

Policy and New Products

# Research Report 10



## **Use of Taxonomies in Assessing Higher-Order Skills**

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# 1 Background

This report was commissioned by SQA and written by Anne Galloway in 2008.

SQA has identified a need for guidance on assessing higher-order skills in its qualifications. This requirement arises out of debates within SQA, generated by Assessment is for Learning and A Curriculum for Excellence, around the question of whether using some sort of taxonomy in SQA-produced assessments would support deep learning and skills development.

Taxonomies have been used as a framework to categorise learning objectives — for instance according to the sort of cognitive process someone aims to learn to apply. The same framework can be used to describe the content of an assessment, and monitor how it covers the same cognitive processes and objects as the learning objectives (or outcomes). This is especially relevant for outcomes that are difficult to assess, in particular ‘higher’ cognitive processes such as analysis, evaluation, skills for life, work, and learning, or ‘deep learning’<sup>1</sup>. In practice, this leads to the use of a table or ‘grid’, in which each cell represents a combination of cognitive behaviour and content to be assessed. Numbers in the cells indicate the importance of these combinations, and the number of questions assessing them.

## The project

SQA commissioned a short project to review issues around the assessment of higher-order skills and to build on the existing literature to develop a consistent approach to the assessment of higher-order skills. The aims of the project were to:

- ◆ identify possible types of taxonomy, including SCQF, for use by SQA
- ◆ review these taxonomies, considering their strengths, limitations and types of skills covered
- ◆ identify the implications for specifying:
  - skills and assessment types in arrangements
  - the content and presentation of assessments

## Methodology

The methodology for the project was a desk review of:

- ◆ the websites of SQA, A Curriculum for Excellence, Learning and Teaching Scotland (LTS), Assessment is for Learning, the Scottish Further Education Unit, HMIE, the Quality Assurance Agency for Higher Education and various further education colleges and higher education institutions
- ◆ literature on taxonomies, frameworks and assessment — specifically the assessment of higher-order skills

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<sup>1</sup> See Entwistle 2000

SQA's (and its predecessor bodies') approaches to defining and assessing outcomes were taken into account in the course of the project. The current approaches were mostly found in *Conditions and Arrangements*, SQA Academy, instructions to setters and vetters, and various exemplar and guidance materials on the SQA website. Information about the practices of predecessor bodies was drawn from the consultant's own knowledge and experience.

Because of the short duration of the project, this is not in any way an exhaustive review. It does, however, aim to identify some of the issues that might need to be taken into account in considering the assessment of higher-order skills and in developing guidance material on such assessment.

## **2 Deep learning and the development of higher-order skills**

### **Basis of the investigation**

SQA does not currently use a formal taxonomy, although one of SQA's predecessor bodies — SCOTEC — did so. Its use died out in the early days of SCOTVEC, when qualifications with syllabuses and examinations based on Bloom's taxonomy were superseded by National Certificate Modules (1985) and the revised HN provision (1989).

As an examining body, SQA does not use any formal taxonomy as the basis for its qualifications. There may be concerns that:

- ◆ assessment for SQA courses (even internal assessment) is directed more to passing the assessment rather than developing learning — in effect the assessment aids surface learning but frustrates deep learning
- ◆ higher-order skills are not always assessed to the right level — which might mean that assessors are assessing what is easy for them to assess rather than what they ought to assess

The project therefore reviewed materials and resources on a range of websites for SQA's school and further education (FE) sectors to identify how these were helping to support the development of approaches to deep learning and the assessment of higher-order skills. For comparison purposes, and because the assessment of higher-order skills is a significant matter in higher education (HE), some support websites for higher education institutions (HEIs) were also considered.

### **What the websites revealed**

#### **School-based qualifications**

The websites for A Curriculum for Excellence, Assessment is for Learning, and LTS, abound with support materials, toolkits, papers, reports, case studies, and discussion documents about teaching techniques, assessment, and ways to engage

young people more fully in learning so as to improve the quality of their learning. The material is directed both at 5–14 testing and National Qualifications assessment.

There was not enough time in the project to undertake a wide review of the detail and coverage of the materials provided on the websites but sampling these showed that A Curriculum for Excellence and Assessment is for Learning are generating discussion amongst teachers around assessment, and how and why it might need to be approached differently in order to encourage deep learning. Teachers involved in the initiatives are clearly contributing to the websites and writing up reports of their own experiences for others. In the sample reviewed, the tone was entirely positive. This is, of course, to be expected since the whole point of putting the material there is to encourage others.

The National Qualifications section of SQA's website provides plenty of information on its school-based courses. However, many of the documents there relate more to administrative and procedural matters and there is less immediately accessible information on assessment and how to foster learning. Making direct links to the *Guide to Assessment* and SQA Academy might help school teachers to find more information on assessment.

### **FE-based qualifications**

The SFEU website advertises continuing professional development courses on assessment issues but provides no detailed information on the content.

The SFEU's Research Online section provides staff in colleges with information and access to research papers, reports and position papers and 'disseminates research and good practice in research across the college sector'. It is possible that this website holds more information on learning and strategies to support assessment that might help those in colleges who are offering National Qualifications. As this is a closed website, however, this cannot currently be confirmed.

A brief random sample of individual college websites failed to find any specific discussion on assessment approaches to deep learning.

SQA's website provides considerable information about the development of HN Courses but only limited information on assessment and the need to foster deep learning.

### **HE qualifications**

Much of the discussion on HE websites is around how to encourage students to engage in deep learning and how to discourage them from learning simply to pass examinations — something to which according to Biggs in *Aligning Teaching for Constructing Learning*, learners in HE are prone.<sup>2</sup> The distinction between deep learning and surface learning is widely dealt with and there is recognition that:

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<sup>2</sup> It is not just HE learners who will have this tendency, of course.

- ◆ surface learning, ie learning facts to pass examinations and performing low level activities, is not what HE is intended for
- ◆ deep learning is what will make successful learners who will be able to take their learning and apply it to different circumstances in life and work
- ◆ basic knowledge of facts or data is a pre-requisite for deep learning, but it is what the learner does with the basic knowledge, in applying it in high level tasks and analysing the results, that supports and brings about deep learning

The debate relates to using active words to describe what learners need to do and know, making the learning relevant, using assessments that demand more of the learner in terms of participation and involvement, and devising assessments that align with the outcomes and the objectives of the course.

### **Use of outcomes**

Many of the HE websites lay considerable stress on the need to express course content in terms of learning outcomes. That there is this emphasis on (and argument in favour of) outcome-based learning is, perhaps, an indication that the idea is still relatively novel in some quarters of HE.

The emphasis on using outcomes in HE is interesting as many of the HE websites then go on to link the use of outcomes directly to making sure that assessment actually assesses what the outcomes express. So if outcomes specify deep learning, there will be a better chance that this is taught and assessed. Deep learning involves the critical analysis of new ideas, linking them to already-known concepts and principles and to personal experiences. This leads to understanding and long-term retention of concepts so that they can be used for problem solving in unfamiliar contexts. Deep learning promotes understanding and application for life.

One of the main reasons for using a taxonomy is so that outcomes can more clearly specify the expected results of deep learning and facilitate relevant assessment. It is worth noting here that outcome-based learning is already routine in SQA and passes unremarked in schools, FE colleges and training providers. Indeed, outcomes and objectives have been around in SQA and some of its predecessor bodies in one form or another for over 30 years. For instance:

- ◆ SCOTEC/SCOTVEC Certificates, Diplomas, Higher Certificates and Higher Diplomas were written in behavioural objectives, using Bloom's taxonomy, from 1976.
- ◆ NC Modules were written in Learning Outcomes from 1985.
- ◆ SVQs were developed in Outcome format from 1988.
- ◆ SCOTVEC Higher National Certificates and Higher National Diplomas began to be written in Outcome format from 1989 — and continue to be so.
- ◆ National Qualifications are expressed in terms of Outcomes and Performance Criteria.
- ◆ Standard Grade courses use Grade Related Criteria.

## **Clarity about the purpose of assessment**

The websites reviewed show, to differing degrees, that teachers in schools and HE are being encouraged to use diversity in their assessments to encourage deep learning.<sup>3</sup> This was not apparent from the FE websites.

There is a recognition that learners are not always keen to embrace deep learning and prefer, on occasions, to keep to the kind of learning which they feel, on the basis of previous experience, will help them to pass examinations. This type of learning is likely to involve memorising facts and information to regurgitate in relatively familiar examinations.

This could indicate at the micro level that there is a lack of clarity, in terms of goals, between assessor and candidate. At an institutional level, this lack of clarity might also be an indicator of a mismatch between theory and practice as far as deep learning and its assessment are concerned.

This is a risk that SQA might be running in examinations for National Courses (and Higher National Qualifications too). SQA has a lengthy and honourable track record of defining learning in clear and active terms, and of adopting innovative and diverse approaches to assessment. It should be well placed to advise its centres on deep learning and to help them to develop an approach to assessment that is more conducive to deep learning.

However, in providing exemplars, past papers and sample solutions on its website, SQA might be giving mixed signals. On the one hand this might be seen as SQA demonstrating openness about its assessment process and helping teachers to identify what might be expected of learners. On the other hand, SQA might be seen to be encouraging assessment that is designed to foster surface learning by encouraging learners to practise for examinations and to develop formulaic responses. Whilst it is accepted that this is not SQA's intention in putting such support material on the website, it might be an unintended, and possibly limiting, consequence as far as deep learning is concerned.

## **Who uses the support websites?**

It is possible that websites designed to support deep learning and to foster innovative methods of assessment are largely used by those who are already interested and actively involved as 'pathfinders' in initiatives such as A Curriculum for Excellence and Assessment is for Learning in schools, or Innovation in Assessment in HEIs.

These users might even contribute positive exemplars and case studies of their own work. However, other assessors might simply avoid the information provided there and not see the relevance of any programmes aimed at reducing reliance on surface learning. Indeed, the requirement to adopt new approaches to internal assessment might be perceived as a threat both to the learners' hitherto successful performances and to the teachers' own skills and abilities in imparting learning.

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<sup>3</sup> The HE websites further reveal that the increase in learner numbers in HE has also been a driver in developing different ways of assessing learners. Who after all wants to mark 400 essays?



As a consequence, support materials that such teachers and assessors might actually find enlightening and useful would not be accessed.

Guidance material from SQA might be required to ensure that the core messages about assessment which supports learning are given to all teachers – not just those who read and contribute to websites. In other words, the message needs to reach the doubters as well as the willing innovators.

### 3 Taxonomies

The defining characteristic of taxonomies is not only that they categorise, but that their categories are ordered. In the case of Bloom's taxonomy for instance, this meant that, in the sequence of cognitive categories 'remember', 'understand', 'apply', 'analyse', 'evaluate', 'create', each category *includes* the previous one. So *applying* requires *understanding*, and because *understanding* requires *remembering*, *applying* also requires *remembering*.

The use of taxonomies sometimes tends to focus on levels of demand and complexity associated with the different categories, and on the ability and/or skill needed rather than on an analysis of the task and the type of cognitive operations and knowledge which can be used to complete the task.

This project covered the following taxonomies:

- ◆ Bloom
- ◆ Anderson and Krathwohl (Bloom revised)
- ◆ Structure of the Observed Learning Outcome (SOLO)
- ◆ Scottish Credit and Qualifications Framework
- ◆ Framework of Achievement

## 4 Reasons for using a taxonomy

Anderson and Krathwohl give these six reasons for categorising objectives in a taxonomy:

- ◆ it permits educators to examine objectives from the student's point of view
- ◆ it helps educators consider the panorama of possibilities in education — teaching for higher-order objectives and learning how to learn
- ◆ it helps educators see the integral relationship between knowledge and cognitive processes inherent in objectives
- ◆ it makes life easier — examiners can easily identify the 'demand' of a question by knowing the framework, so guesswork is removed
- ◆ it makes more readily apparent the consistency, or lack of it, among the stated objectives for a unit, the way it was taught, and how learning was assessed
- ◆ it helps educators make better sense of the wide variety of terms that are used in education — the precision in the taxonomy improves communication and understanding of what is to be taught and assessed <sup>4</sup>

A general review of various websites and documents on taxonomies in relation to HE showed that users think that taxonomies can be used to:

- ◆ define the syllabus or course for teachers so that they know what needs to be taught and to what extent
- ◆ give clear objectives to learners for their course of learning
- ◆ ensure that learners are not set over-simplistic or over-complicated assessment tasks for their course of learning
- ◆ facilitate assessment of learning
- ◆ facilitate the grading of learners

In summary, websites and publications agree that the purpose or intention of any taxonomy is to provide a common understanding, on the part of the users, of what to teach and learners what to learn (often by using specific verbs, such as 'identify', or 'analyse'). This greater clarity about what students must be able to know and do is intended to:

- ◆ ensure that learners learn – and not just to pass examinations
- ◆ improve the efficiency and effectiveness of the assessment or examining process by making sure that the assessment is directly related to the purpose of learning

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<sup>4</sup> Drawn from A Taxonomy for Learning, Teaching and Assessing

## 5 Taxonomies considered

### Bloom

Bloom's taxonomy divides learning into three domains — cognitive, affective (attitudes and behaviour) and psychomotor. The cognitive domain is given six levels — Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. The affective and psychomotor domains were less well defined and, perhaps as a consequence, were less used.

What the learner has to do is defined in active terms in an overarching learning outcome. More detailed active verbs are then used to define the learning outcome further. The outcomes and the underpinning verbs should provide a strong basis on which to found the assessment activity.

### Anderson and Krathwohl

Bloom's taxonomy, as developed by Anderson and Krathwohl, extends the taxonomy into two dimensions. These are:

- ◆ the cognitive process dimension (based on Bloom, but with some changes — for example the positional change of evaluation) Remember, Understand, Apply, Analyse, Evaluate, and Create
- ◆ the knowledge dimension — with four categories of knowledge: Factual, Conceptual, Procedural, and Metacognitive

The level is defined both in terms of the cognitive process and in the depth of knowledge. The learning as it is defined determines the assessment. Different types of learning require different assessments, and similar types of learning require similar assessments.

### Structure of the Observed Learning Outcome (SOLO)

The SOLO taxonomy developed by John Biggs is predicated on a system of *constructive alignment*, in which teachers define the outcomes of teaching in terms of content and the level of understanding. Teachers need to give learners the opportunity to undertake activities which will allow them to achieve the outcomes. The assessment by which the teacher decides that the learner has achieved the outcome has to be aligned to the learning and must provide information on how well individual students have achieved the outcomes.

The SOLO taxonomy has five levels, with the first three being mainly quantitative and the last two being qualitative:

- ◆ Pre-structural — the learner misses the point, which means that the learning has failed.
- ◆ Uni-structural — learners make simple and obvious connections and can cope with basic facts, but they show little evidence that they understand the significance of these facts.
- ◆ Multi-structural — learners know about a number of topics and can make some connections between them but miss the significance for the whole.
- ◆ Relational — learners know and appreciate the significance of the parts in relation to the whole.
- ◆ Extended abstract — learners make connections both within and beyond what they have been taught and are able to apply principles and ideas to new situations and novel concepts.

As with Anderson and Krathwohl, Biggs suggests that appropriate verbs be used to indicate the level of demand for outcomes of learning and he gives suggestions of generic high and low level verbs. However, he also says that each discipline can develop its own appropriate verbs to apply in its own situation.

A notable aspect of SOLO is that the levels are defined by describing activities learners cannot do yet as well as those they can do. This might sit at odds with the 'I can' statement in A Curriculum for Excellence and the general positive tone of SQA's outcome-based approach.

## **The Scottish Credit and Qualifications Framework (SCQF)**

Though it is not called a taxonomy, the SCQF has many of the aspects of a taxonomy — that is, it has a series of levels and uses a set of precise statements to define them.

In the SCQF, the level of a qualification and the number of credit points awarded for it are used as measures by which learners, employers and teachers can compare qualifications.

There are 12 level descriptors increasing in complexity from very basic learning at level 1 to doctoral learning at level 12. Programmes and courses of learning are allocated to levels in the SCQF, by means of level descriptors, and are given credit points (though the credit points would have no bearing were the SCQF to be used as a taxonomy). The level of the qualification and the demand that it makes on the learners would be what was important.

The verbs that are used to define the descriptors for the 12 levels are likely to be broadly similar to those used by Biggs, Bloom and Anderson and Krathwohl. This is hardly surprising since the level descriptors were developed against benchmarked learning such as HNC or HNDs, Highers and Degrees — many of which Courses are written in Outcome forms using active verbs. The 12 levels relate directly to learning in Scotland and to the verbs chosen by successive developers over the years. It should be noted that the level descriptors are shortly to be reviewed.

Some further work would probably have to be undertaken before the SCQF could be used as a taxonomy. For example it would be necessary to make sure that the dual purpose of the SCQF (both progression and taxonomic) was understood by the users.

## Curriculum for Excellence achievement framework

The achievement framework in A Curriculum for Excellence is intended support the learning and development of children and young people from three to eighteen. It has six levels (Early, First, Second, Third, Fourth and Senior). Experiences and outcomes, showing what learners can do at these levels, are being drafted across the curriculum areas. The Fourth level is noted on the website as ‘broadly equating’ to SCQF level 4.

*A Curriculum for Excellence: Progress and Proposals*, stresses the relationship between these curriculum levels and the SCQF. It notes, however, that while the two need ‘to be linked, to enable young people to progress smoothly ... they are not equivalent ... [since] SCQF levels relate to qualifications and not to expectations for the curriculum and associated assessment pre-14.’

While it is extremely unlikely that the achievement framework could serve as a taxonomy, it is noted here for completeness and because it relates to school qualifications.

## 6 Advantages and limitations of taxonomies

While the philosophical benefits for using a taxonomy are clear and easily and briefly stated, the same cannot be said for the possible limitations. These relate to operational and practical matters where, of course, the devil is in the detail.

### Advantages

An advantage of the use of taxonomies is that it provides a means to describe and compare outcomes and assessments. The following grid is an example of this.

	Remember	Understand	Apply	Analyse	Evaluate	Create
Outcomes	Facts	Concepts formulas	Procedure	Structure, example	Conclusions	Plan
Assessment	10%	30%	40%	15%	5%	

### Clarity

Whatever taxonomy is selected by users, it appears that the principal benefit remains the same — that is, there is an expectation that using the taxonomy will lead to a shared clarity about what learners need to learn and how that learning is to be assessed. This should lead to less uncertainty about the assessment since the

parameters of any activity are defined in the outcome and the teaching and the assessment are aligned to these.

### **High-level learning**

Using a taxonomy can provide the opportunity to ensure that activities and aspects of learning that are meant to be addressed at a higher level are indeed written in that way. Those developing the syllabus define the level of the learning using the taxonomy. If high-level concepts need to be covered, high-level verbs are used to show the complexity of the issue. Assessors then use words of similar demand when developing assessments. This will help to ensure that the assessment mirrors the learning and that the demand of the assessment is appropriate.

### **Systematic approach**

Using a taxonomy can give setters and vetters the proper opportunity to consider a question paper and approach the demand of the assessment in a systematic way. The taxonomy guides the setters and vetters in selecting assessment tasks that are appropriate to the learning.

### **Confidence in assessment**

Clarity in the units and outcomes helps to generate a feeling of confidence in the assessment since there is less doubt as to the meaning of the unit. Teachers can be sure that they are teaching what the learner needs to learn — to the right level — and can have greater confidence that the assessment will align with their teaching. Learners can see what is expected of them and so have a clear idea of the standards of assessment that they must attain. Assessors will be able to select assessments that reflect the proper demand of the outcomes so as to make sure that the assessment supports the learning. Others, such as employers are able to see that the assessment aligns with the learning and that learners are able to perform to the level defined in the outcomes.

## **Limitations**

### **Complexity**

Getting to the point of developing learning programmes using any of the taxonomies will take time and will need to be approached systematically. Even so, the exponents of Anderson and Krathwohl and SOLO do, on occasion, make the process of using the taxonomy sound complex and there is a danger that developing a unit or programme of learning could become an end in itself. Anderson and Krathwohl recognise this when they report a teacher as saying:

‘I can imagine teachers fretting over whether they placed their objectives, activities, and assessments in the proper cell ... instead of thoughtfully examining their implicit and explicit objectives, planned activities and assessments. Becoming aware of whether their planned activities are aligned with their intended (stated or intuited) objectives and how they might adjust those activities is the important activity, not whether they have each component instructional part in the proper cell ... I would want teachers to have thoughtful, productive

discussion throughout the analysis, rather than arguments about the proper placement of the items in the table.’<sup>5</sup>

If a taxonomy is too complex it could ultimately defeat the purpose of using it.

### **Applying the taxonomies across all learning**

SOLO and Bloom have five and six levels respectively that would need to be applied to SQA school qualifications ranging from Standard Grade to Advanced Higher.

The literature on SOLO reports that the system is applicable to learners of different ages across a range of different subjects. The five SOLO levels would be applied across SQA school qualifications **within** each SCQF level, that is from SCQF level 3 to SCQF level 7 (Standard Grade to Advanced Higher) or, indeed, virtually the full range of the framework if **all** of SQA’s qualifications were to be rendered in taxonomic terms.

In this way, taxonomy levels would be used to describe an expected qualitative profile of behaviour, with the higher cognitive levels (as a result of deeper learning) in some areas and lower levels in others.

### **High-level learning**

It does not always follow that using words associated with high categories in taxonomies results in a concomitantly high level of difficulty or achievement. Taxonomies do not correspond to developmental stages (although they may be based on developmental progression). Everyday tasks, such as crossing the street, which require evaluation and even creativity (often in a very short time), are accomplished at a relatively early stage, while extensive knowledge may take years longer to develop. Nor do taxonomies correlate with difficulty or grades. Although, in general, higher categories refer to more complex tasks than lower categories, there still is a range from easy to difficult analysis questions, just as there is a range from easy to difficult knowledge questions. This means that using a taxonomy in its own does not guarantee a constant level of difficulty.

For example, in SCOTEC the syllabus (which was written using Bloom’s taxonomy) along with the associated table of specifications, informed the examiner and reviser for an examination paper of the proportions of the syllabus given to the six levels of the taxonomy. Examiners were required to make up their examination papers so that they reflected this table, and the revisers would check that this was the case.

It was expected that the use of high-level words in the outcomes would be reflected in the setting of high-level assessment tasks. The taxonomy made sure that the examination paper would not be **over-demanding** — examiners could not ask questions that went higher than the words used in the syllabus. However, they could still ask questions that undershot the level of demand of the syllabus eg by

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<sup>5</sup> Anderson, L.W. and Krathwohl, D.R. and others, A Taxonomy for Learning, Teaching and Assessing

asking easier analysis questions. There might be good reasons for doing so, such as, for example, to:

- ◆ vary the question type and approach (avoids question-spotting)
- ◆ broaden the question into the lower level areas to get a greater breadth of syllabus cover

The level of demand of an assessment might drop for other reasons as well — for example it might be easier to assess at a lower level, or assessors might ask very similar high level questions to those in previous years and learners might practise these to such an extent that they became routine application (or even identification).

### **Workload**

It is clear from the review of websites and support literature that those who do use taxonomies use them for both defining the course content, programmes of learning or outcomes of learning, **and** prescribing what the assessment should be. Introducing a taxonomy only at the point of assessment seems not to have been contemplated.

It seems unlikely, therefore, that a taxonomy could be imported into an assessment system when it had not been used to define the course content in the first place. Even if this were to be done, there would be likely to be difficulties with the assessment. The examiners can only assess to the level already defined by the standards. Defining assessments in terms of taxonomy for outcomes that do not specify the level required may lead to lowering or raising the level of demand, and in a mismatch between the new assessment and the existing course content.

It seems likely, therefore, that assessment using a taxonomy would need to be predicated on a taxonomy having been used to develop the course of learning. Even so, introducing predominantly higher level outcomes in course content which had previously been defined implicitly in lower levels might result in a mismatch between the level of the course and qualification and the level of achievement among its learners.

However, to institute a whole new process of developing all (or just some) of SQA's provision in terms of a taxonomy would be a massive task and one for which there would probably be little appetite in SQA.

## **7 Evidence of taxonomies in use**

It is not clear from the review of websites of the different organisations that provide support to schools, FE colleges and HEIs how many organisations and institutions are actually using a formal taxonomic approach for their courses and programmes. (SQA does not use any taxonomy, which excludes from consideration here a large number of courses and programmes offered in schools and colleges of FE.)



The websites do provide some evidence that taxonomies and their use have been (and are) under discussion. Most of that evidence is in HE, and it is not clear at all how much use is being made of taxonomies in non-SQA provision in schools or FE.

## **A Curriculum for Excellence**

The websites for A Curriculum for Excellence and LTS were searched for information on how the 'I can' statements for the draft experiences and outcomes were derived. There is similarity in expression between these statements and the format of the SCQF level descriptors, but no information was found to describe the way the statements were developed.

The LTS glossary provides a definition for Bloom's taxonomy, part of which states:

'Based on the premise that cognitive learning occurs on six levels, with comprehension and application at the lower end of the scale, and analysis, synthesis and evaluation at the higher end, specific behaviours were identified and used for writing instructional objectives. These can be used by teachers to structure effective questioning techniques.'<sup>6</sup>

It is not clear whether the last sentence in this definition means that LTS is advising teachers that they can use the taxonomy when assessing their students, or simply noting that this is a use for the taxonomy in general.

This definition, along with the reference to Bloom by Alcorn (cited earlier in this report), appears to be the only direct references to Bloom or any taxonomy in material on the LTS website. If those developing the draft experiences and outcomes are using a taxonomy, it is assumed that they would have been given additional guidance on doing so.

## **HE qualifications**

A large number of the websites of individual HEIs, as well as organisations that support the delivery of learning in HEIs, refer to taxonomies. A number of such websites note that SOLO can be helpful in differentiating between different classes of degrees. It is assumed that some institutions might be using it, but the extent of the usage is unclear.

The Higher Education Academy's (HEA) enhancement theme for 2004 was *assessment* and for 2005 was *flexible delivery*. Many of the reports of enhancement theme workshop activities on the HEA website make reference to Bloom, Biggs and SCQF in relation to enhancing assessment, encouraging deep learning and improving teaching practice.

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<sup>6</sup> Quoted from the LTS Glossary

## 8 How SQA defines standards of assessment in the absence of a taxonomy

### Units expressed in outcomes

While SQA uses no specific taxonomy to describe the learning that learners need to acquire, it does use outcomes to define what learners need to know and do. For example, the *HN Toolkit* on SQA's website shows that SQA gives guidance to its HN Unit writers on making Unit Outcomes clear and understandable. This guidance shows that there is a high degree of formality in defining SQA Units. Links to SCQF in the guidance also help to ensure that the principle of a hierarchy is built in.

There seemed to be no similar guidance for National Qualifications. However, as these are developed centrally by SQA, it is assumed that the guidance exists but that it is not in the public domain.

However, increasing reference to the SCQF in defining and developing Scottish qualifications might mean that the SCQF could be used as a taxonomy. The SCQF is being used not only to allocate existing units and programmes of learning to the framework, but also to support the design of new units. In effect, level is being designed into units at the very start of their development. And to do this, developers are having to use specific words or phrases to define the demand of the units they write.

It is worth noting here that Glasgow Caledonian University advises lecturers to refer to the SCQF levels in relation to programmes that are being taught and to ask themselves how well 'the learning, teaching and assessment activities practised in your modules(s) prepare students to achieve these levels.'<sup>7</sup>

This shows one way in which the SCQF level of demand is being used to test the level of demand of an ultimate assessment. This is an interesting idea, and something that might be used in guidance on assessing any unit. Those developing qualifications for SQA are already required to consider the SCQF level of demand at the stage of designing a Unit.

Teachers of SQA qualifications at whatever level could use the SCQF to identify the demand of a Unit and its Outcomes to ensure that they were assessing to the right level. Getting assessors to ask themselves, 'What does the SCQF level for my Unit require of learners, and is my assessment for that Unit reaching that level?' might be useful and instructive.

### Guidance material

SQA provides guidance material on assessment, including its *Guide to Assessment*. The guide is designed to cover all of SQA's qualification types and is aimed at those who are responsible for developing assessments in schools, colleges and training providers. It reviews a wide range of assessment

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<sup>7</sup> ZEST! Essentials: Principles of Module Design, Glasgow Caledonian University, 2006

instruments, looking at their strengths and limitations, and provides advice on the whole assessment process — including the selection of appropriate assessment instruments. As it is a web-based document it will be possible to develop additional sections as needed.

## **Assessment support material — formative**

### **Specimen question papers**

In addition to Units expressed in Outcome form and Arrangements documents, SQA provides specimen question papers, question papers from previous years, and worked solutions and marking schemes to help teachers and learners to identify the level of demand in assessments for National Courses. However, relying on these could result in the assessment being predicated on the papers and solutions of previous years and not on the Outcomes of the relevant Units. This could mean that:

- ◆ there is no opportunity to consider each year whether the level of the assessment reflects the level of demand of the Unit
- ◆ there is a degree of drift, gradually and year by year, so that the standard of the assessment is actually different from the standard of the Unit

It is possible to guard against both of these eventualities, and SQA goes to some lengths to do so with its moderation activities for question papers. It is not clear whether such rigorous systems would be in place for internal assessments.

Even if there is no drift from the standard from year to year, it might still be necessary to ask if the standard that was first set with the first exemplar is still the right standard in the light of experience — to ask in effect, does it reflect the right level of demand as defined in the outcomes?

There are other pitfalls to avoid. For instance, in providing question papers and solutions, SQA might inadvertently encourage a situation in which the learners start to learn to pass the examination rather than to learn for the subject. Assessment that becomes set and predictable does not assess what it is supposed to assess — it fails to align with the learning, and the learning outcomes.

If the alignment is not good and the assessment that is provided for a particular outcome is focused more on what is easy to assess than on what the outcomes themselves require (Lines and Mason, 2005) then we risk the learner under-achieving and missing the point of the learning in the first place. This would certainly be counter-productive to deep learning.

SQA is not alone in publishing past examination papers and specimen answers — many other examining bodies do the same. It is not unreasonable to give students an idea of the kind of assessment that they might expect. However, it has to be accepted that publishing exemplar material and specimen answers might have an unintended consequence. It can tie examiners and assessors into keeping more rigidly to the format and make-up of previous papers. In this way the structure of individual questions can become set and unchangeable. This would make it

difficult for assessors and examiners to respond to the requirement to encourage deeper learning since a variation from what had become the norm could unsettle candidates and give rise to appeals and complaints.

It remains to be seen whether developing units and courses using a taxonomy would reduce the requirement for such exemplar material. It is suspected that it would not.

## **Assessment support material — summative**

### **NABs**

Teachers have freedom to develop their own assessments in National Courses, but SQA also provides NABs, which many teachers use in preference to developing their own assessments.

There is evidence that teachers are reluctant to depart from using NABs. It might be possible that, in supplying NABs, SQA has developed so good a resource that internal assessors are unwilling to venture too far away from it.

This might be a cause for concern, since regular and continued use of the NABs might lead to learners simply being taught to pass what has become a well-known and familiar form of assessment. While NABs are refreshed from time to time, this must be a drain on resources. It is also likely that the demand for new NABs would exceed SQA's ability to supply them.

### **Guidance to setters and vetters**

The generic guidance note on setting question papers, developed for SQA's Principal Assessors gives advice, amongst other things, on checking the demand of questions and includes the following information.

'When setting a question paper you must ensure that:

- ◆ The question paper relates to the course assessment specification as set out in the Arrangements document.
- ◆ You have included questions/tasks which will generate the evidence of attainment, required to measure against the Course Grade Descriptions. All Outcomes from the component Units must be covered and, where appropriate, there must be opportunities for assessing integration of important skills and knowledge/understanding.
- ◆ The weight given to a particular part of the syllabus in the question paper reflects its relative importance in the syllabus.
- ◆ The sampling of the syllabus is systematic but unpredictable (to avoid question 'spotting'). In particular, you must avoid repeating themes and resource material.
- ◆ The level of difficulty of the individual questions is appropriate. The *mark* available for each question must match the demands of the task and the test specification. In addition, the level of *difficulty of the overall paper must be appropriate.*

A broadly similar version of this checklist also appears in the SQA note *Modern Languages: Principles of Setting and Vetting*. It is assumed therefore that all Principal Assessors, setters and vetters of National Course question papers will at the very least be given these or similar instructions.

Some might be supplied with much more detailed support information.

There was insufficient time in the course of the commission to call for and review all the different sets of instructions for setters, vetters and others involved in the development of question papers.

It is suggested that, in the light of A Curriculum for Excellence, issues around deep learning and how assessment can support this might need to be directly discussed in such documents in future.

## **9 Conclusions**

### **Assessment that supports learning**

There is evidence from school and HE websites that teachers are seeking to develop innovative approaches to assessment to ensure that it both supports learning and assesses the skills that need to be assessed. It is possible that initiatives such as A Curriculum for Excellence and quality enhancement foster such approaches. However, this could mean that those who are writing about and discussing assessment issues on websites are those who are engaged in such initiatives, while the mainstream of teachers in Scotland have yet to get involved. SQA Academy and the revised edition of the *Guide to Assessment* could help to support teachers to develop new and innovative approaches to assessment. It might, though, still be necessary to develop new material for SQA Academy and an additional chapter or sections for the guide to cover specific points.

### **Use of taxonomies**

Using a taxonomy encourages the precise use of specific words to describe learning activities. This can make it easier for assessors to develop assessments that reflect the level of demand of the outcomes and align with the learning and teaching. However, it is doubtful that assessments could be developed using a taxonomy if the units and courses had not first been written in taxonomic format. Therefore, there would be significant cost issues inherent in deciding to develop SQA's qualifications, or even only one qualification type, using any of the formal taxonomies.

There are benefits that can accrue from using a taxonomy. Clarity and a shared understanding are the most significant of these.

There are also a number of limitations, with complexity of expression and the need for considerable change to the format and detail of units being the most

significant. These would need to be borne in mind should SQA decide to adopt a formal taxonomy for some or all of its qualification types.

It appears that at least two of the taxonomies discussed in this paper (Bloom and SOLO) are in use in Scotland to some degree or another, particularly in the HE sector. There is also some evidence that a taxonomy might be informing the development of the draft experiences and outcomes in A Curriculum for Excellence. However, in a desk exercise it is not possible to confirm how much use is being made of taxonomies in reality.

## **Need for a taxonomy?**

SQA seeks, and receives, comment and feedback from its stakeholders on its products and services from time to time. It is not known whether, during such exercises, stakeholders have been critical of SQA's approach to assessment of higher-order skills or expressed concern at the absence of a formal taxonomy in SQA.

There is evidence from the HE sector that **clear outcomes**, aligned with teaching and assessment, help to contribute to deep learning. In the light of this, it might be possible to conclude that what SQA seeks from using a formal taxonomy could be achieved by other means. Although it does not use a formal taxonomy, SQA:

- ◆ has a long history of expressing its Units clearly in a defined Outcome format, which helps to ensure that there is clarity about what needs to be learned and what needs to be assessed
- ◆ provides support materials, which help to show what will be expected of the learner in assessment
- ◆ operates quality procedures, which help to ensure that assessments are valid reliable and practicable

Accordingly, there is some reason to conclude that SQA is already offering assessment that has the capacity to foster deep learning and ensure that higher-order skills are assessed appropriately — provided the requirement for these skills is properly defined in any Unit in the first place.

As a rider to this conclusion, it is possible that the availability of sample assessments, past papers and their solutions might, on occasion, be considered to be counter-productive to deep learning and the assessment of higher-order skills. This would be because these could be perceived as defining and setting the type of assessment, in a given subject, from which it might be difficult to depart in future years.

## **SCQF**

If a structure to align delivery and assessment is sought by SQA, the SCQF has the potential to operate as a taxonomy. There might be good reason to consider whether using it in this way would be preferable to adopting a formal taxonomy, such as SOLO or Anderson and Krathwohl. Given that the SCQF already exists,

and given that SQA's qualifications are all in the framework, moving to a taxonomy might add little value and be of limited benefit.

The SCQF level descriptors are already used when Units are being written in SQA. Writers can, therefore, ensure that the Unit is at the right level of demand for the learners for whom it is intended. It is suggested that the level descriptors could also be used to confirm the level of demand of assessments. Assessors would need to look at the SCQF level of any Unit they were assessing and ask themselves whether the assessments they had developed for that Unit matched the SCQF level of demand. (It should be noted that the level descriptors are in the course of review and possible revision in the light of comment from users.)

## 10 Recommendations

In view of the fact that the project was of short duration and comprised only desk research, there is a degree of tentativeness about these recommendations. It is expected that additional work will be required to take the findings of the project forward. Such work is likely to involve discussions with representatives of the relevant sectors to confirm the information gained from websites and publications.

1. Given that it already offers its qualifications in Outcome format, and bearing in mind the significant cost (both in terms of budget and time) of changing to a formal taxonomic approach, SQA should consider carefully whether the introduction of a taxonomy would add value to the quality of its provision.
2. It is suggested that SQA take soundings, both within the organisation and with its stakeholders, to identify whether there is a feeling that the lack of a formal structure in defining course content might be impeding the assessment both of deep learning and of higher-order skills.
3. It is suggested that, if some form of structure is required to ensure that the demand of SQA qualifications is clearly understood by learners and teachers, it might be preferable to investigate further the use of SCQF as a form of taxonomy. This would ensure that SQA was linking into a system that is already known to its stakeholders and which was developed out of benchmarked SQA qualifications.
4. In the event of deciding either to adopt SCQF as a taxonomy or to adopt a formal taxonomy to define Outcomes and assess learning, it is suggested that pilot activity be undertaken to test some of the practical and workload issues that might emerge.
5. SQA should review the recently-revised *Guide to Assessment*, to identify whether additional guidance will be required on deep learning, assessment of higher-order skills and assessment that supports learning. Such guidance would be for the use of:
  - ◆ Principal Assessors and setters and veters of question papers
  - ◆ item writers for NABs and item banks

- ◆ teachers who want to write their own formative and summative assessments
  - ◆ teachers who want to analyse and understand SQA assessments
6. SQA should review its guidance documentation to ensure that clear and consistent guidance on issues such as assessment that fosters deep learning and the assessment of higher-order skills is supplied to all those who set and vet examination questions for SQA. Any additional guidance required should be based on the revised *Guide to Assessment*.
  7. SQA should consider whether providing sample assessments, past papers and, particularly, their solutions on its website might result in tying SQA in to repeating assessment formats rather than seeking new approaches.



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## **Websites**

[Cambridge Regional College Teachers' toolbox](#)

[Curriculum for Excellence achievement framework](#)

[Curriculum for Excellence draft experiences and outcomes](#)

[Deliberations](#), a website on learning and teaching for Higher Education

[Encyclopaedia of Educational Technology](#), a publication of the Department of Educational Technology, San Diego State University

[Epic: partners in learning](#) for comparison of some of the frameworks noted in this paper

[Learning Technology Dissemination Initiative](#)

[SFEU: Research Online](#)

[SQA: HN Toolkit](#)

[Journey to Excellence](#)

<http://www.ltscotland.org.uk/journeytoexcellence/index.asp>