SSC 312 ASSIGNMENT

Assessment in Secondary Science

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Contents

Edge Hill University

PGCE Secondary in Science

Introduction

- How assessment can be categorised and used?
- What can be assessed?
- Links between assessment and curriculum
- Problems inherent with assessment
- Assessment related to science

Discussion

- A pupil work
- Assessing a pupil work
  - *background
  - *context
  - *marks
- Relationship with Sc1 Level descriptors
- Examination of assessment criteria
- How where generic level descriptors customised to allow levels to be ascertained.
- Assessment reinforcing and complementing the extend assessment profile of the pupil.
- How was the assessment used to develop scientific skills?

A pupil assessment profile

- Building a pupil assessment profile
- Describing data to facilitate learning and pupil Development.
- Pupil report

Introduction

The main concern of this assignment is to explore the real nature of educational assessment. My experience as a PGCE secondary in science student allows me to understand the importance of the assessment arguments when giving some feedback to pupils. During my training period as a science trainee teacher I've been developing some science assessment ideas, (guided by the National Curriculum procedures) being aware of the general concerns about this specific educational argument. The basic scaffold of this assignment's structure will be as follows;

- How assessment can be categorised and used?
- What can be assessed?
- Links between assessment and curriculum,
- Problems inherent with assessment,
- Assessment related to science.

`Assessment and evaluation are best addressed from the viewpoint of selecting what appears most valid in allowing students to show what they have learned´- **Saskatchewan Education, 1991.**

To understand the statement above we need to ask how assessment can be categorised and used. To answer this question as a future trainee teacher, I need first of all to understand what types of assessment can be categorised and used. Assessment can be used as assessment of learning (summative assessment) and assessment for learning (formative assessment). Basically and in agreement with the QCA assessment principles, to use a type of summative assessment teachers should use evidence collected from an end of unit test to make a fair judgement about pupils' performance against national standards as level descriptions. External examinations, quizzes and all performance are considered as some of the summative assessment tools.

Alternatively assessment for learning uses evidence from testing to decide what pupils achieved against their targets and plans how to take the next steps.

Many educators define formative assessment as something carried out *during* (or before) instruction, with summative assessment coming *after* instruction.
Formative assessment is usually not used to assign grades.
An example of formative assessment outside the education field is the medical test. Generally speaking, medical tests are not things that people "pass" or "fail." The purpose of the test is to gather information that helps medical professionals decide the best treatment for a patient.
Formative assessment in the classroom is similar. `Teachers get a sense of how individual students and entire classes are doing based on interpretations of student behaviours' they constantly observe´ - **Colburn, Alan, 2003.**

Sharing learning goals with pupils, helping pupils know and recognise the standards to aim for, providing feedback that helps pupils to identify how to improve and pupils learning self-assessment techniques to discover areas they need to improve are some of the ways to identify effective assessment for learning in a classroom and even in school.

Actually the Ks3 Strategy only talks about these two types of assessment. Other types of assessment can be developed like diagnostic (assessment that is used to identify gaps in learning) and evaluative (assessment used by the teacher that measures the success (or not) of a learning strategy/experience) assessment.

Assessment items were considered an important aspect of education since the Education Reform Act of 1988. Initially this Act just included the TGAT (Task

Group on Assessment and Testing) and some strategies for assessing pupils' progress in the NC in England.

The assessment tools provided and applied in the classroom follows The DfES, national strategies, Ofsted and QCA Assessment Reform Group's interpretation of assessment for and of learning and their research-based principles.

Nowadays and as a future teacher, the importance of improving some assessment routines is one of my priorities and it should be for all the teachers. Working with assessment tools is mainly a teacher job and not a student or pupil work. Some problems (like deciding what am I assessing?, linking assessment with my lesson learning objectives and outcomes, developing rigorous mark schemes, if a pupil miss homework regularly what to do? etc.) can be inherited when teachers work on a way to develop assessment criteria to evaluate each pupil or student performance.

A common problem related with assessment is the rubric scores of a pupil work, that's why the importance of each teacher becomes involved with school staff for example during a discussion about achieving common grounds for marking. Assessment needs to be consistent in all subjects for pupils are aware of their rubric and what is happening around them during the entire academic year.

A rubric is no more than a scoring tool that lists the criteria for a piece of work. In other words, the rubric tells students what "counts" for their grade. The rubric also communicates gradations of quality for each criteria (e.g., from excellent to poor) **(Goodrich 1997)**.

So, a rubric for an assignment where students are designing and carrying out an independent investigation might include criteria for the question to be

investigated, procedures for answering the question, data collection, data display, and discussion or conclusions. Each of those criteria would include a list of quality gradations.

In a sequence to understand more about rubrics score criteria, two main concepts appear to explain the different types of criteria when using tests to assess pupils work.

1 – Criterion- referenced tests

The ones in which graders compare performance to pre established criteria. If a teacher tells students that they must correctly answer at least 12 questions out of 20 to pass a quiz, then she or he is using a criterion referenced test (or, more accurately, criterion- referenced grading).

2 – Norm- referenced tests

The scores are ranked and compared to each other. If teachers grade on a true "curve"—such that they will record the top 10 percent of scores as A or the bottom 10 percent of scores will fail—then they are using norm-referenced grading. In norm-referenced tests, the fraction of students who pass the test will be the same—regardless of how individual students perform. The SAT is an example of a norm referenced test.

Focussing more on my teaching subject science, it's relevant to talk about how assessment can be delivered in science lessons. Science is the field of study that attempts to describe and understand the nature of the universe. It is an integral part of modern culture stretching the imagination of young people and helping us to complex things simple.

QCA worked with a few partners to develop materials called assessing progress in science that supports the delivery of the National Curriculum. During Ks3 pupils assessment are build on their scientific knowledge and understanding and make connections between different areas of science. They are assessed in carrying out investigation by their own and with others, on evaluating evidences they have collected, by their communication skills. Basically assessments in science and in agreement with the QCA, NC purposes, are based on pupils learning about how a scientist works?

'The assessment process should not determine what is to be taught and learned. It should be the servant, not the master of the curriculum. Yet it should not simply be a bolt- on addition at the end. Rather it should be an integral part of the educational process, providing both 'feedback' and 'feed forward.'

(National Curriculum Task Group on Assessment and Testing: A Report, 1988, 1.0. E1)

Introduction References

- Finson, K. D., and Beaver, J. B. 1994. Performance assessment: Getting started. *Science Scope* (Sept.): pages 44–49.
- Kleinhelder, J. K. 1996. Assessment matters. *Science and Children.*
- GALLAGHER James, *Teaching Science for Understanding: A Practical Guide for Middle and High School Teachers.*
- DEPARTMENT FOR EDUCATION AND SKILLS, *KS3 National Strategy* 05/02.
- Colburn, Alan, 2003. *The lingo of learning, 88 education terms that every teacher should know*, NSTApress.
- www.qca.org.uk
- National Curriculum (1999) DfEE/ QCA.
- Wellington, J. (ed.) (2000) *Teaching and learning secondary science contemporary issues and practical approaches*, Routledge.
- Ross, k. Lakin, L. and Callaghan P. (2nd ed) (2004) *Teaching Secondary Science,* David Fulton Publishers.

Discussion

This section of the assignment refers into assessing a pupil work (**appendix 1**). The work done correspond to an investigative work by carrying and developing planning and observation skills. The piece of work that I have marked and included in this assignment is a work written by a Year 7 higher ability pupil. The topic corresponds to Changing Materials (Ks3, Sc3 Unit F (Simple Chemical Reactions), sub unit F4 (Fire Fighting) of the catalyst text books).

- Assessing a pupil work

To use as assessment tool a piece of work done by a pupil, it's relevant to make sure that as a trainee teacher and even as a future teacher, I have some information about the pupil background, the context and even the marks related with the level descriptors.

As learning objectives this piece of work made pupils understand and describe the process of simple combustion as well to name the `reactants' and `products´ of a burning reaction to expand knowledge about it by achieving different skills.

As learning outcomes pupils would be able to identify combustion as a chemical change, to identify the fuel, oxygen and energy needed to start a burning reaction, as well be able to carry it out an investigation work about a candle in a jar as a way to develop more knowledge about the topic and establish a relationship about what they already know from the unit.

I split this piece of work in four different parts (carrying, measuring, recording and analysing). This work relates to the Sc1 section of the National Curriculum guidelines. The sections covered mostly are planning (carrying out), observing (measuring and recording), analysing (conclusions and establish patterns) and evaluating (communication, data and experiment). Pupils were assessed on four main sections throughout the investigation, this included the following:

Section 1 - This section was about carrying a practical investigation being aware of what they know and what they need to do. Pupils need to check how long it takes a candle to go out by using different sized jars. Pupils were assessed by developing some practical skills (being aware of health and safety, risk assessment, lab material, experiment apparatus etc) and work as scientists' investigators.

Section 2 – On this section pupils need to measure and record the results of the different time that the candle takes to go out with the different volume jars. The assessment items were the pupils' ability to record all the results on a proper table (organizing the results) after being measured.

Section 3 – After pupils' record the results they need to spot all the different values of measurement on a graph supported by their own results table.

Section 4 – The last section of assessment on this piece of work was pupils ability to explain and describe their own graph `designing´ a possible explanation and final conclusion of their work.

- Relationship with Sc1 Level Descriptors

The following mark scheme was incorporated in the assessing of pupils progress.

Level	Planning			Observing	
	Using Research	**Prediction**	**Plan**	**Measurement**	**Recording**
3	Use simple texts or own ideas to make plan.		Simple, can be verbal. Recognise need to collect data	Perform a fair test with help. Simple measurements taken (e.g. mass, length) Use range of simple equipment.	Any simple record of measurements.
4	Select info from various sources. Decide on a suitable approach. Identify the independent variable to change.	Simple statement. ('because' is missing or too imprecise)	Plan a fair test (can be shown to be fair from performanc e of task).	Select suitable equipment. Make adequate observations. Repeats results but doesn't know why!	Use simple tables. Units selected with help.
5	As Level 4 only with less help. Identify key factors.	Statement based on k&u.	Plan to use a range of apparatus. U need for repeats	Make a precise series of measurements. Begin to make repeats. Intentionally uses larger sample.	Use more systematic tabulation. Selected own units.
6	Select own sources. Use k&u to decide on approach.	More detailed k&u	U need for accuracy	Measure a variety of quantities with precision. Use fine scale divisions. Make sufficient repeats.	Results tabulated clearly and accurately without help.

7	Identify key factors in complex contexts. Identify limitations in researched data.	Statement based on detailed k&u or scientific theory	U need for reliability (i.e. to produce valid conclusions)	Make systematic measurements. Use a wide range of apparatus. Identify where repeats needed.	

	Analysing		Evaluating		
Level	**Explaining**	**Patterns**	**Communication**	**Data**	**Experiment**
3	Describes observations (rather than "explains")	Recognise simple patterns	Some scientific terms used.		
4	Begin explaining using patterns and scientific k&u	Draw simple bar charts/graphs. Recognise patterns in graphs.	Begin using more appropriate language.	Confuses accuracy with reliability	Suggest improvements, giving reasons.
5	Explain consistent with evidence. Begin to relate to k&u	Plot line graphs. Recognise data that do and do not support conclusion. Use graphs to identify trends.	Use appropriate language and conventions.	Simple explanation of differences.	Practical suggestions for improvement. Understands that repeating results checks reliability.
6	Use more detailed k&u in explanation.	Decide on own scales on graphs.	Use own methods of communication (write up in own words)	Identify anomalies. Recognises that range of data collected affects reliability.	Reasoned suggestions for improvement.
7		Draw and explain lines of best fit. Explain complex patterns. Describes quantitative patterns accurately.	Use wide range of scientific language and conventions. E.g. symbols, flow diagrams.	Recognise if the data is sufficient for a conclusion.	

- Marking

Having in consideration the National Curriculum attainment level and also all the assessment criteria for each section (explained below), I gave this particular pupil for this piece of work (**appendix 1**) a level 6.

Section 1 – This pupil was able to carry out the work by writing properly the title, the aim of the investigation work, as well the method explaining step by step what he has done. A diagram was included to the specific method as a way to understand and be aware of all the lab material and also health and safety issues. This section was clearly and well done detailed.

Section 2 – In this section the pupil have shown that we can measure a variety of quantities with precision and also organize and tabulated clearly his results.

Section 3 - Section three was used to assess the pupil ability to link the results table with graphs with the tallied data and be able to explain the average of the results.

Section 4 - This pupil worked well and also achieved a good conclusion, explained by his own words and also he reinforced the idea of why not improve the experiment, being accurate with his own work.

- Assessment reinforcing and complementing the extend assessment profile of the pupil.

At the front page of the pupil's piece of work I praised the pupil with a merit for his excellent work and effort and listed just two targets to make sure that simple errors will not be repeated for the next work. This pupil received a level 6, because all the work fits with the Sc1, level 6 descriptors. One of the main reasons of making a brief comment on this pupil work was to share assessment with him, reinforcing is work and making sure that is going to carry on improving his own work by achieving the targets set by me as his teacher.

Basically this piece of work was useful for this specific pupil on a way that he has shown that scientific skills like planning an experiment, observing, checking/recording results, making conclusions and evaluating were developed and reflected on his mark for such a good work.

Pupil assessment profile

During my placement I've been developing per class pupils assessment profile described on a detailed data, having in count the school and the NC assessment guidelines. I have collected the following data for a student in my year 7 higher ability class:

- Ks2 Background

Philip Robinson is a very good pupil with an excellent target of level 6, potential upper target of 7 by the end of year 7.

- Tests Scores

Science Subject/Topic tests	%	Level
Chemistry - Simple Chemical reactions - Particles/States of Matter	 60 75	 6 7
Biology - Feeding Relationships	 65	 6+

- Homework Scores

Homework	Grade	Level awarded
Changing reactions	B	6
Acids and metals	A	7
Acids and Carbonates	A	6+
Firefighting	B	5+
Burning Changes	B	5+

- Investigative works

Investigation Work	Grade	Level awarded
Firefighting	B	6
Burning Changes	B+	7

The data shown for the pupil corresponds to the academic year 2006-2007. This pupil presents a very good Ks2 background, with a level 6 target. Basically it was the point of start for me to be able to know what to expect from this pupil. The marks collected (following the NC guidelines level assignment for each test score) include recent tests scores, homework's and two investigative works, that this pupil has shown be working at during a period of seven weeks.

This variety of marks, comments and also percentages were useful to employ in building this pupil profile, assessing is work and also be aware of targets to be developed and improved for progress.

- Describing how the data was used to facilitate learning and the pupil's development:

  This data was used to build this pupil's profile. By assessing homework's, tests, and investigative works, I've shared with him his achievements and targets, supporting and encouraging him to keep on moving with good work, getting to the top of his science subject knowledge and learning during the recently academic year.

  According to this data, all the targets were achieved and this pupil has shown the ability to achieve an upper target of level 7.

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PGCE Secondary in Science

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PUPIL REPORT

Pupil : Philip Robinson

Year 7 group 1G

Science teacher: Miss L. Baldé /Miss R. Cahill

- Science Programme

Recently pupils have being concentrated in the science topic about simple chemical reactions. Pupils have also produced individual and group work as a means of demonstrating the knowledge they have acquired. They have been given various written and practical assessment tasks, which have been marked according to the NC level descriptors.

- Achievements

Philip has shown that he is a great scientist! I'm very pleased with his investigative works, class work and thinking skills. Philip has developed within science lessons. He is totally familiarised with health and safety issues when carrying out an experiment. Philip's work is well organised and at a high standard which is shown in his science exercise book. At this stage he can demonstrate and plan a science activity by himself by measuring and recording important results to achieve good conclusions. An amazing progress since the beginning of this year.

- Areas of Improvement/Targets

Philip is a really bright pupil that requires good and challenging science lessons, but he still needs to be engaged with the rest of the class, when working together as a group. Philip struggles to be involved with the class. Target for progression will be activities that involve working in groups, developing some social and interactive skills with the rest of the class.

Comments:

Philip constantly works to a high standard in class and is currently working at a target level of 7. The target set for Philip will help him progress further and achieve his level by engaging with other students in the class.

Date: 7th February 2007

Science Teacher : Miss L. Baldé

Curriculum Mentor: Miss R. Cahill

References

- CHAPMAN Carol; SHEENAN Moira, *Catalyst Text book*, Heinemann;
- GALLAGHER James, ***Teaching Science for Understanding: A Practical Guide for Middle and High School Teachers.***
- DEPARTMENT FOR EDUCATION AND SKILLS, ***KS3 National Strategy*** 05/02
- National Curriculum (1999) DfEE/ QCA.
- Wellington, J. (ed.) (2000) *Teaching and learning secondary science contemporary issues and practical approaches*, Routledge.

Web References

- http://www.curriculumonline.gov.uk
- http://www.qca.org.uk/nc/
- http://www.dfes.gov.uk/
- http://www.dk.com

APPENDIX 1