

Cultivating a constructivist classroom in S1 Biology

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Introduction

A Curriculum for Excellence (aCfE) is looming large on the horizon in Scottish education. In conversations regarding this major curriculum reform with many teaching practitioners, it was clearly apparent that there was a high level of confusion and uncertainty, on both their part and my own. From a previous assignment on Professionalism and aCfE (Kelly, 2008), I had developed a much deeper appreciation of the learning theories underpinning aCfE, however like many other teachers I still struggled to appreciate how these ideas would work in practice. I therefore decided to find out for myself.

Section 1 – Learning Theories

Having gained six years teaching experience, in a variety of settings, I found myself gradually crystallising on my own teaching ‘style’. Although always open to new ideas, I could now recognise that my lessons followed a fairly familiar format. They would normally take the following form:

1. An introduction: Including a look back at previous lessons, a brief overview of the current lesson and stating the learning intentions.
2. Teacher exposition: Whichever concept was currently being studied is explained by myself and discussed with the class.
3. An academic task: Pupils would then be asked to complete some sort of activity to reinforce the learning, either individually, in pairs or as a group.
4. A plenary: The learning would be summarised followed by a look forward to the next lesson.

Obviously, there would be significant amount of variation from lesson to lesson, but many of these features were commonly observable. All lessons would be planned by me, using the relevant department's medium term plans and SQA Arrangements Documents as guides. If I were to claim that this style of teaching was firmly routed in educational theory, I would be being less than truthful. These techniques had developed over time through trial and error, observing other teachers and attending training courses. They served me well, and seemed to serve the pupils equally well, so I continued to use them.

It is possible, and extremely useful, to consider with hindsight the learning theories which did, and to a great extent still do, underpin this practice. In Wood's (1998) summary of learning theories, he summarises Vygotsky's view of learning as "*co-operatively achieved success*". Vygotsky suggested that children learn by instruction from others. I certainly viewed myself as the instructor of information in my classroom, and the teaching methods outlined above reinforce this. As the more knowledgeable participant in the lesson, I decided what was to be learnt and how it should be learnt, then proceeded to deliver this information to the pupils. However, this process is worryingly similar to the transmission method outlined by Sotto (1994). In his description of Wertheimer's observations of a lesson, Sotto points out that a teacher can go through the commonly accepted teaching methods and still result in no 'real' learning amongst the pupils. So, my reflection on my current practice suggests that I need to look to improve; but what's the alternative?

I am extremely fortunate to have embarked on the route to Chartered Teacher at the same time as the Curriculum for Excellence reform was in its initial stages of implementation. This provoked and encouraged me to examine this teaching 'style' which I have been cultivating, and compare it to the ideas being actively discussed across the profession. This reflection resulted in my realisation that you should never 'crystallise' teaching practice. How can you ever expect to improve if you view your teaching methods as fixed?

Reading the Curriculum for Excellence website suggests that we as teachers in Scotland should be utilising active and collaborative learning methods which build upon the principles of Assessment is for Learning (AifL) (LTS, 2009). This to me seems to be a move towards Bruner's view of learning. There are striking similarities between the practices promoted by Learning and Teaching Scotland (LTS) and Wood's (1998) summary of Bruner's ideas as "social constructivism"; a fact I realised when reading for my Module 1 essay (Kelly, 2008). In this essay I discussed the overlap between aCfE and Brooks & Brooks' description of the constructivist classroom (Brooks & Brooks, 1999).

Shirley Clarke also highlights the role of constructivism in the effective use of formative assessment, an integral component of AifL (Clarke, 2005). She also points out that "many teachers resist the constructivist approach – because they are embedded in their old way of teaching" (Clarke, 2005), I became determined not to be one of those teachers. In order to improve the learning experiences of my pupils I decided to do as she suggests by "taking risks and systematically relinquishing control" (Clarke, 2005).

What therefore would this alteration of learning theory involve in my classroom? To begin with, I decided to try out these ideas with my S1 Biology class. I was about to start a new topic with them, and as much as possible I wanted to convert my classroom into a social-constructivist classroom. In previous years I would have followed the department's lesson-by-lesson medium term plan for the new topic entitled 'Human Physiology'. I decided instead to take a risk and put a new approach into practice. From the reading I had carried out I determined a number of key features of this new approach:

- investing time to find out what the pupils already knew about the new subject
- avoiding deciding on a title for the topic

- abandoning the medium-term plans and opening my mind to whatever the pupils wanted to explore
- devolving the topic planning to the class
- trying to incorporate as many 'active learning' strategies as possible
- constantly discussing the progress of the topic in terms of the pupils' learning
- asking the pupils for their thoughts on the topic at the end

The following section outlines in detail how I went about putting these ideas into practice.

Section 2 – A New Technique

Having already completed one topic with my S1 class, I decided to apply my new approach in the second. As already explained, I wanted to hand over much of the control to the class in an attempt to move toward creating a constructivist classroom. My first step was to alter the way I introduced the topic. In the past I would have begun by stating the name of the topic, perhaps followed by a quick discussion on what this meant, I would then commence with the first lesson. This time, I decided to devote at least two lessons to the introduction and planning of the topic. The first of these was designed to stimulate discussion and allow me, and the pupils, to find out what they already knew on the subject. I started by displaying four questions across two powerpoint slides which we explored as a class. This allowed me to frame the scope of the topic without imposing a title. It also generated a very fruitful discussion, which incorporated many contributions I had expected but also some that I had not.

I then continued with an activity aimed at finding out what the pupils already knew on this subject. I set them the task of drawing the organs of a person into an outline of a body and labelling their functions. The pupils completed this task in groups of four with varying degrees of success. This activity instantly demonstrated the potential of this kind of learning to me. The vast majority of the pupils demonstrated a high level of motivation and enjoyment throughout the task, and I was

simultaneously acquiring a vast amount of informal information on what they already knew. It also provided the pupils with an opportunity to demonstrate their prior knowledge and understanding to themselves, which would be crucial to planning the topic.

To complete this first lesson, I introduced the idea of the pupils planning the remainder of the topic for themselves. Whilst the pupils had been completing the outline task already described I had an idea which I decided to add in on the spur of the moment. I decided to show the pupils the relevant outcome from the Draft Curriculum for Excellence Science Outcomes. I wanted to show them that this is the information I would have used to plan the topic, and therefore they would need it to enable them to plan the topic instead. Unfortunately, this idea was quite unsuccessful. The outcome was far too verbose and was not written in a way which S1 pupils could easily engage with. I was presented with a classroom filled with silence and blank faces. I decided that my last minute idea was not a good one, and quickly moved on. I concluded the lesson by discussing as a class what the topic was about and what they already knew on this and by setting a homework for the following week. The homework required the pupils to write down what they would like to find out during the topic.

In my next lesson with the class the objective was for each group of four to plan the new topic. I prepared a sheet of flipchart paper for each group with the same questions on each sheet; see right. I made it clear to the pupils that I would take their separate plans and do my best to amalgamate

Topic Plan

We already know:

We want to find out:

Topic Title:

We will present our findings by:

Each week's activities

Week 3:

Week 4:

Week 5:

Week 6:

Week 7:

Week 8:

An excellent piece of work will be...

them into one plan for the class. The groups spent much of this lesson discussing and completing their plans. As promised, I looked through the plans produced by the groups and devised a plan for

the topic which was a combination of their ideas. I was surprised that the resulting plan was not tremendously different from the standard plan for the topic. The major differences included a presentation at the end, instead of a test, and the addition of the brain and eyes to the organs explored.

From this point forwards, we proceeded to explore the topic as planned by the class. At the beginning of each lesson I asked the class what questions they were expecting to be answered on that specific area. I stressed the importance of them stating what they wanted to find out in order for them to produce a final presentation which reflected their own learning. I was genuinely shocked by the pupils' enthusiastic responses to these requests. As they called out questions, I made rough notes on my whiteboard to help guide the lesson. The pupils were now so motivated by the topic that I struggled to contain their questioning. As I only have one hour per week with the class, I found it difficult to deal with spending almost half an hour writing their questions on the board! As a result of this lack of time, the lessons did not involve any textbook work and revolved around class/group discussion and worksheets.

Unfortunately, another time constraint on the topic was the need for the class to sit a test on the topic half way through. The reason for this was the fact that our school enters pupils for Standard Grade and Intermediate 1 exams at the end of S3. As a result, our S1 pupils choose their subjects for S2 in April. We therefore, as a department, need to assess the pupils to judge whether they should be entered for Standard Grade or Intermediate 1. I had hoped to be able to give the pupils the necessary test after they had completed their presentations, however this proved not to be possible. The topic was taking much longer than anticipated, partly through the enthusiasm of the pupils, but also due to my own absence through illness. As a result of this need to complete the test, we "paused" our planned topic for a few weeks. I taught the pupils in the remaining content quickly and gave them the test. We then returned to the remainder of the topic plan.

The pupils completed the topic by researching the brain and eyes as planned, and producing their presentations, which they then shared as a class. The pupils peer assessed their presentations using the criteria set at the beginning and were very generous to each other, raising some questions on the validity of this form of assessment.

Having now completed the topic, I asked the class to complete a questionnaire to gauge their response to this new approach. 15 out of 16 pupils noticed that the topic was different to the previous one. They noticed that...

"we got to choose what we done"

"we got to pick our planning"

"it was more fun"

"we did posters"

"we learned what we wanted to learn about"

"we never actually worked out of a textbook"

"we worked in groups more often"

"we said what we liked to do then Mr Kelly went and seen what was most popular then put it up to see what we would do every week"

When asked what they enjoyed about the topic, they responded...

"planning the topic"

"it was about the human body"

"making the posters and the powerpoints"

"the group work"

"not working out of a textbook"

"the dissections"

"everything"

They were also given the opportunity to say what they didn't like. Very few responded...

"drawing on the posters"

"hard to organise who was saying what"

"sometimes it was boring"

When asked which topic was best for their learning, 11 chose the more recent topic. Four misunderstood the question and one did not answer. Although there are clearly some pupils who did not engage with this topic as fully as others, the majority enjoyed it and agreed that it was beneficial to their learning. The two most common themes running through the pupil responses is their appreciation of the opportunity to contribute to the planning of the topic and the variation of activities – especially the lack of textbook work. While it is not surprising that pupils would rather not work from textbooks, it is interesting that they value their involvement in structuring their own learning so highly.

My own response to this topic is quite similar to the pupils. I was encouraged and inspired by the outcomes of the approaches used throughout. By simply starting the topic from a slightly altered viewpoint, the entire learning process altered. Instead of telling the class what we were going to do, I was asking the class what they wanted to learn. At each stage, I felt this altered viewpoint raised the motivation of the class which led to an extremely dynamic and energetic classroom which was focused on learning. This learning, was also much more varied than in the past. As well as learning the necessary facts regarding the human body, the pupils were also developing their skills, ranging from working in a group, to planning and presenting information. This is very much in line with the objectives of aCfE.

The motivation and enthusiasm was most evident when I asked the pupils what they wanted to find out at the beginning of each lesson. The response was so overwhelming that I very much struggled to manage the time. While not wanting to quash the energetic curiosity on display, I was also

conscious of the need to actually spending some time answering some of these questions. In the end I had to encourage the pupils to make a note of any unanswered questions and explore them during the internet research time allocated at the end of the topic. Although there is clearly a difficult balance to be struck here between asking and answering questions, it is a problem I am more than happy to be faced with!

Section 3 – Impact & Implications

Having outlined my efforts to make my classroom more constructive, it would now be useful to return to the theory and reflect on any successes, and consider possible improvements. Shirley Clarke's elaboration on Brooks & Brooks characteristics of a constructivist classroom seems to me to be an appropriate benchmark to compare this intervention to (Clarke, 2005). I am therefore going to assess myself against each of these twelve characteristics:

1. *Constructivist teachers encourage and accept student autonomy and initiative.* The group planning activity certainly shows a move towards this. The pupils were encouraged to formulate their own areas for, and methods of, learning. They were still fairly restricted to the general topic of the human body, and they then had to accept my compromised version of their plans. However, in the context of the contemporary Scottish Secondary School I believe these restrictions will be very difficult to remove.
2. *Constructivist teachers use raw data and primary sources, along with manipulative, interactive and physical materials.* There were a couple of examples of this. Firstly, the pupils had the opportunity to examine real life lungs and heart to learn about the structures and functions of these organs, as opposed to finding this out from textbooks. In addition, pupils were encouraged to search for information on their own to find out how the brain and eyes work. I do feel however that these are quite superficial examples and much more could be done here.

3. *When framing tasks, constructivist teachers use cognitive terminology such as 'classify', 'analyse', 'predict' and 'create'.* I feel that my project was weak on this aspect. Although encouraged to plan the topic for themselves, much of the learning still involved fairly low-order thinking. This is perhaps a consequence of the S1 curriculum, however more could still be done.
4. *Constructivist teachers allow student responses to drive lessons, shift instructional strategies and alter content.* I think I was quite strong on this one, perhaps too strong at times. Not only was the medium term planning directed by the pupils, but a large portion of a number of the lessons was spent discussing what they wanted to know. I think the challenge for the future will be finding a way to give them the freedom to direct the learning, while also retaining some time to actually carry out some learning!
5. *Constructivist teachers inquire about students' understandings of concepts before sharing their own understanding of these concepts.* I feel that this was achieved by the outline of a body activity.
6. *Constructivist teachers encourage students to engage in dialogue both with the teacher and one another.* Both the planning activities and the final presentation required the pupils to work effectively in groups of four. In future, I could encourage more directed discussion activities into the topic lessons also.
7. *Constructivist teachers encourage student enquiry by asking thoughtful, open-ended questions and encourage students to ask questions of each other.* Open questioning has been a feature of my practice since my first post, and although I have no evidence of its use for this project, I do feel I utilise this type of questioning in the majority of my lessons. However, I do not believe that I have been overly successful in getting the pupils to question each other and will strive to incorporate this in future.
8. *Constructivist teachers seek elaboration of students' initial responses.* Again, I believe that this is an integral part of my questioning techniques which I used in this topic also.

9. *Constructivist teachers engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion.* I have long been a supporter of what I would term cognitive conflict, or dissonance, to challenge pupils' expectations and encourage discussion. An example of using this idea in this topic was when we were learning about the lungs. I encouraged the pupils to share their preconceptions of the structure of lungs, receiving the usual 'balloon-like' responses. The pupils were then suitably surprised to learn that they are much more 'spongy' which then led neatly onto their structures being related to their efficient function.
10. *Constructivist teachers allow 'wait time' after posing questions.* Again, I believe this to be an integral part of my questioning technique. I often make use of 'no hands up' and 'talking partners' in lessons.
11. *Constructivist teachers provide time for students to construct relationships and create metaphors.* This is perhaps another area of weakness with this project, which I feel may also be linked with the relatively low-order thinking required in this topic. This is certainly something to consider for the future.
12. *Constructivist teachers nurture students' natural curiosity through frequent use of the learning cycle model.* This I feel is one of the real strengths of the approaches used in this topic. I was able to draw on the pupils' own natural curiosity to drive the learning. I feel the product of this was evident in their questions and their responses to the evaluation.

This self-evaluation against these characteristics demonstrates that I have made some progress towards creating a more constructivist classroom and, unsurprisingly, that I have more to work on.

So, where do I go from here? This project has had two major implications for my practice. Firstly, I am now teaching the following S1 topic in a similar way. I have already made some modifications to the approach following reflection on the human body topic. This includes the introduction of a 'learning log' to help the pupils focus on their learning throughout the topic. I felt that this was

necessary as the pupils did not make much use of their jotters during the human body topic and I felt that they consequently struggled to maintain a clear understanding of the progression of the topic. I did not want to revert to the previous use of jotters, i.e. as a place to make notes and answer questions. I therefore developed the idea of a learning log instead. These two sheets of A4 are stuck into the jotters and are referred to at various times throughout the topic. In addition to the continued use of these approaches in S1, I am also exploring ways to utilise these ideas in other years. However, this will not be easy given the nature of the content heavy examination syllabi which we need to address in the other year groups.

Another outcome of this intervention is the opportunity to share the ideas I attempted with other teachers. This was initially through my personal blog (Kelly, 2009), which is read by a number of other teachers across Scotland and beyond. I was so encouraged by the response to this blog entry that I also shared my work with my Head Teacher. As a result of this she has asked me to speak at our forthcoming in-service training day on a Curriculum for Excellence in June of this year.

Conclusion

The aim of this assignment was to demonstrate a critical reflection of my teaching practice and outline my attempt to introduce a new approach, based on learning theory, and consider the impact of this intervention. By embracing the recommendations of a Curriculum for Excellence I have found myself attempting to convert my classroom from a traditional 'instructive' one, to one based on social constructivism. This attempt has been inspiring for the pupils, myself and my peers and as a result I am looking forward to making ever greater strides towards becoming a constructivist teacher and encouraging my colleagues to do likewise.

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