Comparing Qualifications - Fitness for Purpose

Description of methodology

Introduction
This paper describes the methodology employed in the 'Fitness for Purpose' project, part of Sir Ron Dearing's Review of 16-19 Education which reported in March 1996. The project was designed to develop and apply a method of analysing and comparing different types of qualification. The methodology was to be developed in generic form so that it could be applied to different subjects, different qualifications, and different levels.

Where two or more different qualifications exist at a single national standard they are described as equivalent. However, they may be designed to be offer an alternative type of provision, consequently their structure and content may be different. To maintain confidence in national standards it is important to be able to demonstrate on what the equivalence of the qualifications is based, however the differences between the qualifications may mean that direct comparisons of one with the other are partial and may be misleading. It is important that any comparison should clearly indicate the different strengths and weaknesses of each qualification, providing a constructive perspective on each.

The measure used to gauge whether different qualifications are of an equivalent standard needs to be equally valid for each qualification considered. Because of the intentional differences between the qualifications, this measurement must be against some external comparator. The performance of each qualification can therefore be measured against this comparator. The results for each of the qualifications can then be compared. In a national system, where all types of qualification at a given level are considered an appropriate way to prepare students for a common 'next step', or progression route - whether to work or further study - the preparedness of students reaching these destinations may constitute a valid comparator for the qualifications.

Selecting suitability for progression as a method provides a new dimension for comparing qualifications - an independent judgment of their relative value, indicated by the extent to which they meet the needs expressed by those who use the qualifications as a basis for recruitment or selection - 'users'.

The pilot work was carried out in the context of the GCE A level and Advanced GNVQ qualifications in science. Its initial design built on the work of the 'Mechanics in Action' project at Manchester University (Lord, Wake & Williams (1995))[1] where researchers consulted with subject tutors in HE about mathematics requirements for entry to their courses. The Fitness for Purpose project is, however, far broader than the Manchester project and is designed to allow comparison of subject content, level of demand and assessment model.

Methodology

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[1] Lord,K, Wake, G D, & Williams, J S, Mathematics for Progression from Advanced GNVQs to Higher Education; The Mechanics in Action Project, University of Manchester (1995), ISBN 0 948241 30 6

The project employed a qualitative methodology, drawing on evidence gathered in meetings of small expert groups. The methodology will be described as a series of stages:

1. **Development of framework**
2. **Identification of user representatives**
3. **Piloting of framework and method**
4. **Meetings of user representatives**
5. **Validation and prioritisation**
6. **Selection of qualifications for analysis**
7. **Scrutiny of selected qualifications:**
8. **Development of qualitative coding frame**
9. **Interrogation of data**

1. Development of framework

The methodology hinges on the development of a framework for describing knowledge, skills and understanding in a consistent way. The framework was used to structure the requirements defined by 'users' and the content of qualifications. It was also structured so that the data for all interrogation and analyses could be processed in a co-ordinated way.

In considering the individual components of knowledge, skills and understanding which could be identified by users and be contained in qualifications, it appeared that there were two main features that would be identified in each case.

1. the context or subject matter, for example: *chemical reaction types*. To ensure sufficient detail was given about the breadth and depth of coverage of the context for meaningful comparisons to be drawn, each component contained further detail which described clearly what was intended, and limited scope for differences in its interpretation, for example, *chemical reaction types: Acid base : including and limited to neutralisation; indicators; salt formation; protonation; ionisation, buffers.*

2. the way in which the knowledge, skills or understanding were achieved, for example, would the student only need to *recall* information about Acid Base Chemical Reactions, or *use understanding* to solve problems, or would they also need to be able to *carry out* practical experiments in the area? The term used for this was 'focus of performance'.

To try and increase the consistency of decisions made about the focus of performance, it was decided to provide a single list of terms which could be used to describe the focus of performance, together with a definition of each term. All those involved in the project were required to use this common list of terms. A literature search was carried to identify existing taxonomies of learning strategies, both in traditional qualifications and in vocational qualifications which could be adapted for this project. This drew chiefly on the work of R M Gagné (1985), BS Bloom ((1956), and Mitchell & Bartram[2] (1994). It was decided that the Bloomian model, which is well-known by many involved in education, should

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[2]Gagné, R M, (1985) The conditions of learning and theory of instruction (4th Ed). New York: Holt, Rinehart and Winston

Bloom, B S (ed.)(1956), Taxonomy of Educational Objectives - Book 1 - Cognitive Domain. Michegan: Longman

Mitchell, L & Bartram, D, (1994) The place of knowledge and understanding in the development of National Vocational Qualifications and Scottish Vocational Qualifications in Competence & Assessment 10, 1-47

be used as the basis for the development of the 'focus' definitions. However, it needed to be modified in several ways:

1. incorporation of a 'skills' component to recognise vocational or applied achievement (included in both the Gagné and Mitchell & Bartram work).

2. collapsing of sub-categories of the Bloomian model into six distinctive types. Users felt that this made distinctions between types of knowledge and understanding clearer and it provided more consistency in the use of the broader categories.

The foci identified for use throughout the project, were as follows[3]:

- Recall
- Practical capability
- Interpretation
- Application
- Analysis
- Synthesis
- Evaluation

In summary, each component of knowledge, skills or understanding listed as a part of this project was described in the following format:

Component context	Detail	Focus of performance
e.g.		
Chemical reaction types	Acid-base (limited to neutralisation; indicators; salt formation; protonation; ionisation, buffers)	analysis

2. Identification of user representatives

To ensure that the data they provide was valid, 'users' were selected because they could speak confidently for their discipline or subject area from a firm base of current experience. Representatives were chosen who were employed in either a significant employment or academic domain which recruits from advanced level science students.

The criteria for selection of domains for the project were as follows:
1. They spanned the main areas of science;
2. They covered the main economic and employment domains - many students with advanced qualifications are recruited annually;
3. They are HE areas which produces large numbers of graduates to main employment areas;
4. It is possible to identify key personnel who are likely to be representative of their area of employment or HE.

Looking at numbers employed and the largest recruitment HE courses it was possible to produce a composite list of domains. This list contained a number of duplicated or overlapping areas and was rationalised into a smaller number of primary domains, each of which was subdivided into a further set of constituent

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[3] The accompanying guidance for each term is contained in the full project report Coles M, & Matthews A, 1996 'Fitness for Purpose - a means of comparing qualifications' SCAA and NCVQ London 1996

secondary domains. It was expected that groupings within a primary domain would have similar perspectives on recruitment needs. Moreover, it was expected that each primary domain would have distinct requirements. These domains were subject to consultation with both employer and higher education contacts and the following table provided the basis for identification of representatives who became involved in this project[4].

primary domains	secondary domains
Chemical production	pharmaceutical, bulk chemicals, biotechnology, chemical engineering
Engineering	mechanical, electrical, electronic, civil , transport
Public analysis	health and safety, quality control, environmental monitoring, forensic
Food production	agriculture, processing
Healthcare	medicine, occupations supportive to medicine, psychology
Materials extraction & processing	geology, oil refining, forestry

3. Piloting of framework and method

Initial piloting work was carried out with research scientists in each of the key scientific disciplines - Biology, Chemistry, and Physics. The pilot meetings were designed to find out whether the framework was viable. Each scientist was asked to describe their work, working closely with one of the project directors, using the framework to structure their description. The piloting confirmed that the framework appeared to function well as a way of ordering information. The pilot meetings had required close collaboration between the scientist and the project director. It appeared that quite detailed dialogue was needed to ensure that consistent information was given.

4. Meetings of user representatives

User representatives (n=46) were invited to one of a series of one-day meetings. Most participants were briefed by telephone in advance about the project aims and how they could contribute. Prior to meetings all representatives were sent briefing papers explaining the methodology and background to the project. Six meetings were held, each focusing on a different primary domain.

A number of expert consultants were briefed on the project methodology and the description framework. To help ensure consistency of interpretation of user needs the consultants acted as facilitators in the small group format which was adopted for the meetings.

Each user representative meeting had the same format: a brief introduction and description of the project from the project managers, information on the structure of the day, and a substantial time allowed for questions about the work. The rest of the day was spent in small groups (between 2-3) of user representatives, working with facilitators. Each small group was made up of representatives from both employment and HE, but separate notes were taken about the requirements of each.

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[4]a list of representative organisations is included in the full project report Coles M, & Matthews A, 1996 'Fitness for Purpose - a means of comparing qualifications' SCAA and NCVQ London 1996

5. Validation and prioritisation

The validation and prioritisation stage was included so that the users involved in identifying the components could check the information that was generated in the meeting and, in addition, assign weighting to them. Those involved in this stage were the original user groups plus a small number of additional representatives from each of the sectors (n=66). They were asked whether they would prefer to carry out their work collectively at a meeting or individually by post. All elected for postal consultation.

The data gathered from the user meetings was brought together for collation into a single list. Over 2000 separate components were identified. The information was then divided into a series of groupings.

- Biology
- Chemistry
- General skills
- Mathematics
- Physics
- Scientific method and techniques

All references to those who generated the components were removed and a series of forms created for each of the groupings which listed each of the components. Those involved in this stage were asked to identify the components they felt were required for the areas they represented. They were asked:

> *'what knowledge, skills and understanding would you like to see in students recruited to your company or your course with an advanced science qualification(A level sciences or Advanced science GNVQ)'*

For each component they identified, they were asked to indicated whether it was:

- essential and current;
- essential and covered;
- required and current; or
- required and covered.

Where 'essential' means that it is crucially important in their area, 'required' means they would like to see the component in qualifications, 'covered' means the student will have met the component at some time in their course and 'current' means that the knowledge and/or skill is something that the student should still be able to demonstrate.

Asking the respondents to prioritise, or code, the components that they chose was designed to have a two-fold effect. Firstly, it provided valuable information about the relative importance of components to claimers, and secondly, it encouraged a thoughtful response rather than mechanistic ticking. In addition, respondents were asked to identify any areas of knowledge, skills or understanding which they did not feel were covered by the component lists sent to them. No new components were generated in this way.

6. Selection of qualifications for analysis

Two meetings were held, one for all awarding bodies of GCE A levels and one for all awarding bodies of Advanced GNVQs. The meetings focused on selection of exemplar qualifications for the pilot. At the GCE meeting each awarding body was represented by an officer with responsibility for Science A levels. The project was described in some detail by the project directors and the awarding bodies were given the opportunity to raise and discuss the methodology for qualification scrutiny. The awarding bodies felt that, in general, syllabuses were fairly similar to each other, with major differences between optional and non-optional, and modular and linear syllabuses. Representatives recommended that three separate GCE syllabuses be selected in preference to the combined science A level, because the latter have low candidature. They also advised that the syllabuses selected should be linear and have as much non-optional content as possible. Four of the GCE awarding bodies had syllabuses which fitted this description and representatives advised that the one with the highest candidature be selected for the project.

At the GNVQ meeting each awarding body was represented by their officer with responsibility for Science GNVQs The project was described in some detail by the project directors and the awarding bodies given the opportunity to raise and discuss the methodology for qualification scrutiny. They recommended that the GNVQ selected for the project should be that with the highest candidature.

7. Scrutiny of selected qualifications

Following nomination by the awarding bodies of syllabuses for the project, a scrutiny group was convened. This was composed of representatives from the awarding bodies for the selected qualifications, together with representatives from the Royal Society of Chemistry, Institute of Biology, Institute of Physics, Chemical Industries Association, Association of British Pharmaceutical Industries, Schools Curriculum & Assessment Authority, and two external verifiers of GNVQ Science. Those representing the science professional bodies were familiar with both GNVQ and GCE structure and content.

The meeting focused on agreeing a series of issues as the basis for scrutiny of the qualifications, these were as follows:

1. students are prepared so that they can answer questions on the whole of the GCE syllabus - no sampling of the syllabus is required;
2. student's performance on the sections of the syllabus selected for a particular examination in written papers (GCE) is taken to be typical of their performance if other sections were chosen for another examination;
3. chief examiners for GCE syllabuses should identify the generalisable characteristics of student performance at grade E and grade A in the GCE;
4. external verifiers for the GNVQ should identify the generalisable characteristics of student performance at pass and distinction in the GNVQ;
5. it is possible to identify a set of skills which GCE students develop over the whole course, but which are not stated in the qualification (e.g. the ability to transfer knowledge);
6. external verifiers should draw on their experience of implementation of GNVQ in order to identify the knowledge which GNVQ students require in order to achieve the outcomes stated in the qualification;
7. external verifiers should draw on their experience of implementation of GNVQ in order to identify the depth of understanding which GNVQ students reach.

It was agreed that scrutiny of the GCE qualifications should be carried out by the Chief Examiner or a Principal Examiner for each subject, and validated by another Principal Examiner. The GNVQ scrutiny was to be carried out by a BTEC external examiner for the subject, and validated by a second external verifier. Initial work was carried out together with staff from the Science professional bodies. The scrutineers made a series of judgements at particular grades and levels. They considered the range and level of knowledge, skills and understanding demanded by the qualifications, and, using the definitions of focus of performance developed for the project presented their judgements in the same format as the data generated in the user meetings.

8. Development of qualitative coding frame
A coding frame was developed to describe the project. QSR NUD.IST[5] was used to help organise and interrogate the data. Unique codes were allocated to:
- focus of performance
- qualification references
- user participants
- prioritisation of component by each user

Codes referencing users describe:
- whether the individual is an employer or HE representative,
- the broad scientific discipline they are drawn from (biology, chemistry or physics)
- what sector of the scientific domain they represent.

The two large sets of data (from user and scrutiny stages) were presented in the common format described above. It was necessary to make a series of decisions so that appropriate matches could be made between the user-generated data and the scrutiny data to produce a set of common components. Where there was a mis-match at the level of aggregation, the larger component was split and only the matching portion would be coded to both the qualification and the user. Where the mis-match was at the level of focus of performance there was an automatic 'no match' decision made. Although this led to some findings which seem surprising - for example that certain basic components are marked as not present in the qualifications - it was felt important that this difference was shown since a finding that the qualifications contain material at too high a level is equally valid as a finding that content is either missing completely or is not at a sufficiently high level. The final data set, composed of components identified by users/claimers and components identified by scrutineers - both matching and specific - were then coded and entered onto the NUDIST database for analysis.

9. Interrogation of data
A series of analyses were then carried out to answer the research questions posed[6].

Evaluation of project

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[5]NUDIST - Non-numerical Unstructured Data Indexing Searching and Theorising. Supports processes of indexing, searching and theorising qualitative data

[6] The results are contained in the full project report Coles M, & Matthews A, 1996 'Fitness for Purpose - a means of comparing qualifications' SCAA and NCVQ London 1996

The fitness for purpose measure provides an independent judgment of the relative value of qualifications and components of qualifications, from the perspective of those who use them in recruitment. The results of the pilot study do indicate the alternative strengths of each qualification. This provides a constructive perspective of both of the qualifications. This can be contrasted with information drawn from direct comparisons of alternative qualifications which may mislead because the comparison is usually made in terms of one or other of the qualifications.

The methodology allows for judgements to be made about the fitness for purpose of single qualifications. It is not essential for a comparison between qualifications to be made. This means that analyses can be carried out of different qualifications at different times.

Poor progression from one qualification to another is a serious problem. The fitness for purpose methodology can be applied 'vertically'. Judgements can be made about how well a qualification builds on those at lower levels and prepares for those at higher levels.

Critique of methodology

Feature of method	Success	Changes in future
Framework (component)	Quite useful organiser - broad structuring	None
Framework (detail)	Level of detail varied too much between groups	• Need to be more consistent about the type and level of detail required, clearer guidance to be provided. Inclusion of examples would be useful. • Detail intended to limit as well as amplify content. • No definitive answer on amount of detail possible, limited trialling should be carried out in each new domain.
Framework (focus)	Moderate success - some variation in interpretation.	More time would have led to more secure judgements - descriptors need to be more fully conceptualised by users, those scrutinising the qualifications
Mapping user area - employer	Successful	None necessary - should always be rigorous
Mapping user area - HE	Successful	None necessary - should always be rigorous
Domains	Successful - six domains seemed to allow sufficient differentiation	Dependent on subject area. Domains may be more or less diverse.
Piloting/validation of framework	Limited in pilot study. Validation that did take place was very useful in informing subsequent work	Vital stage to be included in all future work. Each domain should have some pilot work.
User meetings	All effective. All users involved equally, ample evidence generated	• Prompt sheets should not be seen by users • Time should be given between initial briefing and meeting for users to gather information • 3-4 hours sufficient • Small groups (4) of users per expert facilitator • Mixed groups of employers/he required • Evidence should be collected and validated during meeting
Time scale	Sufficient project time	Longer lead-in required. Project relies on co-operation with industry and he goodwill must be maintained - time scale pressures are unhelpful.
Claiming round	Generally effective, postal system probably introduced some variation in interpretation. Some indication that claimers tended to tick unreflectively, despite use of prioritising system (e.g. essential, required)	• Claiming grid effective • Guidance on completion needs some refining to make prioritising system clearer • More people likely to contribute if time scale reasonable.

Scrutiny - process	Confused at times because methodology under development	• All participants to be identified in advance • Participants must always include chief & principal examiners, and senior external verifiers • Training sessions required • Validation of judgements vital
Selection of qualifications	Unproblematic	Size of candidate entry key factor
Costs	£40,000 allocated - £5,000 spent - no officer costs incurred in this pilot, no users or claimers paid	Future projects would be unable to rely on unlimited goodwill. Users were happy to contribute to the Dearing review, this would not be an on-going factor.
Who should carry out?	Project directors referred to project as 'Dearing owned', all meetings held at Royal Society, correspondence used Royal Society stationery - to stress independence of project	• Essential for manager to be independent of qualifications. Participants will only cooperate if they feel they are making a difference. • Joint NCVQ/SCAA operation would be effective, as would an independent commission from say, a university