The Reforms in Scottish Schools' Science Education

Introduction

In the late spring of 2014, the Learned Societies' Group on Scottish Science Education (LSG)[1] carried out a brief enquiry into how teachers and schools had responded to the recent reforms that encompassed the introduction of the Curriculum for Excellence (CfE) and the new National Qualifications in Scotland (NQS). This enquiry was entitled *Science in relation to Curriculum and Assessment arrangements in Scottish Secondary Schools* and encompassed two parts: Survey 1 focussed on curriculum structures within each school (one response per school), and Survey 2 sought views from as many individual science teachers as possible on their classroom practice and levels of confidence in relation to the curriculum and assessment reforms.

This paper reports on two aspects of the enquiry:

1. In Survey 1, schools were asked to provide information, often in numerical form, on their science curriculum arrangements and SQA presentations for the academic year 2013-14. (See Appendix 1 for the findings which will be referred to in the rest of the text).
2. In survey 2, as well as being asked to provide information on classroom practice and confidence levels relating to the CfE and assessment reforms, individual teachers were invited to respond to an open-ended question:

   Please provide us with any additional views you have on the CfE curriculum and qualification/assessment changes in relation to science teaching and the uptake of the sciences in your school.

The schools and teachers involved in this study did not constitute representative samples, although both samples drew on institutions across the country. They are likely to reflect more of those schools and teachers who are closer to the learned societies in science (Royal Society of Chemistry, Institute of Physics and Society of Biology) since the surveys were promoted through the science teacher web forums for biology (Synapse), chemistry (Strontium) and physics (Sputnik).

A total of 84 schools responded to Survey 1, a large majority of these (approximately 94%) from the local authority sector. However, the data provided was sometimes incomplete and a significant proportion of the findings on issues reported in this paper come from about 40 to 50% of those schools who responded (in number roughly 10% of all secondary schools in Scotland). For Survey 2, there were 248 responses from individual teachers and 92% of responses were from the local authority sector. The open-ended question (above) was addressed by155 teachers.

While the schools' answers describing their arrangements and the teachers' individual responses were welcomed by LSG and have been dealt with systematically, it is important to stress that this 'brief enquiry' is not claiming to be a rigorous or extended piece of

[1] The LSG comprises representatives from the: Association for Science Education, British Computer Society, Engineering Policy Group in Scotland, Institute of Physics, Royal Society of Chemistry, Royal Society of Edinburgh and Society of Biology. More information about the work of the LSG is available from: http://www.royalsoced.org.uk/1076_LearnedSocietiesGrouponScottishScienceEducation.html

educational research. The limitations of the sampling, articulation of clear research questions, research design and sophistication of the analysis, imply restrictions on what can be generalised by any inferences drawn from the findings. Furthermore, those findings arise from practitioners' views at a time when they were just finishing a demanding year of curriculum change, were in the midst of introducing new and unfamiliar approaches to assessment and qualifications, but as yet had not seen any formal results relating to those qualifications.

However, that is *not* to say information of this kind is without value and interest. In particular, it has importance in a context of national reforms that:

- have undertaken no baseline assessments and so cannot assess any differences the innovations may have made;
- failed to carry out any conventional pilot studies and testing of the innovations.

What the LSG findings can offer is a source of *exploratory* data on schools' initial practices in response to the reforms and on teachers' reactions to, and perceptions of, the new systems. Such findings could be used to inform the design of more sophisticated and extensive research and as a preliminary agenda for curriculum and assessment developers seeking more fundamental understanding and implicit guidance on how to improve these important reforms to the system.

Survey 1: Formal information about schools' implementation of curriculum arrangements for science (see Appendix 1)

One of the concerns publicly expressed by schools and parents has related to the implications of the extensive *autonomy* that the reforms claim to assign to local authorities, schools and teachers, how this engages with the central advice that is offered on the implementation, and what impact this has had on the curriculum models that schools are adopting. For example:

- The previous system for the secondary curriculum has mostly had a 2/2/2 pattern for the six years of secondary school: initially two general years (S1/S2) covering more or less all subjects; followed by two years of subjects (up to 8) chosen in S3 as preparation for qualifications at S4 (e.g. Standard Grade at about age 15); and finally two years in S5 and S6 of Highers and Advanced Higher qualifications (important for entry to higher education). Survey 1 data suggests that, in previous years, over 70% of pupils were able to choose to study all three sciences in S3 and S4.
- The CfE reforms proposed a 3/3 model comprising a *Broad General Education Phase* (BGE) for the first three years of secondary school, S1 to S3, followed by a three year S*enior Phase,* S4 to S6, including formal study for SQA qualifications. National 4 and National 5 would occur mostly in S4 with Highers and Advanced Highers in S5 and S6 (the timing of presentations for qualifications has some flexibility). The implication was that significant choice of subjects would first be encountered in S4.
- The guidance about the time to be spent on each element of the curriculum implied that, if such advice were strictly followed, the maximum number of subjects that a pupil could present for in S4 is 5 rather than the previous 8. While the official

> response to this has been that it is for *schools or local authorities* to decide how many subjects should be available, this has remained a significantly ambiguous area. Parents have been particularly concerned about differences between schools in what is offered to their children in the way of numbers of subject courses, schools have appeared unsure about whether their pupils will have the appropriate number and mix of qualifications to gain entry to their choice of programme in further and higher education, and there has been an absence of data in the public domain about which versions of 2/2/2 and 3/3 curriculum models have actually been followed.

This study suggested that a 3/3 model had been adopted by more than half (56%) of the respondent schools. However, of these less than one in six said they had implemented the 'no choice until S4' element. The rest claimed to include some subject choice within S3. Together with a further 29% of schools maintaining the traditional 2/2/2 model with its significant selection of courses at the end of S2, these findings suggest schools' unease about leaving subject choice too late. The following teacher comments exemplify such views:

> *We call it a 3-3 model, but in reality with the time constraints of teaching bi level classes where there is insufficient time to teach N4 and N5 in one year, we start N4 in S3, it really is a 2-2-2 model.*

> *Our school model has made several changes over a short time with the current model asking pupils at the end of S2 to choose subjects then at the end of S3 to choose again from within those subjects.*

> *Essentially 2/2/2 in the sciences and some other areas - particularly those with a heavy knowledge content. Skills-based courses are perhaps a bit more 3/3. Kids take 8 subjects in S3 and drop two in S4. So in the sciences, they do the first half of a National course (3/4 or 4/5) and then do the second half in S4 if they carry on with the subject.*

> *Choices made at end of S2 where some curricular areas are compulsory. Within Science: Biology, Chemistry, Physics are options. This year it is not compulsory to take a science as an S3 option but we hope this will change under our new Head Teacher. The S3 courses in science address the remaining SCN3 and SCN4 outcomes and cover content that links into N4/5.*

For the small number providing no subject choice in their Broad General Education phase up to the end of S3, half teach integrated science with one teacher, a quarter teach consecutive blocks of biology, chemistry and physics and the rest do something else.

An interesting figure from the survey, however, was the estimate of 75% of pupils being able to study all three sciences in S4 during 2013-14. This compared with a slightly smaller percentage (71%) of pupils in previous years being able to choose to study all three sciences in S3/S4. Such figures suggest that, so far, there is no evidence for the concern expressed by some of a reduction in 3-science opportunities.

43 responses were received to the question which asked about the total number of subjects pupils were able to follow in S4 for any of the National Qualifications. Of these, six appeared to misinterpret the question, focussing on the science courses only, as opposed to all subject

courses that can be followed at S4. We have therefore discounted these six responses. The findings from the remaining 37 respondents are as follows. The most common response was that 6 National Qualification courses could be followed in S4.

Number of NQ courses at S4	5	6	7	8	9
School responses	5%	41%	27%	24%	3%

Survey 2: Individual teachers' responses on classroom practice and confidence levels relating to the CfE and assessment reforms
(See Appendix 2)

Science teachers were asked for their views on a range of CfE and assessment-related matters, including their use of Glow, confidence levels in classroom practice for delivering the national qualifications, understanding of assessment procedures, and on the content of the qualification courses.

The new Glow platform is intended to support the delivery of CfE and provide teachers with opportunities to collaborate with other practitioners by sharing resources and examples of good practice. Teachers were asked about their use of and views on Glow. 53% indicated that their level of use of Glow at the time of the survey was about the same as the previous year, 25% suggested this use was less than the previous year, and 22% claimed that they were using Glow more than in the year before. 47% considered the support provided by Glow for learning and teaching to be of some benefit, with 42% indicating that they found it to be of little or no benefit, and just 11% claiming it to be very beneficial. Teachers routinely mentioned the following as their main sources of information for new CfE materials: Education Scotland, SQA, Times Education Supplement, SSERC, colleagues and the teacher web forums in Scotland for Chemistry, Biology and Physics.

They were also asked about their confidence in teaching National Qualification courses. On the whole, they were quite or very confident when it came to teaching one level of National Qualification course to a class. For example, 73% indicated that they were either quite or very confident about teaching the N5 science courses to a class. However, this picture changed quite significantly where teachers were required to teach bi-and/or tri-level classes: 57% said that they were either not at all or not very confident about teaching bi-level N4/N5 classes and 69% suggested they were either not at all or not very confident teaching N3/N4/N5 tri-level classes.

There was a further question about their understanding of the SQA assessment procedures. In relation to N4 and to N5, 92% and 94% of the teachers said they had either some or a complete understanding of the assessment procedures. They were also asked how confident they were about the required breadth and depth of the content of the N5 courses for examination purposes. 67% of teachers were either not at all or not very confident, with only 3% indicating that they were very confident. However, 66% of teachers said that the content of National 4 provides for progression to N5 to some or to a great extent, and 89% suggested

the content of National 5 provides for progression to the CfE Higher to some or to great extent.

Individual teachers' own reactions to, and perceptions of, their experiences of the innovative reforms in response to the open-ended question

The following brief report offers a general description of the significant common strands of responses provided by individual teachers to the open-ended question, set out on page 1. Trends and emphases are illustrated below (including in the Appendices).

Initially, the general overarching views that were expressed are considered, followed by those that focused on assessment, curriculum, resources, and the impact on the levels of uptake in the sciences as young people moved on from their experiences of CfE and the new qualifications.

General views on the implementation:

A general appreciation of the potential quality and soundness of the principles of CfE was evident, but so was condemnation of the processes of the reforms' introduction as lacking adequate resources, effective management or proper trials. The following exemplify such views:

> *The underpinning philosophies of CFE such as decreased burden on summative assessment, and increased opportunities for development of key science skills, are admirable. Increased autonomy with choice of content and context particularly suits the teaching of science for younger pupils. However, in terms of certification the current implementation of these principles has major flaws.*
>
> *The principles of CfE were sound but they have been lost under a cumbersome system that has created a great deal of angst for many.*
>
> *Super courses, greater engagement, interest, enthusiasm from pupils, just a shame the implementation of it was such a shambles . . . I used to love teaching science and hoped I would inspire the next generation of students . . . now I just want to survive.*
>
> *Exhaustion, reduced morale and stress for teachers and pupils – not conducive to an effective learning environment.*

There were statements that applauded the reforms for perceived improvements over Standard Grade courses through, for example, the up-dating of a number of areas in chemistry, revision of some of the content of physics, and introduction of innovations in biology that cover exceptionally interesting areas. The *processes* of change, however, were heavily criticised as being incoherent, amateurish and rushed, causing stress among teachers and pupils. There were also accusations of a lack of pragmatism and of professional forward thinking. Added to this, many of the assessment requirements have been seen as poorly explained, inadequately implemented nationally and undermining the confidence of both staff and pupils in the new qualifications.

The overall effect of the substantial stress on teachers has been seen as resulting in exhaustion, loss of confidence in their own teaching and lack of motivation for the

continuous development of new approaches. Unlike the teachers' memories of helpful support packages at the start of Standard Grade, this time the resources provided were regarded as too few, too unwieldy and too late. Information on assessment and qualifications was seen as often lacking meaningful advice, consistency and clarity. Some of the criticisms, however, were also focused at the level of school or subject department about matters such as poor communication and a lack of materials, time, or effective leadership.

Significant unease has arisen from the inevitable variation of provision arising from the new autonomy for local authorities, schools and teachers. The argument was expressed as:

*For a **national** exam to be viable, schools need to teach the **same** curriculum*

It was reported that pupils, parents and teachers have expressed particular concern about the distinction between schools that offer a traditional 2/2/2 system of subject choice and those following the new 3/3 – which has the advantage and will this introduce a two-tier system ?

There was also anxiety about loss of the 'ethos of certification for all' with the reintroduction for some of a 'simple' pass-fail approach at Nat 3/4. Future problems were mooted for (a) those pupils with poor attendance who would no longer be able to turn up for a final exam and gain some sort of certification, and (b) those who achieve at Nat5 and start Higher but then struggle and have no longer the possibility of moving into Int2 - what do they do now, where is the 'progression'?

How many Scottish youngsters will leave school this year with no qualifications at all?

Assessment and qualifications

In relation to what goes on in the classroom, there was strong support for the wide and publicly voiced concern about the excessive time taken up by the requirements of internal assessment. Such pressure, it was claimed, was leading to repetition, boredom and overload for pupils when their full curriculum was considered. Teachers were concerned about the loss of time able to be given to teaching and learning, e.g. the lack of time for practical work, formative assessment techniques and the illumination of the 'wonder' element in teaching certificate classes.

There were also perceptions of an unwelcome impact arising from National 1 to National 4 not being graded, but assessed as simply pass or fail. From Nat1 to Nat3, learners are assessed through internally marked unit assessments only, while at Nat4 they must pass all the units in the course, including the Added Value Unit. The absence of *external* assessment in Nat4, it was claimed, devalues the courses in pupils' eyes so they become demotivated and 'feel like lesser citizens'. In these circumstances, Nat4 has had little currency outside school and parents were reported as already exerting pressure for presentation at Nat5.

As well as such overarching concerns, others were expressed about specific matters. These covered technical issues about difficulty levels, content coverage and marking systems. However, they also included perceived problems with the quality of advice and support given (especially by SQA), the ways in which changes to the arrangements were made, and the impact of the innovations on particular individuals or groups of pupils. (See Appendix 3 for examples of these comments). Since the surveys were conducted, SQA has taken measures to

address some of these criticisms. However, it is not possible at present to gauge the extent to which those measures have assuaged teachers' concerns.

Sometimes more detailed criticisms of assessment approaches were made. For example, it was suggested that the assessment of the Nat4 Added Value Unit had a marking scheme that was seen as too specific and allowing little flexibility. It was regarded as almost impossible for pupils to cover all the required content without repeated feedback from the teacher and was, therefore, judged to be more difficult to pass than the Nat5 Assignment which had a relatively short teaching time, but an externally assessed mark out of 20. This assignment, however, lacked an exemplar and had difficult-to-interpret marking instructions. Added to this, the difference in the level of demand between the unit assessments and the course assessments at Nat5 was thought to be far too great.

Curriculum

Although there were indications of approval of the ideas upon which CfE has been built, as with assessment there were many statements implying anxiety about the implementation of the curriculum. For example:

> *The CfE curriculum is fine in theory, but it has not been properly thought out, the materials provided to teachers are not sufficient and the level of support that schools have received is appalling.*
>
> *Pupils are being used as guinea pigs . . . areas of Standard Grade were in need of updating, but the current national courses are too vague, too disjointed.*
>
> *CfE was supposed to give us the chance to teach in depth and topically. I'm frantic to finish the course, but huge assessment burden means this is not happening.*

More specifically, there were concerns expressed about whether the early stages of CfE provided an adequate preparation for qualifications from Nat5 onwards and the problems of trying to prepare pupils at different levels of qualification in the same classroom. (Appendix 4 provides examples of anxiety about the kinds of learning emanating from the reforms and whether these are at the expense of other kinds that are valued.)

Resources

A lack of resources is a frequent concern when new curricular programmes are introduced and this is a particularly difficult time for hard-pressed local authority finances. For CfE and NQS, included under this heading were accessible finance, time (especially for teachers' planning), equipment or materials, computer access, photocopying and the increased costs brought about by the demands of recommended changes in activities i.e. more field trips, experiments, other practical learning and greater storage capacity for materials and evidence. (Appendix 5 provides examples of teachers' concerns about resources.)

Separately, the LSG commissioned research work in the first half of 2014 into the resourcing and state of funding of science in state maintained (predominantly local authority) Scottish primary and secondary schools. Responses were received from 46 secondary and 39 primary schools. The LSG's findings were published in November 2014 and they are available from: http://www.royalsoced.org.uk/news/news.php?id=263

The key findings from this commissioned study can be summarised as follows:

1. *Equipment and consumable provision is not sufficient*

Primary schools

- 58% feel they do not have sufficient equipment and consumables.
- Less than half feel they have enough of specific listed equipment in working order.

Secondary schools

- 57% feel they do not have sufficient equipment and consumables.
- 82% are not confident in sufficient resourcing for practical work over the next two years.
- Schools have problems providing sufficient equipment to support the new Curriculum for Excellence courses that require more up-to-date equipment (e.g. only 22% reported having sufficient data loggers).

2. *Funding allocated to science resourcing in budgets is not sufficient*

The reported average annual spend per pupil on science in primary (£1.62) and secondary (£7.33) schools is lower than funding levels reported in comparative research conducted in England.

Primary schools

- 44% are dissatisfied with funding for science practical work.
- 98% draw on additional funding sources for practical activities with parental sources being most common for extra-curricular activities.

Secondary schools

- 80% are dissatisfied with funding for science practical work.
- 38% of total science spend is on reprographics, with only 17% on equipment.
- 98% draw on additional funding sources for practical activities, with teachers themselves being the most frequent contributors of the additional funds required for normal curricular activities.

3. *Teacher confidence is low in primary schools and teacher support is low at all levels*

Primary schools

- 52% are not satisfied with the access to training on equipment and consumables.
- 45% reported no access to safety equipment or an appropriate resources area.

Secondary schools

- 44% are not satisfied with the levels of technician support.
- 46% are not satisfied with preparation time in laboratories to carry out practical work.

Impact on science choice/uptake

The teachers' responses suggested there has been significant variation in the levels of uptake in science this year: in some schools numbers of pupils continuing with science appear not yet to have been greatly affected, but in others they have clearly declined (including some decline in uptake from S2 to S3). Because the recent cohort of pupils signed up before the implications of introducing the new National Qualifications were fully understood, it was suggested that the impact on uptake will become more evident over the next few years. Currently the picture appears uneven and possibly heavily dependent on local circumstances. Levels of difficulty, changes in the opportunities for subject choice, the efforts of school management teams, the impact of earlier BGE experience and the heavy load imposed by the assessments were all cited as reasons for an uncertain future for young people opting to continue with science. (Appendix 6 offers examples of teachers' statements on science subjects' uptake.)

Separately, the Learned Societies' Group has undertaken preliminary analysis of the SQA Attainment Statistics (August 2014)[2]. This indicates that there has been a reduction between 2013 (Standard Grades, Intermediates and Access 3) and 2014 (National Qualifications, Intermediates and Access 3) in the number of learners presenting for SCQF level 3, 4 and 5 qualifications across science subjects and mathematics. English has also been included for reference purposes.

SCQF Levels 3, 4 & 5 (across all years)	**Change from 2013 to 2014 (%)**
Biology	-8.9
Chemistry	-8.8
Physics	-5.6
Computing-related courses[3]	-22.4
Mathematics	-9.4
English	-4.9

In conclusion

While there may not be a great deal in these findings that has come as a surprise to LSG, we are aware of a continuing *paucity of other evidence* in the public domain that is denying education stakeholders the opportunity to judge the validity of the official assertions that are made about the quality and effectiveness of CfE and NQS. LSG believes that without such evidence it becomes almost impossible to play a *constructive* role in helping the Scottish Government and its agencies to improve these important school reforms.

Even though this has been a somewhat provisional enquiry, it has aimed to start making public use of data gathered from those at the chalk-face (not a very modern concept) of the reforms. This study has been undertaken, however, at a rather anxiety-feeding stage of the developments and although practitioners' responses have been collected, the details and variation of the conditions under which those individuals are working have not been mapped out. Nevertheless, the information gathered is of value in charting the general reactions to the reforms and providing a current picture about:

[2] SQA Attainment Statistics: http://www.sqa.org.uk/sqa/64717.4239.html
[3] Which includes Information Systems as well as Computing Courses

- how curriculum frameworks are being developed in the schools,
- the issues and arguments associated with subject choice at different stages,
- perceptions of the opportunities for pupils to study three sciences,
- differing speculations of the impact of the reforms on science uptake in the future,
- those aspects of curriculum, resources and assessment that are of concern to teachers and in need of attention.

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For further information about the work of the Learned Societies' Group on Scottish Science Education, contact William Hardie, Secretariat (email: whardie@royalsoced.org.uk)

Learned Societies' Group on Scottish Science Education
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Appendix 1

Science in relation to Curriculum and Assessment arrangements in Scottish Secondary Schools

A general sense of the features of this sample can be gained from the fact that 84 schools responded to the survey of which 94% were in the local authority sector and 6% in the independent sector. Approximately, 40-50% of the sample of schools responded to each question.

Schools were asked to choose from a list of Curriculum for Excellence models the one best describing their own scheme (Based on 45 responses).

2/2/2 traditional: **29%**
i.e. subject choices made at the end of S2 followed by 2-year courses

3/3 Broad General Education S1-3 (a): **9%**
i.e. with no choice followed by senior phase S4-6

3/3 Broad General Education S1-3 (b): **47%**
i.e. with some choice within S3

Other: **15%**

Of the 8 schools who indicated that they were following the 3/3 model with *no choice* up to the end of S3 and with an allocation of 3 periods a week for science, the teaching of science was organised as follows:

50% Integrated science with one teacher

25% A block of one science, then a block of a second and then a block of the third

0% One period a week of each of biology, chemistry and physics

25% Something else

In previous academic years, in more than 70% of schools pupils were able to choose to study all three sciences in S3 and S4, and in just under 30% they were not. These figures compare with being able in the year 2013-14 to choose all three (but in S4 only) of 75% and 25% respectively (Based on 44 responses).

The minimum and maximum time allocations for a pupil in the sciences for S3 and S4 were on average as follows (Based on 43 responses):

MINIMUM in S3 121 minutes/week

MAXIMUM in S3 308 minutes/week

MINIMUM in S4 136 minutes/week

MAXIMUM in S4 389 minutes/week

The most common number of National 3, 4, and 5 courses that pupils were able to follow in S4 was **6** (Based on 37 responses).

Although the average number of S4 pupils on the school rolls increased from 387 to 396 from 2013 to 2014 (based on 38 responses), this was not reflected in the number of presentations across all levels in S4 in the science subjects. In each of biology, chemistry and physics there were reductions in the average numbers of SQA presentations (see below) (Based on 37 responses):

In Biology in 2013 **71**

In Biology in 2014 **61**

In Chemistry in 2013 **57**

In Chemistry in 2014 **55**

In Physics in 2013 **50**

In Physics in 2014 **46**

However, the *projections* for SQA science presentations at *Higher in S5 for 2015* suggested a modest *increase* in expectation for average numbers as follows (Based on 34 responses):

In Biology in 2014 **24**

In Biology in 2015 **31**

In Chemistry in 2014 **24**

In Chemistry in 2015 **26**

In Physics in 2014 **22**

In Physics in 2015 **23**

Appendix 2

Science Teachers' views on the curriculum and assessment reforms

248 teachers responded to this survey, of which 92% were in the local authority sector.

Teachers were asked about their use of and views on GLOW.

On average, teachers indicated that they log on to GLOW twice a week to access resources for learning and teaching. (Based on 206 responses)

In relation to how their use of GLOW compared to their use in the previous year (Based on 220 responses):

25% used GLOW less than they did the previous year
53% used GLOW about the same as they did the previous year
22% used GLOW more than they did a year ago

In terms of how useful they found the support provided by GLOW for learning and teaching (Based on 221 responses):

42% considered it to be of little or no benefit
47% considered it to be of some benefit
11% considered it to be very beneficial

Teachers were asked whether they were aware of the Education Scotland Curriculum Impact Update Report on The Sciences 3-18 which was published in September 2013. Those aware of the report were also asked about their engagement with its key messages.

53% of respondents indicated that they were aware of the report with 47% not being aware of it. (Based on 232 responses)

30% indicated they had little or no engagement with the report's key messages.
27% indicated that they had some engagement with the report but had not taken action on its key messages.
39% indicated that they had some engagement and had taken some action on the report for future science learning and teaching
4% indicated that engagement with the report was shaping action for future science learning and teaching
(Based on 138 responses)

Teachers were asked to identify the 'best fit' description for their CfE classes and to indicate their level of confidence in being able to teach to the desired standard.

	Not at all confident	Not very confident	Quite confident	Very confident	N/A	Number of responses
N3	8%	18%	21%	15%	38%	156
N4	2%	18%	39%	28%	14%	163
N5	1%	18%	43%	30%	9%	171
N3/N4 Bi-level	20%	26%	21%	3%	29%	163
N4/N5 Bi-level	24%	33%	27%	6%	11%	198
N5/Higher Bi-level	49%	18%	6%	0%	27%	154
N3/N4/N5 Tri-level	56%	13%	3%	0%	28%	160
N4/N5/Higher tri-level	59%	9%	1%	0%	31%	148

Teachers were asked to estimate their understanding of the SQA assessment procedures.

	Very little understanding	Some understanding	Complete understanding	Not Applicable	Number of responses
N3	13%	38%	22%	53%	192
N4	4%	60%	32%	4%	219
N5	4%	58%	36%	2%	226

Teachers were asked to describe their experience of the external verification procedures for the internal assessments. (Based on 221 responses)

57% indicated that no external verification had taken place
20% indicated that the external verification had taken place and the process was satisfactory
22% indicated that the external verification had taken place and the process was unsatisfactory

The content of the National 5 qualification courses are defined by key areas. Teachers were asked how confident they were about the required breadth and depth of the content of the courses for examination purposes.

Not at all confident	Not very confident	Quite confident	Very confident	Number of responses
14%	53%	31%	3%	216

They were asked about the extent to which the content of National 4 provides for progression to National 5

To very little extent	To little extent	To some extent	To great extent	Number of responses
7%	27%	58%	8%	214

Teachers were asked to what extent does the content of National 5 provide the 'right experience' for S4 students in their subject.

To very little extent	To little extent	To some extent	To great extent	Number of responses
6%	17%	67%	11%	218

Teachers were asked about the extent to which the content of National 5 provides for progression to the CfE Higher.

To very little extent	To little extent	To some extent	To great extent	Number of responses
2%	9%	71%	18%	206

Appendix 3

Examples of teachers' comments on assessment and qualifications

1. The inconsistency of difficulty levels.
2. Assessments where significant numbers of items fell outside the mandatory course key areas, but at the same time accompanied by a failure properly to sample overall the extensive Nat5 course content.
3. The low numbers of marks in the external examination making bands very close.
4. Too many open-ended or numerical questions that tested general knowledge or basic mathematics rather than the science subjects.
5. Changes in assessment leading to pupils with regular absences having difficulty in passing all the different elements
6. SQA's unit assessments having poor quality in both content and presentation, advice offered proving difficult to decipher, too often useful information about progress not being provided, and assessment information frequently placed remotely away from suggestions for appropriate activities.
7. Support documents from SQA being changed without notifying teachers.
8. Training in the standards used for assessment being inadequate e.g. on how to ensure that pupils have sufficient guidance to achieve the standard, but without being given too much assistance.
9. Unit assessments do not informing teachers of the progress of their pupils.
10. Pupils finding it tedious and boring to undertake so many similar assessments across all their subjects.
11. Because staff often failed fully to understand the marking, pupils not being as well supported as they should be.
12. Assessment getting in the way of teaching and making it difficult to complete the course in the time allocated.
13. There being no way to distinguish between a higher level Nat 3/4 and a lower level Nat 3/4 because the course is only pass or fail.
14. Internal assessment for national qualifications lacks validity because of schools' pressure to ensure all pupils achieve Nat4awards and so impact on league tables.

Appendix 4:

Examples of teachers' concerns about the curriculum

1. The basic general education phase (BGE) up to S3 does not cover enough relevant course content to prepare students adequately for S4.
2. Nat3 level dumbs down science education to a significant degree.
3. Pupils in S3 and S4 are not mature enough to cope with the rigour needed to secure a pass at Nat5.
4. Mixed level classes (bi- or tri-level) require that different knowledge be taught to different within-class groups and that has militated against high quality teaching.
5. Pupils' research skills have improved, but at the expense of knowledge and understanding.
6. To say a course should not be prescriptive does not marry well with an external Nat5 exam that expects prescribed answers
7. Nat5's content suggests it should be a 2 year course and classes have felt rushed in order to complete it in one year.
8. The CfE aim of greater depth at key points in order to make the work more interesting and relevant has been challenged by the extent of Nat5 content.
9. The extensive course content for Nat5 has not allowed time for practical explorations.
10. The idea of experiential learning has been lost in a mountain of paperwork.
11. Possible progression pathways after Nat5 are now reduced to just Highers with Int1 and Int2 no longer available.
12. Is the depth of knowledge covered in Nat5 enough to allow a smooth progression into the new Higher?

Appendix 5:

Examples of teachers' concerns about problems of resources

1. The requirement for pupils to 'research' is difficult to deal with because schools have inadequate resources, including a lack of computer access.
2. Budgets have been cut so much that even photocopying has barely been affordable.
3. Internally produced materials have often been fraught with difficulty; even within one centre, teachers may have provided different levels of support that have threatened the idea of a 'level playing field' for all pupils.
4. A significant increase in the grading of assessments has resulted in a reduction of time available, even though more work has been taken home by teachers.
5. Storing evidence has been a demanding task with big implications for space and time.
6. Teachers have not had the time or material resources to develop materials that help pupils learn through participation.
7. Pupils have found the courses much more interesting, but that has not being backed with interesting field trips, because of a lack of teachers' time for planning and of budget cuts curtailing trips.
8. It has been a struggle to even cover the cost of photocopying.

Appendix 6

Examples of teachers' comments on science uptake.

1. The difficulty of assignments has greatly increased in comparison with Standard Grade and Intermediate and this has had an impact on numbers continuing with science.
2. Uptake into Physics has suffered as a result of a reduction of choice in S3 and S4.
3. Because the content of Nat5 and the new Higher physics is stimulating to pupils, there would be an increase in uptake into Higher if more were allowed to sit Nat5 in S4.
4. In some cases, supportive management teams can increase the uptake of science across the school with creative subject options systems.
5. Levels of uptake can be subject-dependent; there were reports of increases for some in the uptake of chemistry from Nat5 to Higher, or for physics in S3 and S4, but elsewhere pupils had chosen engineering science rather than the more demanding physics.
6. An S3 BGE course seemed to have led to a fall in numbers taking biology.
7. Even able pupils were significantly stressed by the load of assessments and assignments and so may now see 'easier' subjects as better options than science.
8. Uptake may vary with secondary school stage, possibly because science is no longer compulsory after BGE, so numbers continuing into S5 remain good, but not into S4.