Assessment of practical work in GCSE science

The Policy Note from the Gatsby Foundation and the Wellcome Trust dated 17th April[1] makes the case for a combination of direct and indirect[2] assessment of practical work in science GCSE. This Addendum develops further how the system could work in practice. It is based on the outcomes of two focus groups with experienced science teachers held in July 2013.

Our view is unchanged that direct assessment of practical skills is essential to any valid qualification in science. Whilst we acknowledge that experimental and investigative skills can be assessed through written questions, it is not possible to directly assess technical and manipulative skills in this way. The teachers we consulted share our view that the current system of controlled assessment using investigations is discredited and must be replaced. Teachers' objections centre on the amount of teaching time consumed by the assessments, and deep unease at the malpractice to which the current system is open – particularly the awarding of unjustifiably high marks to candidates.

In the long term, a way needs to be found to restore professional integrity to teachers' assessments, but this is not easy to do within the current high-stakes system and timescale for implementation. A good start would be for Ofqual and Awarding Organisations (AOs) to show that effective and visible systems are in place to monitor the operation of teachers' assessments and to impose exemplary sanctions where abuse is shown to have taken place.

For the short to medium term, we have the following suggestions, based on our discussions with teachers.

A suggested model for direct assessment of technical and manipulative skills

The following model for a **terminal practical examination** has been developed to minimise the impact on teaching time and to reduce the potential for malpractice. Ideally, it would be piloted before widespread implementation.

The examination would comprise a series of short experimental tasks, each focussed on a specific practical skill. It would be set up as a carousel of stations, performed under exam conditions, with individuals moving between stations after a set period of time. Groups of candidates would take the examination sequentially; stations would be refreshed and tasks changed between groups.

The examination could take place over several days using a number of different tasks, drawn from a bank provided by the AO to prevent candidates from sharing the contents. The examination would be independently invigilated, perhaps by a teacher from a neighbouring cluster school. Tasks could have simple and advanced versions, providing differentiation. Evidence of performance would combine results recorded by the student and witness statements from the teacher. Written or photographic evidence could be taken and samples sent for moderation by the AO. The examinations would be monitored by the AO through visits to schools, with serious consequences where malpractice is discovered.

Indirect assessment

Teachers are sceptical about the use of written questions to assess practical knowledge and skills, finding that it is possible to train pupils to answer the questions without having done any practical work themselves. Work needs to be done by AOs to improve the quality of written questions on practical work, to minimise the potential for candidates to score well without having done any experimental work.

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[1] Gatsby Charitable Foundation and Wellcome Trust Policy Note: Assessment of Practical Work in Science (2013) http://www.gatsby.org.uk/~/media/Files/Education/Practical%20Science%20Policy%20Note.ashx

[2] 'Direct assessment' is based on the direct assessment of candidates while they carry out practical science activities; indirect assessment involves written questions designed to assess knowledge and understanding of practical science.