning activities	0	2	4	0
% learning activities	0	33	67	0

Lesson plan analysis of teaching strategies:

Trainee Name: ..... School: ..... Year Group: 10 No pupils: 10(6m/4f) Topic: Metals, pros & uses Date: 23.3.10

**Structure and sequence** (Normally this should include entrance and /or starter activity at the beginning of the lesson and a plenary session at the end.)

Sub-headings (with timings)	Teacher activities (and AOT if available)	Pupil activities	Tutor observation notes & analysis of actual teaching strategy applied
10 mins	Meet and greet and hand out correct workbooks to each pupil and give instructions.	Pupils to open workbooks and complete starter activity with help where appropriate.	Constructivist Activity – (starter in individual differentiated workbooks)
12 mins	Go through starter activity and explain the meaning of the new words  Demo practical investigation and explain purpose of activity.	Class listen to instructions and complete main task 1 filling in the table with information gathered from looking at samples of metals and testing their hardness and electrical conductivity. LO1.	Constructivist Activity – (pupils listening & responding individually) Social Constructivist activity (Pupils working collaboratively on practical task)
2 mins	Tell class to look back at the objectives set for them and assess whether or not they have achieved any of them yet.	Class to look at objectives and self-assess progress so far.	Constructivist Activity – (individual reflection on objectives)
12 mins	Describe main task 2 and answer any questions	Class to complete main task 2 – fill in the blanks exercise about the uses of certain metals using their properties. It is expected pupils will need help completing this activity as many of the words will be unfamiliar. LO2. LO3.	Constructivist Activity – (pupils completing task individually)
2 mins	Go through answers to main task 2 and answer any questions Ask class to self assess based on the objectives set for them.	Class self assess using objectives.	Social Constructivist activity (pupils swap sheets to peer assess)
5 mins	Go through examples of alloys		
10 mins		Class to complete main task 3 based on information given in discussion about alloys.	Constructivist Activity – (pupils completing task individually)
7 mins	Talk to class about work done in lesson and objectives set.	Class to complete plenary self-assess activity.	Constructivist Activity – (pupils self reflect)

**Homework** (This should be set at the most appropriate point in the lesson, not necessarily at the end. Include date for completion.)

	Behaviourist activities	Constructivist activities	Social constructivist activities	Socio-cultural activities
Number of different learning activities	0	6	2	0
% learning activities	0	75	25	0

Lesson plan analysis of teaching strategies:

Trainee Name: .... School: ..... Year Group:7 No pupils: 29(16m/13f)Topic:Diffusion Date: 6.5.10

**Structure and sequence** (Normally this should include entrance and /or starter activity at the beginning of the lesson and a plenary session at the end.)

Sub-headings (with timings)	Teacher activities (and AOT if available)	Pupil activities	Tutor observation notes & analysis of actual teaching strategy applied
5 mins	Greet class, address uniform and instruct what to do	Class copy date, title and begin entrance task, odd one out.	Constructivist Activity – (starter in individual differentiated workbooks)
5 mins	Develop ideas into full class discussion	Class to complete starter activity: brainstorm in pair show the smell from the gas taps reaches their noses.	Social Constructivist activity (Pupils working collaboratively on brainstorm)
5 mins		Class to play ‘musical statues’ to demonstrate diffusion of gases.	
5 mins	GC to show video of diffusion of gasses and ask class to explain in their own words why the bromine diffuses quickly in a vacuum.  <u>Review outcomes</u>	Class to explain diffusion in gasses using ideas about energy levels of particles and explain why bromine diffuses so quickly in a vacuum. <b>LO1 achieved here.</b> Ext: think of real life examples of diffusion of gas.	Constructivist Activity – (video of diffusion shown)
5 mins	GC to lead class discussion about their ideas about diffusion in a liquid. Do they think it will be slower or faster than in a gas? Why? How will they test it?	Class to make a prediction about how temperature of water will effect how quickly the potassium permanganate diffuses through the water. Ext: Draw a table to show predictions about how temperature will affect dffusion rate.	Constructivist Activity – (pupils listening & then prediction as individuals)
10 mins	GC to give safety talk and instructions for practical activity.	Class to test their theory about the temperature of the water and the diffusion of potassium permanganate using warm and cold water and stopwatches. <b>LO2 achieved here.</b>	Constructivist Activity – (pupils listening to intro to practical) Social Constructivist activity (Pupils working collaboratively on practical task)
7 mins		Class to write up what they saw using pictures and colour in the progression of the diffusion at 1 minute, 2 minutes etc. <b>LO3 achieved here.</b> Ext: Include in the explanation information about the energy of the particles and the bonds holding them together.	Constructivist Activity – (individual write ups of practical, but choose on format for table)
	<u>Review outcomes</u>		Constructivist Activity – (pupils completing task individually)
5 mins	GC to lead class discussion to predict what would happen if we used boiling water that was evaporating or ice water.		
3 mins		Class to explain their ideas for whether or not you can see diffusion in a solid and explain using ideas about particle energy. <b>LO4 achieved here.</b>	Constructivist Activity – (pupils listen to & respond individually about diffusion in liquids & solids) – plan changed as short of time.
	<u>Review outcomes</u>		
10 mins	GC to give instructions about plenary activities.	Class to write 3 true or false statements for their partner about today’s lesson.  Class to sum up today’s learning using a picture or a sentence.	
	<u>Review outcomes</u>	Class to self-assess using outcomes.	Constructivist Activity – (pupils self reflect)

**Homework** (This should be set at the most appropriate point in the lesson, not necessarily at the end. Include date for completion.)

Find out about a way diffusion occurs in the natural world, in animals or plants

	Behaviourist activities	Constructivist activities	Social constructivist activities	Socio-cultural activities
Number of different learning activities	0	8	2	0
% learning activities	0	80	20	0