Impact of change on Attitudes, Skills and Professional Learning Requirements

Survey of secondary teachers of Craft, Design, Engineering and Graphics

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Susan V McLaren
Senior Lecturer in Design and Technology Education
The University of Edinburgh
susan.v.mclaren@ed.ac.uk

Lee Dunn
Senior Fellow HEA and Senior Fellow RET
University Teacher in Education Studies and Technology
The University of Glasgow
lee.dunn@glasgow.ac.uk
Twitter @leeandrewdunn

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Background Information

Executive Summary

Following the introduction of Curriculum for Excellence (CfE), there has been significant transformation in curricula design and responsibility within the Technologies Broad General Education (BGE) and Senior Phase curriculum: Design, Engineering and Technology (DET). This report explores the attitudes, skills and professional learning requirements of secondary school teachers across Scotland, with a specific focus on those teaching Craft, Design, Engineering and Graphics (CDEG). This is an independent report based on a national survey. It is designed to capture the attitudes and thoughts of teachers currently involved in the implementation of the new curriculum arrangements and the teaching, learning and assessment inherent in delivery. The purpose of this report is to guide and inform future support, advice and guidance for professional learning and further research enquiry. Critically, it offers an overview of current thoughts, as a snap shot of time, set in the context of the roll out of the senior phase of DET. The survey took place in November and December 2015, when the majority of the new national qualifications (NQs) had been presented i.e. National 4&5 (2014 & 2015), Higher Grade (2015), and Advanced Higher Grade (due May 2016). The Scottish Qualifications Authority (SQA) had already facilitated National Understanding Standards events for National 4&5 CDEG subjects in Graphic Communication, Engineering Science, and Design and Manufacture. A response rate of 10% of all teachers registered with GTCS (technical or technological education categories) was achieved. Key findings suggest that CDEG teachers:

- Continue to innovate, albeit development 'fatigue' is noted;
- Generally report 'no change' or 'positive attitudinal change' related to the impact in terms of personal engagement, skill set and motivation, albeit with less confidence;
- Currently make good use of networks and peer support, and would welcome support through local hubs or similar;
- Are concerned with the quality of learner experience, and teacher workload, due to over-assessment;
- Feel underprepared to teach Engineering Science and metal work generally;
- Are well prepared to teach BGE CDEG, yet require support in aspects, such as Technological Development in Society of BGE;
- Have concerns regarding changes to leadership and management structures in schools, particularly those removing / replacing DET related specialists.

Introduction and Review of Literature

Several researchers (Fullan, 1991; Hargreaves & Fullan,1992; Shann 1998; Smith, 2005; Guskey, 2002; Demirtas, 2010) have explored the role of teacher attitudes, confidence and personal construct of the subjects that they teach and how these impact on change and curriculum development. Van Driel, Beijaard and Vreloop (2001) conclude that experienced teachers develop a pedagogy in line with their knowledge and beliefs and their approach tends to be determined by the most familiar curriculum arrangements, in the schools where they have taught the longest and have become accustomed to the culture of that specific institution. However, problems arise when changes are made to the content of the curriculum and the structure of systems. A rethinking of a personal pedagogy is not intuitive, especially when the teachers' own beliefs may not match those that are implicit in the new curriculum.   A professional learning session does not serve as a 'fix' that subsequently re-engages a teacher into a new curriculum and related requirements. More is required than simply adding information to personal beliefs and existing knowledge frameworks of a teacher.

Times of transition and change create a sense of discomfort for many. Demands are made on existing knowledge and understanding, values, attitudes and world views. Change in education and curriculum requirements, society and learner expectation often require changes in pedagogy as well as content and learning experiences. However, as Dottin (2010) cautions, when citing Dewey (1933:30) "*Knowledge of methods alone will not suffice: there must be the desire, the will, to employ them. This desire is an affair of personal disposition".* Dispositions form the link between knowledge and action. A re-envisioning of what it is to *be* a teacher of Design and Technology is possible. It is a complex process and involves uncertainty.

Hargeaves (2005) has written on the importance of change in educational systems involving practicing teachers, and examined the issues arising when change is imposed upon teachers, with a top-down directive imploring them to enact. Treating teachers as 'deliverers' and unthinking technical operators can create a sense of alienation and de-professionalisation. This in turn has a knock on in terms of 'buy-in.' It is central to any change that the rationale for change is understood and seen to be of value for all actors and stakeholders. Without this, a rift can occur at several strata of the systems involved.

Fullan (1993) also noted detrimental impact on teaching when, for example, there are changes made to curriculum content and structure, or school systems such as departmental restructuring, which are undertaken without teachers being actively involved or having sufficient time to develop a personal and professional understanding of the rationale underpinning the change(s). He suggests that those who have a keen self-awareness and secure construct (moral purpose) of why they entered the teaching profession can become disheartened. Farber (1991:36) identified there was a danger of teachers being disenfranchised and frustrated with imposed change. This has the potential of teachers feeling inconsequential in the larger scheme of things and suffering from 'burn out'. Teachers may exhibit some resistance and reluctance to make changes as required. As Zimmerman (2006) identifies, barriers to change may arise from the teachers themselves not recognising any need for change to the status quo. Zimmerman also uncovered resistance to change where teachers felt comfortable with their habits in terms of approach, content and their adopted rituals. There is also a fear of the unknown that inevitably can cause teachers to feel their expertise being threatened. Change, in systems, structures, curriculum, ideologies and management can result in different a dynamic and teachers may potentially fear negative impact on existing roles and relationships.

Negative attitudes can have consequences for learners in several ways such as teachers not keeping up to speed with curriculum guidance and content, design strategies, materials, processes, and technological changes that may have impact on manufacture, graphics, engineering and the core of the content of DET courses and general educational experiences. The negativity may transmit to the learners and demotivate them and discourage them from engaging with the subject areas. Zimmerman (2006) suggests that teacher negativity can manifest in several ways, e.g. as a lack of willingness to respond to learners' interest and topical issues; little effort devoted to innovation in methods and approaches for teaching, learning and assessment which results in the adoption of a 'safe' and mechanistic teaching style; and efforts made to disguise personal limitations in pedagogical content knowledge and current content knowledge. For these reasons, Labosky (1993), as others (cf. Arnold et al 2012; Mezirow, 1990) suggests that the impetus for taking time to study the constructs and power structures of society, and analyse how these impact on educational policies, curriculum, assessment, accountability, and pedagogical choices, is not linked to a particular professional life phase of a teacher but considered more as a professional frame of mind. Several researchers (Huberman 1993; Steffy et al 2000; Hattie 2003; Dreyfus & Dreyfus 2005) acknowledge that although the first professional life phase of teacher will focus more on connecting to the discipline of being a teacher with growth coming through increased clarity, identity, and efficacy of teaching, it is problematic to think of

professional life phases as a linear sequence. It may be possible to progress and grow from being a novice, an advanced beginner through experienced to an accomplished teacher, and by late career be an expert teacher, teaching with practical wisdom (phronesis), as differentiated from being an experienced teacher (Hattie 2003). However, it may be the case that due to organisational disruption, political interference, curriculum content, format and assessment changes and / or technological developments, a late career teacher may become a novice again. Thus a DET teacher, by the very nature of the DET educational arena, may experience professional life phases in a different and less sequential way than anticipated on entry to the profession.

Kirk and Wall (2010) suggest that by mid or late career most teachers will have experienced considerable change and had to find ways to cope with these demands, which may even have required them to re-orientate their own understanding of education e.g. those who have experienced the changes to the technical education curriculum from 1991 (first presentation of Standard Grade Craft and Design) and 1993 (Curriculum Guidelines for 5-14 Environmental Studies) to current curriculum arrangements for SQA senior phase and CfE BGE. Care is needed to avoid teachers with many years of teaching experience feeling that the reforms dismiss their ideas and values are 'old fashioned' resulting in them feeling a sense of loss. This, Goodson (2006) suggests, can engender a deep sense of instability. However, those teachers that stay within the profession display a high degree of commitment and purpose, sometimes described as resilience.

Accordingly, at a time of curriculum change for teachers of Design and Technology, a window into their thoughts on the journey so far is of value. This report summarises a survey that is intended to inform the priorities and direction for practice and support for change.

Context of Study

CfE Technologies Principles and Practices (rationale) and Experiences and Outcomes for 3-15 years old (early to 4th level) were distributed for start of teaching session 2010-2011. While teachers awaited the senior phase (S4-S6) SQA course specifications and assessment they were required to devise a coherent, progressive and authentic programme of work to engage the S1-S3 in contexts related to Craft, Design, Engineering and Graphics, and Technological Developments in Society. Those in the first cohort of secondary CfE Technologies were presented in 2013/14 for SQA Nationals 4/5. At the time of writing, all CfE senior phase DET certificated courses had been implemented and assessed [Table 1].

Table 1. SQA CfE senior phase certificate presentation.

Academic Year	CfE National 4/5	CfE Higher Grade	Higher Grade	CfE Advanced Higher Grade	Advanced Higher Grade
2013/14	presented		presented		presented
2014/15	presented	presented	presented		presented
2015/16	presented	presented	presented	presented	

Various councils and schools have adopted a range of models for CfE. Some persisting with the 2+2+2 approach, others opting for a 3 year BGE, with the 4th level, as initially devised, to be utilised as a time for learners to be offered a 'pick and mix' option menu of courses, enrichment classes, specialist tasters and IDL. Revised 'Significant Aspects of Learning' (SALs) for the Technologies, and specific lines of development for CDEG were published March 2016- i.e, after this survey closed.

The SQA pronounced that, in keeping with the philosophy of CfE (Scottish Government, 2008 & 2011), assessment will support learning and the curriculum, and should not 'drive' teaching. Naturally occurring evidence was to be suitable for assessment purposes, and work on making thinking visible drew on Hattie's work (2012). *'It is also important that assessment is proportionate and that arrangements do not place excessive burdens on learners and teachers which divert their time and effort from learning and teaching.'* (Scottish Government 2011:27). The principles of curriculum design as promoted in Building the Curriculum 3 (Scottish Government, 2008) encouraged planning to take account of choice and personalisation, challenge and enjoyment, breadth, depth, coherence, progression and

relevance. Teachers were to be recognised for their professional autonomy, creativity and integrity.

Prior to CfE, the equivalent SQA assessment instruments for Intermediate 2 and Higher Grade certificated courses (assignment folios) were sent for central external marking, with additional payment for those who offered their services as markers for these folio-based assessments. In addition to this, the workload related to previous SQA *unit* assessment (NABS) was acknowledged as burdensome and hindered the quality of experience for the learners and teachers and was thought to be an obstacle to meaningful learning.

Not only are all course units now internally assessed, but so are all National 5 'added value assignments' and Higher 'Course Assignments', with internal moderation undertaken, prior to sampled external verification. This is a change that not all subject specialists have experienced. The majority of subject course assessments are externally marked. Computing Science Education being the only other internally assessed course in the senior phase commonly offered by schools. [However, SQA issued a survey (closed 29th April, 2016) to take stock of the teachers' views on the assessment in terms of SQA final brief scenario selected, timing, marking / assessment approach and work load to gather views on unit assessment (August 2016). In 2009, HM Inspector's 'Improving Scottish Education' (Scottish Government, 2009) highlighted the following priorities:

- *ensuring challenge and progression in learning through imaginative, well-judged teaching, leading to the achievement of high levels of understanding and skill;*
- *devising curriculum structures which reflect the design principles of Curriculum for Excellence and enable all learners to benefit from the experiences and achieve the outcomes described in guidance on the curriculum;*
- *planning to ensure that all young people achieve the outcomes which comprise a broad general education and that they have suitable opportunities for choice and specialisation;*
- *working collectively to ensure that children, young people and adult learners make successful transitions between stages or establishments and from education to the world of work, building upon their prior learning;*
- *enabling all learners to apply learning in active and creative ways; and*
- *putting in place arrangements to support teachers in their assessment of learning, so that they and society can have confidence in their judgments and that assessment plays a central role in tracking and facilitating progress in learning.*

This was then followed up, 5 years later, after the first presentation of CfE SQA National 4 and 5 courses, by a report commissioned to examine experiences and issues of the initial implementation. The resultant report by Watt et al (2014) was titled *Tackling Bureaucracy Executive Summary for the Curriculum for Excellence Working Group*. Key points of note from this review included many criticisms and a fairly negative view of SQA e.g.

- *excessive demands in relation to assessments and verification*
- *SQA changing guidelines, late arrival of important pieces of information and generally poor communication such as overly lengthy emails with important information hard to see immediately.*
- *general increase in workload for teachers and the increased stress levels*
- *while more tasks have been added, both educational and bureaucratic, it does not appear that much has been taken away leading to higher workloads.*
- *difficulties of teaching bi-level classes in some subjects where the course content is very different in Nat 4 from that at National 5.*
- *N4s were stigmatised as they did not sit an external examination and provision had to made to for those learners over study period / examination time.*
- *the level of assessment was excessive and put undue pressures for S4 pupils sitting the a high number of courses and exams*

The 2014 report makes the following recommendations (numbers are selected as pertinent to this survey):

3. Assessment and the recording of assessment, particularly in connection with the new National Qualifications, appear to have become disproportionate to the benefit achieved. As a matter of urgency, SQA should continue to seek means to significantly reduce the assessment burden on schools.

4. Communication of new information by SQA should be as straightforward as possible. Important messages should not be contained in extensive emails covering a wide range of topics. It should not be possible to miss important messages.

5. Both SQA and Education Scotland need to improve the navigability of their websites and make the important guidance more readable, simpler and easier to find. It is important that the distinction between strategic guidance and other forms of advice or examples of good practice should be obvious.

7. An unintended consequence of the emphasis on new qualifications has been the relative neglect of the phase of BGE in the early secondary years. It is also clear that schools are finding the transition from the phase of BGE to the senior phase

problematic with some schools wanting, in effect, to begin the senior phase at some stage in S3. Further clear guidance is needed to help secondary schools with the phase of BGE for S1-S3. This includes the assessing and recording element but also the fit with S4 which many schools are now revisiting.

10. There needs to be more effective strategic oversight of the development of CfE as a whole in order to avoid disproportionate emphasis on some aspects (such as verification) at the expense of others (linking the phase of BGE with S4) and the unintended consequence of growth in teacher workload.

Curriculum for Excellence Management Board (2014) also published a report reviewing the first year of the new national qualifications. Although the report acknowledges there are many examples of good practice of putting learners at the centre of the experience, the review also identifies issues with the un-anticipated / un-intended, unsustainable level of over-assessment, excessive workload, confusing and / or poor communication and recommended that these were addressed as a matter of urgency. The group offered a range of recommendations and actions for teachers, school leaders, LAs, parents, SQA and Education Scotland.

In a recently published report for the Scottish Government by Black et al (2016) titled *Evaluation of the impact of Implementation of Teaching Scotland's Future* a cultural shift among teachers generally was noted. Of a sample of 6,346, 41% of teachers reported they were more willing to try new practices and strategies more often than they did 5 years ago and only 18% reported they were less willing, less often. This report also suggests that the 'new generation' of teachers were more willing to engage in professional dialogue, share practice, work collaboratively and encouraging more experienced staff to 'raise their game' (Scottish Government 2016). It was noted that some of the remaining challenges included better signposting to professional learning, the high quality resources available and to professional networks.

It is interesting to note that these publications highlight similar issues to those identified and expanded upon in personal experiences of those responding to this survey, undertaken specifically with Craft, Design, Engineering and Graphic teachers in late 2015.

Survey of Scotland's CDEG Teachers

Methodology and Survey Design

The premise of this report is to evaluate the perceptions of CDEG teachers across Scotland, exploring their voice and emotion, as they perceive the impact of the changes associated with CfE and the new SQA national qualifications. It is our aim to identify the impact of the changes (positive and negative), challenges that teachers feel they face, and additional support they deem to be required. The analysis identifies issues, needs and possible actions/recommendations to address the career long professional learning requirements of CDEG teachers, and aspects requiring further research. The scope included: Craft, Design, Engineering and Graphics, Technological Developments in Society, Graphic Communication, (Product) Design and Manufacture, Engineering Science, Practical Woodworking, Practical Metal Working and Practical Electronics.

The research was approved by the University of Glasgow, College of Social Sciences Research Ethics Committee, with the online survey open to all those teaching CDEG across Scotland. Using a list of Education Scotland Technologies Leads, the survey was disseminated to schools locally and within professional networks. The survey adopted a blended method (quantitative & qualitative) approach using a secure online questionnaire through the Bristol Online Survey tool (BOS). Questions were pre-coded and later indexed using an interpretivist methodology. The questionnaire used Lickert type rating self-response scale to allow respondents to select best fit opinion or 'feeling', through 'strongly agree to strongly disagree, or large positive change to large negative change. There were opportunities to offer open text response throughout the questionnaire.

The questions were pre-coded into four broad themes: *Contribution to curriculum development and resource innovation*; *preparedness to teach; required support and sources of support* and *personal attitudes & attributes*.

The latter was further categorised into *motivation, skillset, confidence, engagement,* and *workload.*

Data Analysis

Our analysis comprised frequency examination of selected responses, and to determine if patterns and significant differences were apparent in terms of demographics and geography. The open questions that were initially coded into broad themes and later interrogated

through a basic content analysis for recurring subthemes and categories. Where there were frequently occurring words and topics, these were taken to be issues and aspects of the original themes that affected the participants / respondents and could be assumed to be having significant impact. This form of constant comparative analysis was carried out through a process of blind review between researchers, where we were later able to verify similarities and differences in interpretation, leading to conclusive findings from the data to be presented as information within this report.

Acknowledgement of limitations

The data presented within this report is based on a small sample in a snapshot of time. We acknowledge that many teachers value their time and that for some completing an online survey is not a priority. The opening of the survey was limited to a 6 week period (Oct-Nov 2015). Accessing teachers through network lists and council distribution may have limited responses. There may also have been difficulties accessing the secure BOS survey in some centrally managed digital networks. The timing of survey may have been such that emotions were high and too many unknowns of what the year would have in store with regards to, for example, changes to the Learning outcomes of National 4/5 Design and Manufacture (reduction in number); the first presentations of Advance Highers; 'Insite' analysis of results completed; forthcoming events for Understanding Standards for new Highers (mid/ late Dec 2015 and January 2016); New National / Higher Principal assessor and verifiers reports (available late in October / November); movement in staffing, for example, head of department and head of faculties and probationers having gone and new ones arriving; plus several D&T staff posts left unfilled.

The resultant low response rate limits reliability of any claims, and cautions against any generalisations. It may have been useful to have encouraged 'snowballing' to recruit further respondents and achieve a better representation in responses.

We recognise that not all teachers actually teach across the full breadth of national qualifications within the DET subject area. Where the option '*not sure*' was selected we surmise this was due to the respondent not teaching / nor having had experience in teaching that course at the given level. There was also the option of stating '*not sure*' in several of the more personal attitudinal statements seeking opinion of their feelings e.g. 'change' in confidence, motivation, ability to innovate etc.

Profiling Respondents and Local Authority Areas

The survey received responses from 203 teachers, which represents around 10% of those GTCS (General Teaching Council Scotland) registered teachers of Technical Education and Technological Education (CDEG). This includes private sector teachers, with 5 of the 32 local authorities represented by only one teacher, and Orkney represented by none. The profile of respondents in the sample, ranges from those entering the profession as a student / probationary teacher to those with more than 25 years in teaching experience (Fig 1).
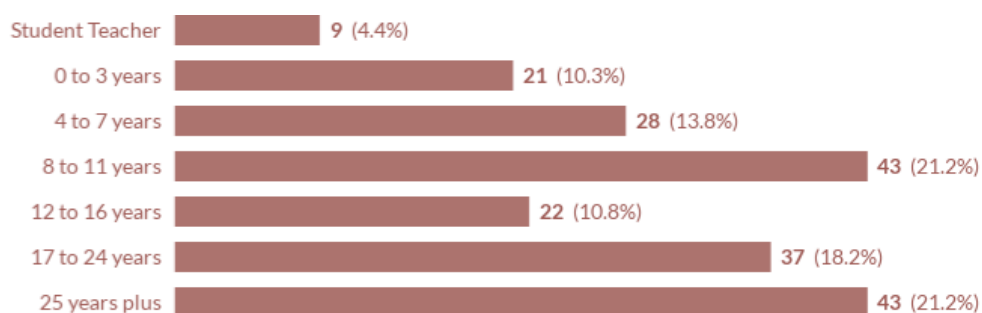

Fig 1: Respondent data by length of service

Nearly 40% have more than 17 years' experience with comparable returns for the ranges between 8 to 11 years and 25 years plus. This suggests that the majority of people responding (8 years plus) may have seen at least one major change within the curriculum and that they are likely to use this experience as a basis for comparison against CfE. For example, some may have experienced the introduction of Standard Grade, 5-14, Higher Still and most recently the broad general education, National 4, National 5 and changes to content and assessment within Higher Grade and Advanced Higher Grade. Other significant changes have seen transformation in classroom pedagogy through the use of new and emerging technologies that have impacted on manual technical drawing and increased computer-based applications and digital simulations.

The majority (94%) of responses were collected from 31 local authority areas as shown in Table 2, with the remaining 6% based within the private sector (including Higher Education Institutes). The biggest response from any one local authority was Glasgow City at 13.3% (n=27), which also represents the largest proportional area of secondary schools. This correlation does not feature throughout the entire data set. For example, Highland Council (29 schools) returned 3% of the total responses and East Lothian, with only 6 schools, returned 5.9%. The highest proportion of responses came from Aberdeenshire, Dumfries

and Galloway, Dundee City, East Lothian, City of Edinburgh, Falkirk, Fife, Renfrewshire and Glasgow City.

Table 1: Comparison of responses against the number of schools within each local authority area. Source: Scottish Government School Estate Supplementary Data (2015).

Local Authority Area	Proportion of Responses (%)	Number of Secondary Schools
Aberdeen City	2%	12
Aberdeenshire	**8.40%**	**17**
Angus	3%	8
Argyll & Bute	1%	10
Clackmannanshire	0.50%	3
Dumfries & Galloway	**6.90%**	**16**
Dundee City	**4.40%**	**9**
East Ayrshire	1.50%	9
East Dunbartonshire	0.50%	8
East Lothian	**5.90%**	**6**
East Renfrewshire	1%	7
Edinburgh, City of	**6.90%**	**23**
Eilean Siar	0.50%	5
Falkirk	**4.90%**	**8**
Fife	**3.90%**	**19**
Glasgow City	**13.30%**	**30**
Highland	3%	29
Inverclyde	2.50%	6
Midlothian	2%	6
Moray	1%	8
North Ayrshire	1.50%	9
North Lanarkshire	1.50%	23
Orkney Islands	0%	5
Perth & Kinross	0.50%	10
Renfrewshire	**5.40%**	**11**
Scottish Borders	1.50%	9
Shetland Islands	0.50%	7
South Ayrshire	1.50%	8
South Lanarkshire	2%	17
Stirling	2%	7
West Dunbartonshire	2%	5
West Lothian	2.50%	11

Analysis and Discussion of Data

Our narrative within this section is based upon a revised number of responses where we removed student teachers given that they would not have seen the full breadth and depth of curricula change within schools. Our analysis here accounts for n=197 responses where year zero (Question 2: What is your total length of service?) begins with probation.

Theme 1: Contribution to curriculum development and resource innovation

Over half (52.4%) of the respondents had contributed towards curriculum design, resource development and / or assessment in some way in their own school [Q3:Fig 2]. 29.6% had contributed to developmental work within their local area, with 17.1% participating in national development. One respondent reported that s/he had been contributing to curriculum design, resource development and / or assessment from as early as 1982. Others noted their involvement had encompassed such aspects from the 1990's, such as the introduction of Standard Grade Technological Studies, Graphic Communication and Higher Still (1996/1997) preparation for implementation in 1999.
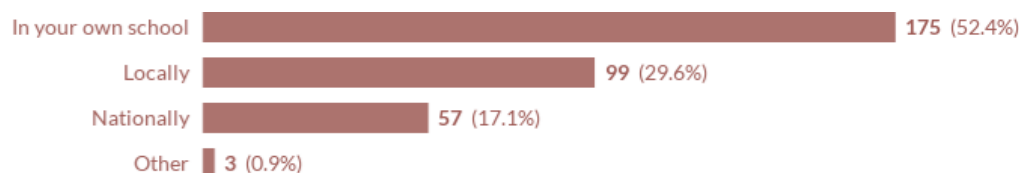

Fig 2: Respondent contribution towards curriculum development and resource innovation.

It is evident that the respondents are active contributors to their own specialist areas and many had experienced various changes and revisions through to current curriculum. This would reinforce the assumptions made when profiling the responses and looking towards overall length of service.

The data illustrates the step between local innovation and national development. Table 3 shows an emerging pattern, for example, those with 0 to 3 years' experience are starting to engage in developmental work within their own school and local area, and then after 4 years, this practice shifts to involvement in local development, through to national contribution. There seems to be a slight dip between 12 to 16 years in school based and local development, and this could coincide with a change in priorities based on experience. Of this group, more than 1 in 4 are or had been involved in national development and at

26.32%, this group appears to be the most active, nationally. It is of interest to note the high level of innovation and development by those with 0-11 years of experience in their own school and local council/ local 'hub'/ network. As would be anticipated those with longer service contribution more highly at a national level.

Table 3: Contribution to curriculum design by years of service.

	What is your total length of service?						
	Student Teacher	0 to 3 years	4 to 7 years	8 to 11 years	12 to 16 years	17 to 24 years	25 years plus
In your own school	77.7%	83.33%	58.14%	49.37%	44.74%	47.62%	47.44%
Locally	0.00%	16.67%	30.23%	34.18%	28.95%	31.75%	30.77%
Nationally	0.00%	0.00%	11.63%	16.46%	26.32%	19.05%	21.79%
Other	22.22%	0.00%	0.00%	0.00%	0.00%	1.59%	0.00%
No answer	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

The trends illustrated here are expected, however the scope of our survey did not directly account for those who engaged in only one area of development e.g. a one-off national project after several years of service. The telling sign here is that there is a clear desire for many teachers to engage in innovative approaches to developing their specialist subject area.

We asked respondents to tell us about the work in which they had been engaged [Q3a&b]. 98 people took the opportunity to describe local (including in school) innovation and 58 people chose to provide an extended response when asked to describe the national development work in which they had participated. Teachers reported involvement as follows:

- 10 people describe innovation within their local school clusters (where they developed curriculum, resources and / or assessment and then shared with a different school);
- 18 people described development for Graphic Communication;
- 5 people described development for Design and Manufacture;
- 33 people describe 'designing', 'creating', 'devising' and 'developing resources' generally;
- 22 people described their role (previous or current) with the Scottish Qualifications Authority (SQA). A high proportion of responses came from those with over 8 years of practice that also resonates with the pattern illustrated in Table 4;
- 4 people have written material for Education Scotland;
- 13 people state their contribution nationally through work with HMIE, SQA (e.g. verifier, assessors, CARG / CDT members) and other agencies/organisations.

Although approximately one third claimed the changes to the curriculum had not altered their ability to innovate, 40% reported a positive change and 1 in 4 report they feel the new curriculum affords them less opportunity to innovate [Q5.6]. Those with more than 25 years in service tend to report 'no change' in their ability to innovate or believe that this has had a negative impact [Table 4]. When we examine the pattern here, it is critical to take note that there appears to be a negative impact change for those with 8 to 11 years and 25 years plus, experience, with a 4.43% to 1.48% and 2.46% to 4.43%, swing respectively.

Table 4: Length of service against responses reporting teacher perception of how the new curriculum/ system as impact on their ability to innovate [Q5.6](note: student responses have been removed in this table)

Ability to innovate	Totals					
	0 to 3 years	4 to 7 years	8 to 11 years	12 to 16 years	17 to 24 years	25 years plus
large positive change	2.46%	0.99%	1.48%	0.99%	1.97%	1.97%
small positive change	4.43%	4.93%	4.43%	3.45%	6.40%	3.45%
no change either way	1.48%	5.42%	8.87%	1.97%	5.91%	7.39%
small negative change	0.99%	1.48%	4.43%	2.96%	2.46%	2.46%
large negative change	0.49%	0.49%	1.48%	0.99%	0.99%	4.43%
don't know/ can't say	0.49%	0.49%	0.00%	0.49%	0.00%	0.99%
no answer	0.00%	0.00%	0.49%	0.00%	0.49%	0.49%

Theme 2: Preparedness to teach

We asked teachers to indicate how they felt about their ability / preparedness to teach new courses, using a scale that ranged from *Completely agree; Mostly agree; Not sure either way; Mostly disagree; Completely disagree* [Q4].

The data shown in Table 5 illustrates the responses made against each subject area. We make an assumption that those selecting *Not Sure* either have little or no experience in teaching the course, as there was no option to omit this question. It is evident that teachers feel more prepared to teach some courses than others. We have highlighted the most significant features within the data.

Table 5: Overview of responses – preparedness to teach [Q4]

	Completely Agree	Mostly Agree	Not Sure	Mostly Disagree	Completely Disagree
The Broad General Education	39.4%	**45.3%**	5.4%	8.4%	1.5%
N4/5 Graphic Communication	**42.6%**	36.1%	10.4%	9.4%	1.5%
N4/5 Design and Manufacture	27.1%	**37.7%**	16.1%	14.6%	4.5%
N4/5 Engineering Science	15.2%	17.7%	17.2%	18.2%	**31.8%**
N4/5 Practical Woodworking	**45.7%**	38.1%	6.6%	7.1%	2.5%
N4/5 Practical Metalworking	18.5%	**27.7%**	19.5%	19.0%	15.4%
N4/5 Practical Electronics	6.2%	9.3%	20.6%	25.3%	**38.7%**
HG Graphic Communication	32.8%	**33.3%**	13.8%	15.4%	4.6%
HG Design and Manufacture	19.9%	**30.1%**	17.9%	17.9%	14.3%
HG Engineering Science	8.9%	13.0%	16.7%	19.3%	**42.2%**
AHG Graphic Communication	10.3%	20.0%	21.0%	23.6%	**25.1%**
AHG Design and Manufacture	3.6%	15.4%	20.5%	23.6%	**36.9%**
AHG Engineering Science	3.1%	5.2%	18.8%	15.1%	**57.8%**

Table 6 provides an overview of responses as positive (completely agree + mostly agree) and negative (mostly disagree + completely disagree) perceptions in preparedness to teach. We have removed any data for responses as *Not Sure*.

Table 6 teachers reporting their perception of their level of preparedness for the new CfE SQA courses

	Well prepared	Less well prepared
The Broad General Education	**84.7%**	9.9%
N4/5 Graphic Communication	**78.7%**	10.9%
N4/5 Design and Manufacture	**64.8%**	19.1%
N4/5 Engineering Science	32.9%	**50.0%**
N4/5 Practical Woodworking	**83.8%**	9.6%
N4/5 Practical Metalworking	**46.2%**	43.4%
N4/5 Practical Electronics	15.5%	**64.0%**
HG Graphic Communication	**66.1%**	20.0%
HG Design and Manufacture	**50.0%**	32.2%
HG Engineering Science	21.9%	**61.5%**
AHG Graphic Communication	30.3%	**48.7%**
AHG Design and Manufacture	19.0%	**60.5%**
AHG Engineering Science	8.3%	**72.9%**

Figures 3 to 14 illustrate responses to specific courses as a graphical representation.
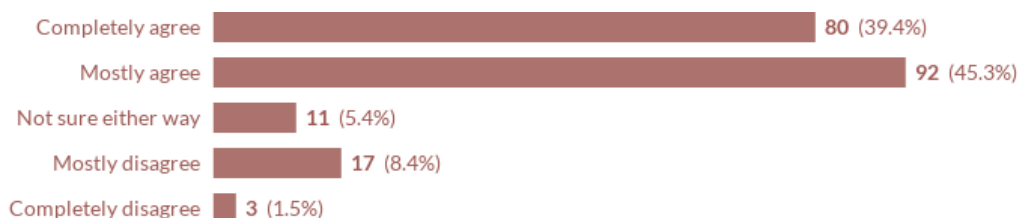

Fig 3: [Q4] You feel fully prepared to teach The Broad General Education
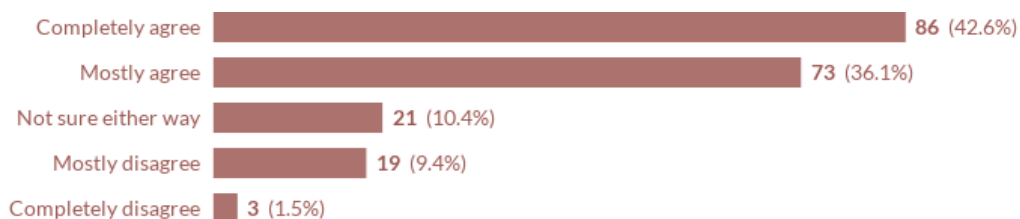

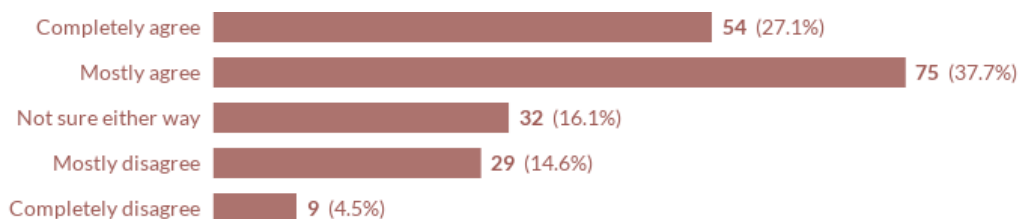Fig 4: [Q4] You feel fully prepared to teach N4/5 Graphic Communication

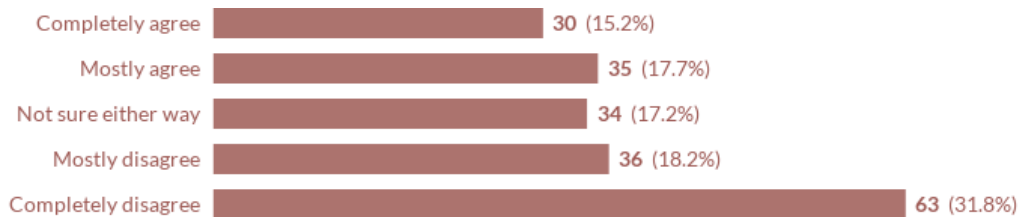Fig 5: [Q4] You feel fully prepared to teach N4/5 Design and Manufacture

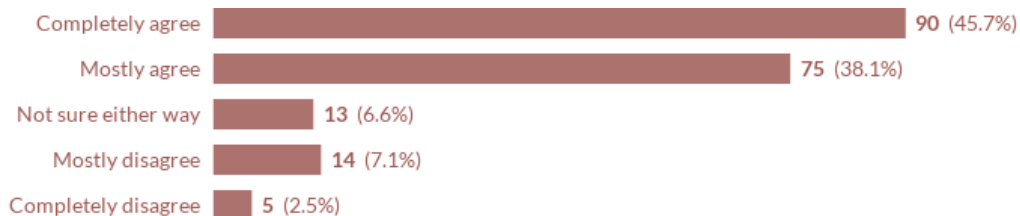Fig 6: [Q4] You feel fully prepared to teach N4/5 Engineering Science

Completely agree — 30 (15.2%)
Mostly agree — 35 (17.7%)
Not sure either way — 34 (17.2%)
Mostly disagree — 36 (18.2%)
Completely disagree — 63 (31.8%)

Fig 7: [Q4] You feel fully prepared to teach N4/5 Practical Woodworking

Completely agree — 90 (45.7%)
Mostly agree — 75 (38.1%)
Not sure either way — 13 (6.6%)
Mostly disagree — 14 (7.1%)
Completely disagree — 5 (2.5%)

Fig 8: [Q4] You feel fully prepared to teach N4/5 Practical Metalworking

Completely agree — 36 (18.5%)
Mostly agree — 54 (27.7%)
Not sure either way — 38 (19.5%)
Mostly disagree — 37 (19%)
Completely disagree — 30 (15.4%)
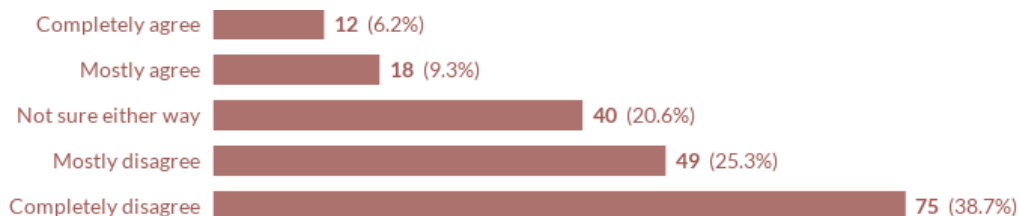
Fig 9: [Q4] You feel fully prepared to teach N4/5 Practical Electronics

Completely agree — 12 (6.2%)
Mostly agree — 18 (9.3%)
Not sure either way — 40 (20.6%)
Mostly disagree — 49 (25.3%)
Completely disagree — 75 (38.7%)
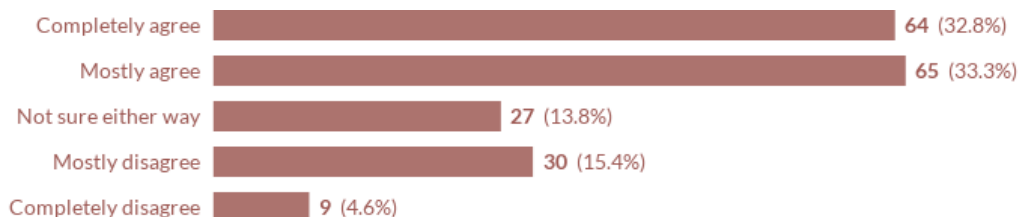
Fig 10: [Q4] You feel fully prepared to teach HG Graphic Communication

Completely agree — 64 (32.8%)
Mostly agree — 65 (33.3%)
Not sure either way — 27 (13.8%)
Mostly disagree — 30 (15.4%)
Completely disagree — 9 (4.6%)

Completely agree — 39 (19.9%)
Mostly agree — 59 (30.1%)
Not sure either way — 35 (17.9%)
Mostly disagree — 35 (17.9%)
Completely disagree — 28 (14.3%)
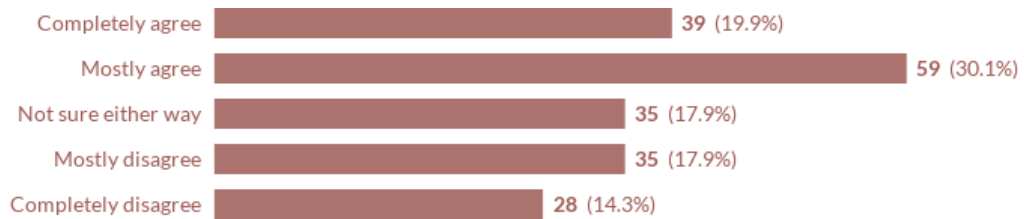
Fig 10: [Q4] You feel fully prepared to teach HG Design and Manufacture

Completely agree — 17 (8.9%)
Mostly agree — 25 (13%)
Not sure either way — 32 (16.7%)
Mostly disagree — 37 (19.3%)
Completely disagree — 81 (42.2%)
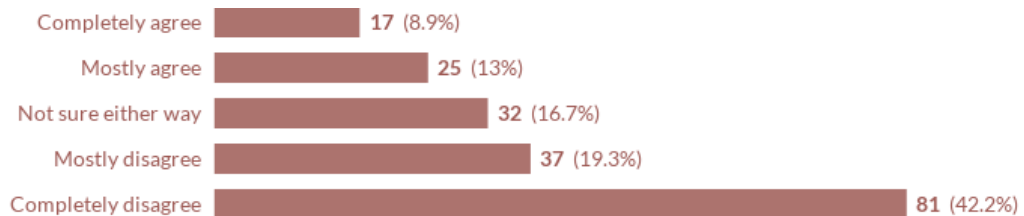
Fig 11: [Q4] You feel fully prepared to teach HG Engineering Science

Completely agree — 20 (10.3%)
Mostly agree — 39 (20%)
Not sure either way — 41 (21%)
Mostly disagree — 46 (23.6%)
Completely disagree — 49 (25.1%)
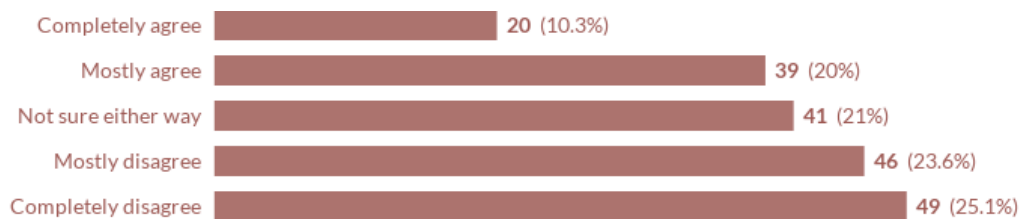
Fig 12: [Q4] You feel fully prepared to teach AHG Graphic Communication

Completely agree — 7 (3.6%)
Mostly agree — 30 (15.4%)
Not sure either way — 40 (20.5%)
Mostly disagree — 46 (23.6%)
Completely disagree — 72 (36.9%)
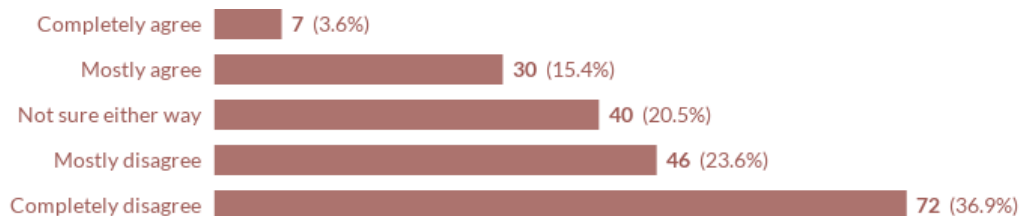
Fig 13: [Q4] You feel fully prepared to teach AHG Design and Manufacture

Completely agree — 6 (3.1%)
Mostly agree — 10 (5.2%)
Not sure either way — 36 (18.8%)
Mostly disagree — 29 (15.1%)
Completely disagree — 111 (57.8%)

Fig 14: [Q4] You feel fully prepared to teach AHG Engineering Science

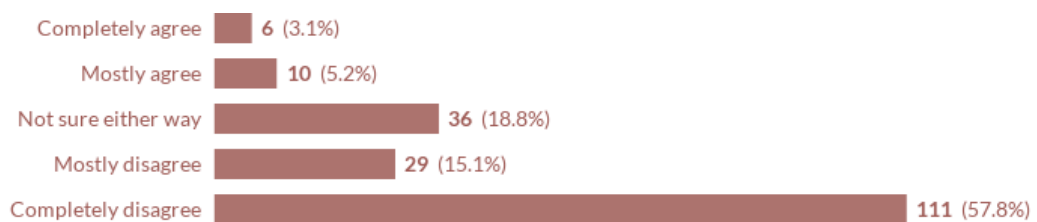A significant majority (84.7%) feel prepared to teach BGE. However, it is interesting to note that there is a distinction made between BGE CDEG and *Technological Developments in Society* which is noted as an area where teachers feel less well prepared and responses suggest more support is needed. There are a number of features emerging, notably teachers feel far more prepared teaching within the BGE and some of the National 4&5 than they do

within the Higher Grade and Advanced Higher Grade of the senior phase curriculum. One reason could be that Higher Grade and Advanced Higher Grade is still relatively new and that at the time of data collection, little resource was available to support learning and teaching. Engineering Science is where the teachers report they are less well prepared with National 4 and 5 at 50% increasing by 11.5% (to 61.5%) and then and by 22.9% in Advanced Higher Grade (to 72.9%). Findings indicate that teachers feel most prepared for National 4 and 5 Graphic Communication (78.7%) and National 4 and 5 Practical Woodworking (83.8%).

Those with more than 8 years teaching experience generally feel more positive about their preparedness to teach, with those with less than 8 years or more than 25 years feeling less well prepared. Those feeling more unprepared to teach Engineering Science generally work within Dumfries and Galloway, Dundee City, City of Edinburgh, East Lothian, Glasgow City and Renfrewshire. These responses may be directly proportional to the number of returns made within each area. For example, Glasgow City made the highest proportion of responses (13.3%) and had the highest response regarding less well prepared (6.4%). This does not necessarily indicate that the area requires more support, but rather it may be assumed, taken with those teachers who reported 'unsure', that these teachers are not offering / presenting candidates for these course (reasons unknown). Engineering Science is generally considered a challenge nationally, and not confined to any specific geographical area. Teachers were asked to report *which areas do you feel that you need more support? [Q4.a]*. Again, Engineering Science at 17.7% is seen as the area where most support is required, with the Broad General Education and Practical Woodworking the lowest at 6.7% and 6.6% respectively [Table 7:Fig15].

Table 7: Subject areas where people felt they needed more support (order most support required to least support required).

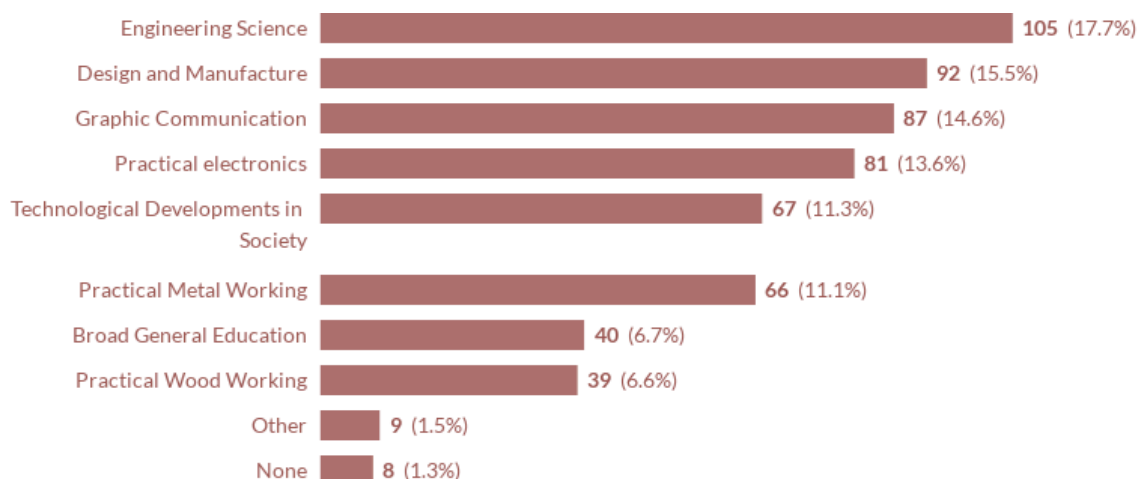| Subject Area (not defined by specific course)	Response
Engineering Science	17.7%
Design and Manufacture	15.5%
Graphic Communication	14.6%
Practical Electronics	13.6%
Technological Developments in Society	11.3%
Practical Metal Working	11.1%
Broad General Education	6.7%
Practical Woodworking	6.6%
Other/None	2.8%

Fig 15: Subject areas where people felt they needed more support – graphical representation.

Table 8 illustrates the support requirements from the teachers' perspective as tabulated against the length of service. Again, Engineering Science features as the perceived highest area where support is needed (n=105) with Practical Woodworking and the BGE the lowest (n=39:n=40).

Student Teachers feel less prepared to teach Engineering Science and Electronics. This may be a result of taught class organisation within Initial Teacher Education (ITE) at University. For example, at the University of Glasgow, there are specific courses focused on Design, Graphics and Technology Craft, however the content that we would recognise as Engineering Science is spread across several courses: Mathematics, Electronics, Engineering Mechanics, Systems and Integrating Technology, Materials and Processes and Engineering Systems and Robotics. Making interdisciplinary connections between these discrete subject areas requires experience during school placement, yet we recognise that not all schools deliver this subject area. In theory, this may mean that a student studying a 4 year Undergraduate Degree Programme may not experience classroom teaching in this subject, until they enter their Probation year.

Those with more teaching experience, although still recognising that Engineering Science remains challenging, also begin to highlight Graphic Communication and Design and Manufacture as areas where they feel that they need more support. The open comments provided by respondents would suggest that this comes from confusion caused by multi-faceted approaches to delivery e.g. *Portfolio*, *Unit by Unit* and *Combined* methodologies, assessment requirements and changes in pedagogy, requiring less manual technical graphics and more computer-aided input.

Table 8: Tabulated support requirements against length of service.

In which areas do you feel that you need more support?	What is your total length of service?						
	Student Teacher	0 to 3 years	4 to 7 years	8 to 11 years	12 to 16 years	17 to 24 years	25 years plus
Broad General Education	1	1	5	11	4	12	6
Technological Developments in Society	2	10	11	14	11	12	7
Graphic Communication	2	6	9	18	9	**19**	**24**
Design and Manufacture	3	6	12	**19**	**12**	18	22
Engineering Science	**7**	**15**	**23**	17	7	13	23
Practical Metal Working	4	11	10	17	9	7	8
Practical Wood Working	1	6	4	10	5	7	6
Practical Electronics	**7**	13	16	14	7	10	14
None	0	0	0	3	2	0	3
Other	0	1	0	4	3	1	0
No answer	0	0	0	0	0	0	0
Totals	27	69	90	127	69	99	113

Theme 3: Sources of Support & Guidance

We asked respondents to indicate where they would normally seek guidance, resources and/or information [Q5.b]. The most popular sources are colleagues from within school, with (n=157) people stating this as their most likely source. This data is displayed as a raw number given that respondents could specify more than one source. Other sources included, The SQA, Scottish Technology Teachers' Association and the Education Scotland website. The third most common source for information is the CDT Facebook group, where more than half (n=116) people indicated they would look for help. Current membership of CDT Facebook stands at 1,136 (last accessed on 26th August 2016). The total registered (full and provisional, Technical and Technological Education categories) with General Teaching Council Scotland (GTCS) at the time of the survey is 1860 teachers.

Table 9 provides an overview of where CDEG teachers are most likely to source support, in order of preference [Q5.b]. There is very little difference between those recently entering the profession and those with many years' experience. There are two exceptions; first, those with 8+ years' service turn to the SQA more so than those with less than 8 years teaching practice. The open responses indicating that the SQA is not the first option to newer teachers. Data indicates that they are making more use of social media and seeking

guidance from experienced colleagues for support in curriculum development and assessment. Second, GLOW is used far more by those with more than 17 years in service than anyone else. There were some instances where some people selected all options, with only one person stating that they did not seek support.

Table 9: Sources of support – most popular to least popular [Q5.b]

Identified Source	Number of People (Total n=203)
Colleagues within own school	**157**
The Scottish Qualifications Authority(general)	**121**
Scottish CDT Facebook Group	**116**
Local network or hub	**112**
Understanding Standards Website	**103**
Education Scotland Website	55
Other e.g. DATA, Youtube	32
The Scottish Technology Teachers' Association	22
GLOW	20
Higher Education Institute	4
None	1

Only 22 people indicated that they would seek support from the Scottish TTA, despite 85 people indicating that they were members. 57.1% of those responding within the survey said that they would be interested in joining a local professional hub, with 36 stating no interest and a further 51 saying that they were already in a hub. Those with 17 plus years' experience were generally participating in existing local networks, with those ranging from 4 to 11 years more likely to join a new professional network.

Theme 4: Impact of change on personal attitudes & attributes

Respondents were given an opportunity to state and describe their attitude towards how the changes had impacted on their own skills set, confidence in teaching, engagement with new approaches to teaching, learning and assessment, workload and motivation [Q5.1;Q5.2;Q5.3;Q5.4;Q5.5] – see Figures 16 to 21.

The most significant finding emerging from this data matrix is the response to **workload** [Q5.5:Fig 20], where 69% of respondents described a large negative change following the introduction of the new curriculum and a further 12.8% describing a small negative change. Only 9.9% suggested an improvement and 6.4% indicated no change either way. It would appear that this is the largest challenge that teachers face, with demand on their time and resource in developing new teaching materials and in carrying out assessment.

Notable features around **engagement** [Q5.4:Fig 19] are more neutral in nature, with 34.6% indicating a positive change, 40.6% indicating no change either way and an additional 24.8% feeling negative about change (figure x).
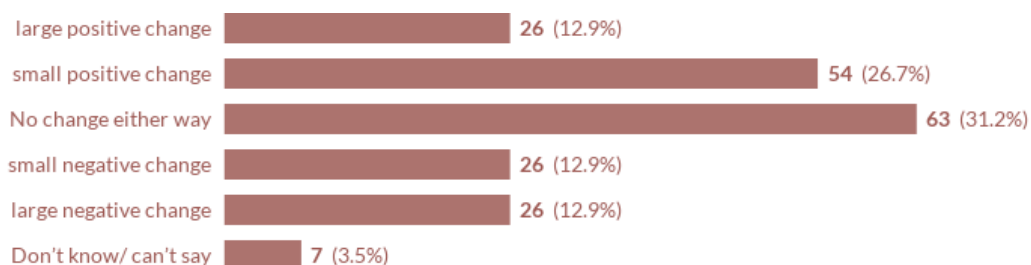
large positive change	26 (12.9%)
small positive change	54 (26.7%)
No change either way	63 (31.2%)
small negative change	26 (12.9%)
large negative change	26 (12.9%)
Don't know/ can't say	7 (3.5%)

Fig 16: Curricula change impact on motivation.

large positive change	28 (14%)
small positive change	62 (31%)
No change either way	64 (32%)
small negative change	24 (12%)
large negative change	14 (7%)
Don't know/ can't say	8 (4%)
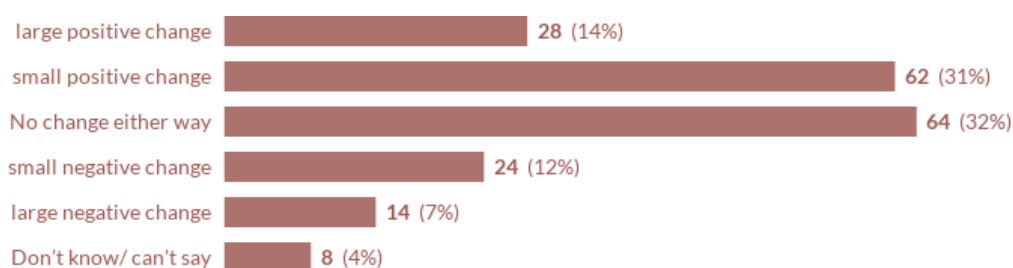
Fig 17: Curricula change impact on skills.

large positive change	19 (9.5%)
small positive change	41 (20.5%)
No change either way	66 (33%)
small negative change	45 (22.5%)
large negative change	23 (11.5%)
Don't know/ can't say	6 (3%)
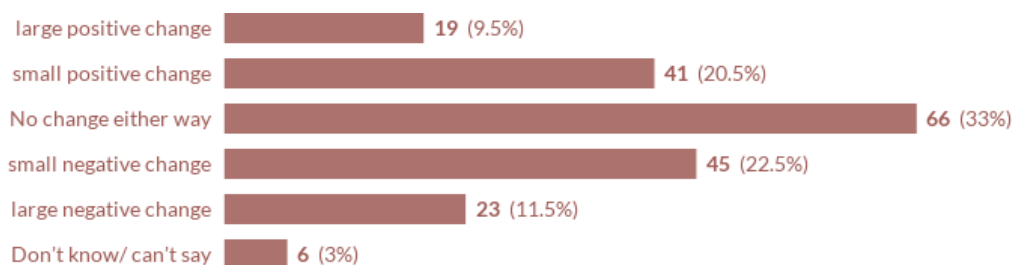
Fig 18: Curricula change impact on confidence.

large positive change	20 (10.2%)
small positive change	48 (24.4%)
No change either way	80 (40.6%)
small negative change	29 (14.7%)
large negative change	14 (7.1%)
Don't know/ can't say	6 (3%)
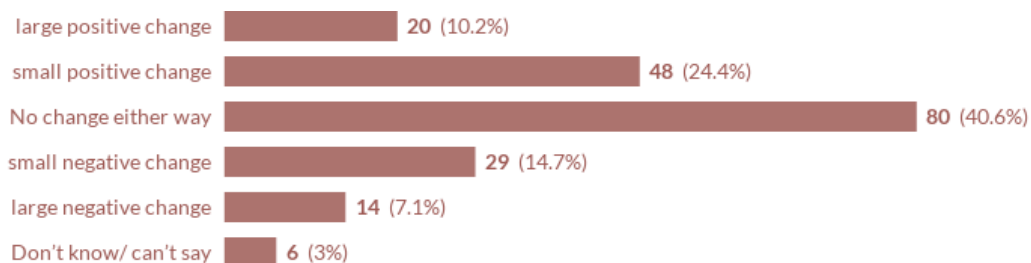
Fig 19: Curricula change impact on engagement.

large positive change 15 (7.4%)
small positive change 5 (2.5%)
No change either way 13 (6.4%)
small negative change 26 (12.8%)
large negative change 140 (69%)
Don't know/ can't say 4 (2%)
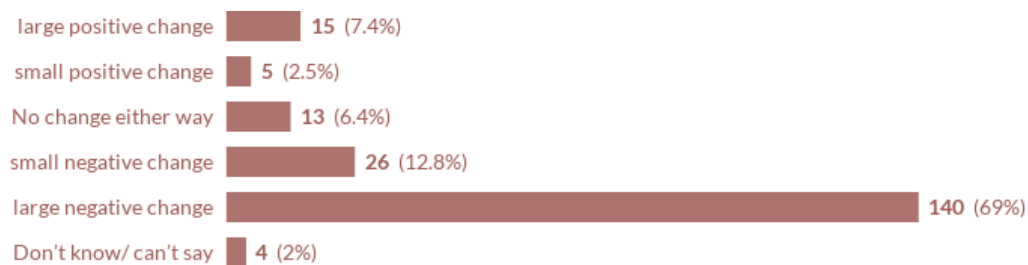
Fig 20: Curricula change impact on workload.

large positive change 22 (11%)
small positive change 58 (29%)
No change either way 64 (32%)
small negative change 31 (15.5%)
large negative change 19 (9.5%)
Don't know/ can't say 6 (3%)
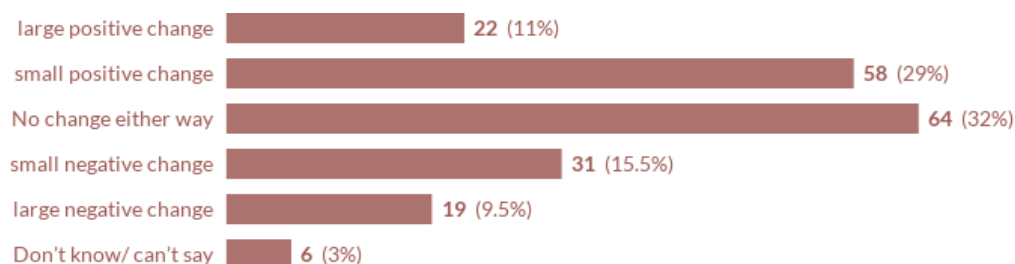
Fig 21: Curricula change impact on ability to innovate.

For the majority, motivation [Q5.1:Fig 16] has remained the same or has increased. However, 1 in 4 responding they feel less confident. In terms of confidence [Q5.3:Fig 18], 30 % feel confident, with 33% feeling no change and 34% feeling less confident.

Respondents report on impact of changes to their personal **skill set** [Q 5.2:Fig 17]. A significant majority (77%) felt that there had been no change or a degree of positive change, whereas 19% felt that there had been a negative impact on their skills set (Table 10). The cross tabulated data, against length of service, suggests that those with 25 years plus experience have felt the biggest detrimental impact on their skills set.

Table 10: Overview of attitude towards changes to skill set. Unknowns have been removed.

	Large Positive Change	Small Positive Change	No Change Either Way	Small Negative Change	Large Negative Change
How do you feel about changes to your skills set?	14.0%	**31.0%**	**32.0%**	12.0%	7.0%

Further Interpretation and Discussion

Throughout the questionnaire there were opportunities for open responses. Question 5.C specifically requested insight to the challenges the teachers felt they faced. The qualitative data collated from the survey was analysed, coded and grouped into emerging themes. 81 comments related to **assessment** [*Too much, too ambiguous, too time consuming, overassessment, seeking correct evidence for standards, making sense of, gleaning information*]; 43 comments related to **workload** and 102 comments that defined challenges related to **time** e.g. *need time, takes time, too much time, all time high, without time, long time, no extra time, lack of time.* Nearly all these references were connected to assessment and or/resource development. Further sub-categories were evident, e.g. teaching (n=34), SQA (n=30), learning (n=21), resources (n=42) *[lack of resources, out of date, limited funds]* and confidence (n=10). Several teachers commented on the differences between CfE models within schools, where some young people experienced more or less time within CDEG courses than their counterparts elsewhere in the curriculum. There are some who indicate that there may be instances where there is insufficient time to cover all the Experiences and Outcomes and that the SALs are not always addressed.

Teachers continue to contribute to curriculum development throughout their teaching experience and acknowledge that it is the nature of being a CDEG teacher to devise resources, plan units of work and contribute towards curriculum innovation to some degree at personal, school, local and/ or national level. However, this is less appreciated if teachers are expected to do this through lack of provision, clarity, support and resources. If they are obliged to fill a vacuum, they report that this is detrimental to their workload, and thus impacts on the general experience.

They are especially disheartened by the burden of the additional assessment workload demanded of them by the new SQA courses. Some note that they are aware that this has been detrimental to their work/life balance and to their physical and mental health. There is also concern with the impact this is having on the quality of teaching and learning from a learner's perspective. For both learner and teacher, assessment is viewed as too complex and time consuming. Teachers display a willingness to **engage with professional learning** and note interest in being part of a network for mutual support, sharing of ideas and resource development. However, the issue of **competing demands** on their time was reported throughout the survey e.g. curriculum development, resource design, innovation and assessment. Time is limited for professional learning and there were specific issues raised

regarding access to 'formal' professional learning, e.g. including the limited spaces on official SQA events, supply cover (available personnel and costs). Some indicated that they were increasingly required to work at the weekend, beyond a 35 hour week. This was considered to be a challenge. If a teacher could not attend personally, they were reliant on SQA exemplar material online or cascaded by a colleague or local network event. It was noted that this is where conflicting information, or misconceptions could be communicated, especially when there is a rise in the number of people turning to social media.

The survey notes that a Faculty structure can be challenging where there is no collegiate CDEG specific professional discourse and collaborative development is not available. Handler (2010) discussed the difference between specialist teacher as curriculum leader and curriculum leader, as in Faculty head, outwith the specialism. He notes that issues arise when curriculum leaders have a less strong level of cognisance in terms of political and societal ideology and construct of the subject. They are less able to understand the challenges and issues experienced by the teachers in their department/faculty. As long ago as 1949, Tyler noted the importance of curricular leaders understanding of educational purposes and purposes of the subject discipline teaching and learning on offer and what type of experiences would best suit the learners. They also need to understand what organisation and arrangement allows the teachers to enact, review, and modify and have professional ownership of the purposes and experiences offered to the learners.

Fullan (2001) notes that when teachers lose 'control' over the curriculum, due to perhaps over tight specification by exam boards, assessment and verification requirements, state curriculum arrangements, new initiatives and development planning to which they had no input, then curriculum leaders require substantial understanding and up to date knowledge of the changing policies, arrangements and challenges of implementation to address the challenges arising. When a faculty, department or curriculum area is led by a non-specialist this understanding may not be fully apparent. Several responses indicate some resentment where their curriculum leader did not have a background in CDEG, or where infrastructure and resource management did not fully appreciate the needs and requirements of a fully operational CDEG department.

Key Findings

The analysis of the findings suggest CDEG teachers:

- Continue to innovate, albeit development 'fatigue' is noted;
- Generally report 'no change' or 'positive attitudinal change' related to the impact in terms of personal engagement, skill set and motivation, albeit with less confidence;
- Currently make good use of networks and peer support, and would welcome support through a local hub or similar;
- Are concerned with the quality of learner experience, and teacher workload, due to over- assessment;
- Feel underprepared to teach Engineering Science and metal work generally;
- Are well prepared to teach BGE CDEG, yet require support in aspects, such as Technological Development in Society of BGE;
- Have concerns regarding changes to leadership and management structures, particularly those removing / replacing DET related specialists.

Key Findings

Conclusions

Most teachers arrive into the profession with a personal construct / vision and why they became a teacher. Fullan (2001) describes this as their 'moral purpose' and suggests that those who recognise they, as teacher, need to operate as agents of change and to develop strategies to accomplish 'moral goals' which hold the learners at the centre, whatever the system demands or whatever the imposed structure with which they are contending. A teacher requires a secure personal construct / moral purpose (this does not imply that this cannot change) and a willingness to engage in inquiry and collaboration to achieve some sort of mastery that can be developed through continuous learning and practice. Any change can prove to be a challenge for individuals and groups. It may expose them to new ideas and skills and require them to review where they fit into the bigger picture and what is demanded of them in the immediate, and longer term. It may be that the change promotes an approach or ideology that is long held by them personally, but equally, it may be in direct conflict and demand them to adopt an entirely different mind-set or set of skills. Teachers are not only being asked to change their roles and take on increased responsibility, in curriculum development, resource and assessment design, but at times this may impose a change to previously held attitudes and beliefs. They may have entered the professional with an entirely different view on the purpose of Technological Education.

Those that have been teaching in Scotland for over 25 years have experienced changes in general lower secondary stage, for example, the introduction of 5-14 Environmental Studies, if not in 1993, then the revised 2000 guidelines, and the implementation of CfE TCH I from 2010 onwards. At certificate stage, they may have experienced the introduction of Standard Grades in 1991 and revised Higher Grades, such as Graphic Communication (1994) followed by Higher Still in 1999. The shift from Standard Grade to Access, Intermediate, Higher Grade and Advanced Higher Grade in 2014 added systemic change to their teaching practice. CfE Nationals and new Higher Grades and Advanced Higher Grades therefore may be their fourth or fifth senior stage curriculum change. This is reflected within the comments made by those with a longer length of service. The findings in this survey suggest that on the whole, although there is a reporting of a lowering confidence with the introduction of the changes, there remains a willingness to collaborate / network and share. Innovation instigated by teachers is enriched when it is valued and given explicit support from the 'top' be that curriculum leader or senior manager. The findings from this survey indicate that teachers are aware of where they require additional support and report a willingness to engage in collaborative networks/hubs.

However, the issue of workload and time needs to be addressed as matter of urgency to create the space for the teacher to engage in professional learning, as appropriate to their personal and professional needs and context. Currently, there is a picture of being overwhelmed and a general feeling of 'only just coping'.

Guskey (2002:386) reminds us that during any period of change, it is important to recognise it is a gradual and difficult process, which requires time for the extra work. Thus, change does add to the workload and sense of anxiety, and may even be threatening, particularly if new practices may potentially 'not work' and impact negatively on the learners, or result in the impression that teachers are less capable as teachers.

Recommendations

Initial Teacher Education and Professional Learning

Formal continuation of CPLD for newly qualified teachers, and experienced teachers, ought to be available for personal and professional development in CDEG content, skills and knowledge of the DET portfolio and related pedagogy. PGDE and Masters level study help students appreciate the complexity of teaching, learning and assessment. These entry routes place emphasis on the importance of reflection, critique and reflexive practice, and promote enquiry led action research. However, limited time is available to develop pedagogical content knowledge and the required breadth of subject specific skill set. This is a particular issue for those entering teaching through the PGDE route, as there is no specific undergraduate degree that prepares a professional graduate for the entirety of the DET portfolio with the breadth and depth of knowledge and skill required.   The current teaching qualifications which help develop autonomous professionals, with high self-efficacy, are welcomed but may have skewed time balance away from the time available to develop some basic workshop craft skills, graphics and the range of engineering concepts required for teaching S1-S6 (and responding to more open ended design challenges). Teachers are keen to improve their own DET knowledge and understanding, skills set, and pedagogy. They are interested in seeking and sharing ideas. Additional support through high quality, and specific, continuing professional learning and development is welcomed. Investment in CPLD for staff, recruitment and retention of suitably qualified CDEG teachers and subject specific support resources and professional learning hubs would prove beneficial.

CPDL for curriculum leaders

It is evident that there is a need for continuing professional development / career long professional learning (CLPD) for non D&T specialists who are Faculty Heads or Curriculum Leaders to develop a deeper understanding of the DET specific and related issues, requirements and resource centered requests including CAD, CAM and general software / housekeeping aspects and requirements.

Workload

The ongoing review of SQA senior phase certificate courses and approaches to assessment is welcomed. The SQA have taken further action to reduce / combine Higher Design and Manufacture learning outcomes. There are two Understanding Standards events for teachers (August 2016). Such actions acknowledge some of the issues the teacher voiced in

the survey. Further work to address workload issues, specifically the issue of internal / external assessment of course assignments has to be resolved.

Clarification of BGE model and equity in entitlement

Since the survey (Oct / Nov 2015) clarification has been issued to schools regarding the BGE model of entitlement and a revisiting of the CfE philosophy that underpins the purpose of education in Scotland. The Cabinet Secretary of Education and Skills' Strategy has reiterated review and clarification of underpinning philosophy and purpose of CfE should be undertaken 2016-2017 (Scottish Government, 2016). The survey indicated dissatisfaction with the discrepancies across schools and councils. This clarification may result in the equity of provision that is currently an issue for the respondents. The shortage of DET staff and issues of recruitment also needs to be addressed to enable parity and equity in this regard.

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Annex 1: Illustrative Comments

motivation [of teacher and / or learner] examples of extended responses:
- *'I feel as those the students are jumping through hoops to meet the assessment criteria. I have particularly noticed this in ES where after each outcome I feel as though I am giving out a class test. This effects students' motivation for the subject and their engagement at times.'*
- *'self motivation increased by positive results in class. Pupils see need for learning skills and learn more better Still motivated despite increased work load'*
- *'CfE at BGE was fantastic opportunity to innovate and collaborate. This was the most motivational and positive phase in terms of career.'*
- *'A lot of work was created in the lead up to the introduction of the new qualifications, a lot of which we have had to change each year as we have been developing our understanding of the new courses. As a result my personal motivation is very low. '*
- *'Initial excitement and motivation for new courses (flexibility, innovation, etc) has vanished. Assessment is very restrictive and lack of confidence has prevented us from deviating from prescribed unit assessment. Many staff refusing to alter teaching styles and content at all. Exhausted from having to develop so much due to lack of provision.'*
- *'Initial motivation was high, but after a few years of delivery and constant refinement against SQA verification process and complete lack of feedback on our approaches/marking this has dropped off. Workload is disproportionate to the results both in terms of the huge amount of development work undertaken and the over assessment/data collection of Assessment Standards for each course - in complete juxtaposition to CfE principles. '*
- *'Work pressures and expectations at both national and local level have changed enormously over the past few years meaning my personal motivation is on the way down.'*
- *The number of changes over the past couple of years has been too much too soon. There has been far too much to do with regards to new courses, I do not feel I have completely mastered any. This has affected my personal motivation all be it short term!*

confidence examples of extended responses:
- *'Increased confidence will come through ongoing course delivery.'*
- *'This has lead to decreased confidence and motivation.'*
- *'Initial excitement and motivation for new courses (flexibility, innovation, etc) has vanished. Assessment is very restrictive and lack of confidence has prevented us from deviating from prescribed unit assessment. Many staff refusing to alter teaching styles and content at all. Exhausted from having to develop so much due to lack of provision.'*
- *'feel that often I am 'winging' lessons as feel underprepared. Confidence in teaching my lessons has decreased. Although I'd like for my skill set to develop there is no time or money to allow this to happen'' Confidence is reduced due to lack of standard setting by SQA during development/deployment of new course but in direct relation to this it has allowed us to have more innovate ways to deliver/assess the course. Initial motivation was high, but after a few years of delivery and constant refinement against SQA verification process and complete lack of feedback on our approaches/marking this has dropped off. Workload is disproportionate to the results both in terms of the huge amount of development work undertaken and the over assessment/data collection of Assessment Standards for each course - in complete juxtaposition to CfE principles. '*
- *'It is emotionally draining to not have full confidence in your own judgments and to constantly feel like you are making mistakes with the worst possible outcome being you negatively impacting a child's future. I'm terrified I will burn out very very quickly.'*
- *'The large increase in workload, shortage of time and the "new" aspects of some coursework, eg.DTP and CAD., has had negative impact on my confidence. I used to feel confident teaching all courses within the Design Technology suite. I no longer have that confidence.'*
- *work load is an issue with the number of subjects being taught and the number of AS to be marked. marking of final Design Assignments and AVU it is unmanageable and having an impact on teachers motivation and confidence in their own abilities.'*
- *'Pupils have lost confidence because staff generally are not confident across the school.'*
- *'New assessments, have dented my confidence. Changes made to courses PWW issued in Nov 2015 by word of mouth by verifiers, vague outcomes in N7 graphics lack of support, Verifiers schools failing verification. Feeling abandoned'*

Workload e.g. extended comments

- *Greatly increased workload. Bi and Tri-level teaching in one class is also a major issue, particularly with Design and Manufacture that we are yet to overcome. (I.e teaching workshop processes v industrial processes).*
- *Workload is huge!!!*
  Having to mark all subjects internally.
  Keeping up with changes and getting a grasp of the national standard.
- *Workload - we have 5 distinct subjects in the dept and BGE. It has been a huge task to develop coursework - something that should have been done properly centrally. To overcome this we have shared a little centrally and I have 'grabbed' some things from the CDT facebook page.*
- *Workload and marking is getting better as I have developed better recording systems. However, having to develop so much resources for 5 different subjects taught at N5/H/Adv H is becoming tiring and is having a negative impact on health.*

Time e.g. extended comments

- *3. BGE- meant to be S1-3 but realistically I have met very few schools that do this and often S3 is used as an additional year for Nationals. However although that sounds like a criticism of school actually I aim it at SQA who are asking for so much evidence to be produced that the only way we can do that is to use time from S3. There is a lack of consistency across authorities never mind Scotland that some schools have 3 periods a week, others have 4 or 5. and the timings of those period vary between 42 minutes and 54 minutes. There is no help from the SQA saying this course takes 120 hours therefore if you are only doing 3 periods at 45 mins you'll need time from S3. But again that is down to schools too with some S4 pupils sitting 9 nationals (my previous school) and some sitting 7 (my current school)*
- *The biggest challenges have been access to development time and appropriate CPD*
- *3. Time. I have so far not been able to find a way to assess all assessment standards effectively within one academic year. I have so far always ended up rushing some major sections which obviously disadvantages the pupils. This is across all subjects. Covering content in enough depth but quick enough is a major challenge. The AVU tasks apparently have a guide time of approx 10 hours. Not possible. so far pupils have required over double that. I do not know how I am going to overcome this*
- *Time allocation - Insufficient development time given to Staff*
- *We find the courses challenging for time, we have less than 120 hours for Nat 4&5, and 150 hours for Nat 6&7 courses.*
  Schools across Scotland have varying time allowances, equipment resourcing, but results are being compared as an equal.
- *Time - teaching such a wide and varied timetable (as well as running a faculty) means that materials produced are not always to the standards I would be used to. Very much I am only one or two periods ahead of classes which makes forward planning really difficult. Although I can rely on previously made resources, these don't always suit the new outcomes which means development needs to be made for all teaching materials.*
  2) Skill Set - Many new topics (which generally relate to changes in technology - which is good!) but just now I'm struggling to up my skill set. Most of this is completed in my own time (more than my 35 hours!!!!) searching for hours to find the answers to my development needs. School CPD budgets are really small now and a lot of our CPD needs require multiple courses for multiple subjects and teachers....there is no way it can be afforded! This training needs to be provided by Education Scotland...yes authority support can be used, but you then have to rely on having an expert in your authority....which is not easy when you don't have many schools to choose from.
- *Time: increased workload has reduced time to create meaningful and engaging lessons*
- *Severe lack of time within timetable to research and create new robust courses.*
- *Lack of time to develop new understanding of AH curriculum content.*
- *Time- My faculty head isn't a subject specialist and has her protected time yet can't do any work for us. We however are told it's a part of our yearly CPD. If I stopped working after my 35 hrs our school wouldn't have a course. The stress of ensuring my pupils have work for them is never ending. You are constantly having to be a week ahead at best. It's not ensuring quality learning and teaching that I know I could do if I was giving time to properly develop courses.*
  I feel the unit assessments take time away from teaching, pupils are begining to feel disheartened when they are given yet another task sheet. It's hard to have autonomy in your class when you must follow the tasks given. The tasks aren't engaging enough for the pupils.
- *Time will be taken away from learning and teaching and put into marking, cross marking, verification and moderation on the behalf of the SQA. Teachers are not SQA employee's and are no longer paid to mark scripts etc.*
- *3. The lack of time and money to develop new courses or resources which are sustainable, robust and even just useful in supporting our pupils learn, and achieve in exams.*
- *Time constraints mean that more work has to accomplished at home .*
- *3) creating teaching resources for new courses without any TIME allocated*
- *When do you get the time to look for information? Could be good recourses in the above but when do I get to them?*

- *Time- My faculty head isn't a subject specialist and has her protected time yet can't do any work for us. We however are told it's a part of our yearly CPD. If I stopped working after my 35 hrs our school wouldn't have a course. The stress of ensuring my pupils have work for them is never ending. You are constantly having to be a week ahead at best. It's not ensuring quality learning and teaching that I know I could do if I was giving time to properly develop courses.*

Assessment e.g. extended comments
- *Assessment standards are vague and very subjective*
- *Keeping on top of all the assessment requirements, particularly as we have to internally assess all work with no time to do this.*
- *Significant increase in assessment at unit level. eg Higher ES requires around 1000 assessment judgements to be made and recorded for a class of 20 students. Marking of homework, class tests etc is on top of this. Lack of exemplification materials in the first 2 years of each course was/is frustrating.*
- *Massive over-assessment meaning that I am more focused on getting through the huge amount of assessment standards for each student.*
  In a full class of 20 we are looking at about 3500 assessment boxes that require some form of acknowledgment, teacher signature, evidence reference.
- *The assessments have made the job much less enjoyable, and served little purpose . It has reduced teaching time, done little to improve pupil's knowledge or ability. Any good teacher has their own strategy for keeping tabs on pupil progress. The present system is monumental and not sustainable. The same happened with Higher Still, and Standard Grade. As the years unfolded, assessments were reduced as it was realised it was not workable. Here we go again.*
- *The management of internal assessment, moderation and agreeing standards. Still trying to overcome.*
- *I feel the unit assessments take time away from teaching, pupils are begining to feel disheartened when they are given yet another task sheet. It's hard to have autonomy in your class when you must follow the tasks given. The tasks aren't engaging enough for the pupils.*
- *3) Inconsistent application of standards - As we teach multiple subjects under the heading of Design & Technology it's quite easy to see that the standards expected in D&M, WW and GC change between each other. It is also noticed that the standard between unit work and final assignments don't match up either. This seems to change from subject to subject and is something that needs addressed!*
- *The new approaches to unit assessment in N3-AH is excessive and is stifling learning and teaching*
- *Unnecessary assessments and lack of time leads to a very boring and stressful experience for both children and staff.*
- *Include unpaid internal assessment not only of unit, but also AV i.e course assessment units compared to other subject areas…*
- *Include unpaid internal assessment not only of unit, but also AV i.e course assessment units compared to other subject areas…*

Resources e.g. extended comments
- *Lack of exemplar materials throughout the entire process in all subjects.*
  The vastness of different approaches across Scotland due to resources and materials.
- *Poor resources from SQA*
- *2. Not having enough of a budget to develop new resources/buy textbooks and required equipment.*
- *Lack of up-to-date resources.Still working on this one!*
- *Underfunding of resources, lack of staff to deliver full range of courses and lack of training to confidently deliver the courses*
- *A clear understanding of assessment standards and interpretation of resources such as the E's and O's, progression framework, sig. aspects of learning etc. Exemplars are minimal on Education Scotland website and do not cover all E's and O's. Individual interpretation in each department could mean inconsistency in pupils learning. I have not yet overcome the challenge of assessing at each level however I am sure that even more documentation will be trickled out from Education Scotland.*
- *Lack of resources so everything has to be created in house*
- *Resources dwindling with budget cuts*
- *Lack of resources - restrictions on funding to purchase necessary equipment/materials to satisfactorily complete the course work expected.*
- Lack of **CPD** e.g. finding relevant CPD; access to CPD ; SQA Education Scotland provided CPD, with space for all who need it and offered in a timely fashion… to date Understanding standards too late on in the year.. .. .
- *School CPD budgets are really small now and a lot of our CPD needs require multiple courses for multiple subjects and teachers....there is no way it can be afforded!*
- *Sourcing relevant CPD and training materials to prepare myself (and my staff) to best deliver the new qualifications*
- *N7 graphics. lack of support, have yet to meet anyone who can explain the technologies and techniques in the visual media unit. have asked for support form the sqa since Auguest CPD promised, nothing. Questions sent eventually replied still vague.*

> *The final project, the wording says your teacher will tell you if your project is suitable. My challenges is how do I know if it is complex enough or challenging enough.*
- *Too much of my time is used to develop new courses, I am struggling to balance this with improving my skill set in order to produce this material....especially at Advanced Higher level. Teachers/authorities have been left on their own to try and seek out information/help for this....should this have not been offered at a national level???*

Bi/ tri-level e.g. extended comments
- *Teaching multi level courses in the same classroom, particularly when some are sitting an exam and some are not.*
- *tri/quad level classes sometimes with two courses in the one room for example I currently have nat 4,5 and higher GC in the one room*
- *This year, I have been given two split level classes: Graphic Communication and Design and Manufacture. This has been challenging due to the big differences in course content but I do feel it has developed me more as a teacher. Due to teaching effectively 4 qualification classes, I find developing material difficult as I need to spread it over the levels/courses. However, as a department we have tried to delegate a course and level to try and decrease this anxiety but there is still some there.*
- *Bi-level teaching has been very challenging mainly because the tasks being totally different.*
  Time to fit teaching and learning in before the unit tasks is tight to say the least.
  Pupil motivation is a challenge when it comes to nat 4...as there is no exam my pupils will not turn up for supported study as they feel they do not need it.
- *Varied implementation in different schools. Poorly managed. 2 or 3 different levels in one class requiring wildly different teaching (nat4/5 and higher d&m)*
- *1. Teaching bi/tri level classes with subjects that are so significantly different and having no fall back. None of our subjects have a National 3 and therefore the standard grade foundation pupils that we would have taught have been forgotten because it is not beneficial to anyone to try and teach N3 D&T in a class with Nat4/5 DM/GC/PWW or EngSci. I feel like I am completely failing these pupils who have to "settle" for units. What good is a unit? and the lack of exam for National 4 pupils is a very serious bug bear of mine as these pupils are left behind when doing exam revision, they disengage because they don't have an exam to study for. I just feel there is a lack of value in the Nat 4 and Nat 3 courses because of this. I have pupils failing Nat 4 who would have achieved a foundation SG but that's not an option but its now N3 D&T. I've had to focus on getting pupils units but it is still a challenge to engage pupils who do not care because they have no end result.*
- *Bi-level teaching is almost impossible with no N4 exam and overall serious flaws in the curriculum structure and progression.*
- *Inflexibility of curriculum structure/timetable in school.*

Budget / resources e.g. extended comments related to
- ICT issues of support, renewal, access to changing software and technologies of 21st century including aspects such as PC for pneumatics, need kit, need CPD, need time to learn
- *(teachers) lack of knowledge of DTP*
  (teachers need) training for 3D modelling
  lack of computers to allow each pupil to develop their skills
- *Lack of appropriate infrastructure. ICT access, flexibility to use latest software are denied by our LA*
- *IT issues. Challenges getting softwares which would be beneficial installed across L.A as IT isn't up to scratch, no money to buy new equipment and therefore standard of work produced is lower than others, unfair advantage to other candidates in other L.A's. BIG challenge.*
- *Lack of resources, many of the projects which are suggested departmentally are not possible due to budget/computing restrictions.*
- *Changes required in approaches to teaching and new software due to new qualifications*
- *Having to better my skills with computer software for graphics, there is a definite lack of courses on DTP, and, image manipulation.*

Models of school CfE approach e.g. extended comments
- *The new curriculum structure has devastated numbers in the upper school, the narrowing of option choices has limited uptake despite students being eager to continue.*
- *Complete change to the BGE courses we offer to bring them in line with CFE.*
- *3 year BGE. The problem of S2 pupils coasting has been extended to S2 and s3. High ability pupils are being held back and restricted and low ability pupils are fed up being in classes they have no interest in.*
- *Timetabling and staffing. Pupil choices have been narrowed not widened. All classes are multi level in some instances trilevel to fit them in. Some subjects are being removed from timetable due to difficulties in staffing and due to less choice being avaliable to pupils and there fore less pupils choosing non-core subjects*

- *The main challenge is that there are many interpretations of what CfE should be. I believe S3 should be a deeper broad general education and others believe that s3 should be doing assessments (almost a 2 yr course again)*
- *Bureaucracy created by CfE*
  Principles and methodology of CfE resisted by school managers - they want to dictate.
- *Assessment of Achievement and progress within the CfE framework (&SAoL) whilst ensuring a sound foundation is set for NQs.*
- *BGE development then redesign in light of N5*
- *S3 BGE doesn't work. Kids become disengaged.*
- *Skills: This is probably one of the most positive aspects of cfe and to be embraced. It s logically instrumental in its goals and easier to implement though Alan taking time to develop understanding, delivery and resources.*
  I could talk all day about the challenges of delivering cfe and the courses, but the reality is everyone lacks the time to effectively develop resources, learn and understand the concepts, that will ensure effective delivery of the outcomes. It is going to take many more years to feel we can confidently say we are in control of the courses, and they are being delivered in cognisance with the cfe ethos.
- *lack of parental understanding of CfE and the BGE*
- *1). Tracking progress of SALs across the curriculum. Not yet overcome*
- *Assessment is too complex N4-Higher, too vague at S1-3.*
- *2) No advice when applying C for E Outcomes. Have to see what otherschools are doing.*
- *We have been expected to modify the way we teach and what we teach yet the SQA have basically stayed the same in their assessment of pupils - except, for those pupils who cannot achieve N5, we are basically back to the reason O levels were scrapped. N4 is thought so little of (outwith schools) as to be not worth pupils efforts. My experience is that a large part of the pupil community are totally switched off and demotivated by school. This is a damning indictment of this flagship curriculum design and is derived from SQA's assessment model, rather than the conceptual model for CfE.*
- *Updating and constantly reviewing the BGE to best prepare and support pupils for the new qualifications.*
- *CfE in the BGE is fun, open, challenging, exciting and skilful. All that energy is sucked away as soon as they hit their first Nat 5 course and have no freedom to experiment or divert from a very linear path.*

Variety of models adopted for presentation, timetabling etc in schools across Scotland. e.g. extended comments

- *Time - I have found that different school are being allocated different times in which to teach SQA course. In my school we have four one hour periods a week to teach National 4/5 and Higher. I have found it a struggle to complete the necessary course work and assessments in this time.*
- *BGE- meant to be S1-3 but realistically I have met very few schools that do this and often S3 is used as an additional year for Nationals. However although that sounds like a criticism of school actually I aim it at SQA who are asking for so much evidence to be produced that the only way we can do that is to use time from S3. There is a lack of consistency across authorities never mind Scotland that some schools have 3 periods a week, others have 4 or 5. and the timings of those period vary between 42 minutes and 54 minutes. There is no help from the SQA saying this course takes 120 hours therefore if you are only doing 3 periods at 45 mins you'll need time from S3. But again that is down to schools too with some S4 pupils sitting 9 nationals (my previous school) and some sitting 7 (my current school)*

Note: some comments may have been removed as they identify individuals or contain inappropriate commentary.

Postscript

Clarification

Since the survey (Oct -Nov2015, clarification has been issued to schools regarding the BGE model of entitlement and a revisiting of the CfE philosophy that underpins the purpose of education in Scotland. The Cabinet Secretary of Education and Skills' Strategy has reiterated review and clarification of underpinning philosophy and purpose of CfE should be undertaken 2016-2017 (Scottish Government, 2016).

Review of SQA senior phase certificate courses

The SQA have taken further action to reduce / combine Higher Design and Manufacture learning outcomes with two Understanding Standards events scheduled for first month of the new academic term. Such actions acknowledge some of the issues the teacher voice as expressed in the survey.

CPDL for leaders

It is evident that there is a need for continuing professional development / career long professional learning (CLPD) for non D&T specialists who are Faculty Heads or Curriculum Leaders to develop a deeper understanding of the issues, requirements and resource centered requests including CAD, CAM and general software / housekeeping aspects and requirements.

Initial Teacher Education

Formal continuation of CPLD for NQTs (Newly Qualified Teachers) in content, skills and knowledge of the DET portfolio with the shift to PGDE and Masters level study, although underlines the complexity of teaching, learning and assessment, places emphasis on the importance of reflection, reflexive and critique, and promotes continued enquiry led action research. The autonomous professional, with high self-efficacy, may have skewed time balance away from the time available to develop some basic workshop craft skills, graphics and the range of engineering concepts required for teaching S1-S6 (and responding to more open ended design changes).