



For Membership as a MirandaNet Senior Fellow

UK PRIMARY & SECONDARY TEACHERS' RESPONSES TO THE NEW COMPUTING CURRICULUM

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INTRODUCTION:

In 2014 the UK Government introduced a raft of changes to the National Curriculum, amongst these was the rebranding and replacement of 'Information and Communications Technology (ICT)' with 'Computing' under section 84 and 85 of the Education Act 2002.

Devised in association with industry experts from the Royal Academy of Engineering and the British Computer Society, with its subject content based on the findings in the Royal Society's report on Computing in schools called 'Shut Down or Restart'¹.

Government's public consultation to inform the change was completed on 16 April 2013, it raised a number of responses that formed the basis for this survey 3 years after implementation. The main drivers for change as listed by Government was that ICT was not considered a 'rigorous subject, had a bad reputation and ill prepared students for the digital future they would live in'. In response the public listed important considerations that had seemingly been ignored or overlooked in the Government's proposals, pertaining to the readiness of the UK Education system for the changes suggested.

The concerns by respondents to the consultations covered various aspects of the Educational experience including:

- A lack of adequately skilled teachers with a relevant degree to teach the subject effectively, as most ICT teachers largely had a different subject background, usually Business studies.
- Primary teachers especially would find its teaching daunting due to the nature of their teacher training and specialisms.
- If learners had the required cognitive and practical ability to engage with Computational concepts, especially at primary level.
- The name change was myopic in focus and exclusive in content with too much emphasis on programming over digital literacy skills and other areas of Information Technology.

The aims of the survey and this report was to primarily identify how these concerns were being addressed by teachers across all the Key Stages - from primary to secondary.

BACKGROUND, RESEARCH METHODS & SAMPLES:

The survey was carried out as part of a leadership programme offered by the National Union of Teachers (NUT) from November 2016 until July 2017, with the focus of understanding the impact the new curriculum was having and to identify areas for improvement for it to fulfil its idealised objectives.

The entire survey was carried out online using Survey Monkey and open to all teachers of the subject. Contact details for respondents were a requirement to ensure verification and reliability of responses, with identities kept anonymous for the dissemination of results in the public domain.

A focus group interview was later conducted with primary pupils to correlate with primary teachers responses but that data was used for a different study. This report focuses solely on the teachers' responses.

In total 36 teachers responded to the survey. Of these 8 taught at primary and 22 at secondary level. 6 responses were voided as no personal details were provided for verification and one of them (a primary teacher) actually did not teach Computing.

1 of the secondary respondents taught abroad but followed the English Curriculum.

At secondary 2 were in Management, including a Vice-Principal, 11 Subject Leaders, 3 Teachers with responsibilities and 6 teachers. At primary 1 was in Management, 3 subject leaders, 2 teachers with responsibilities and 1 teacher.

RECRUITMENT & RETENTION:

Attracting trained professionals with a relevant background to the subject was an on-going issue. Only 1 of the respondents had a department where all staff had a relevant prior qualification. 1 department head was a Maths specialist who had been co-opted to the role due to no available staff. The rest were previous ICT teachers still in their roles but had to re-train to deliver the new curriculum.

Recruiting skilled personnel was also a problem. The main reason identified by 9 out of the 22 secondary school teachers was low salary packages. It was cited as the main reason why the teaching profession would seem a less attractive option to pursuing a job in industry. More attractive salary packages were required to attract the right type of professionals with relevant qualifications to the roles.

3 stated that the introduction of grants, bursaries and other incentives to graduates would have a positive effect on recruitment like it does for other 'in-demand' subjects like Maths, English and the Sciences.

In a similar vein, 3 others mentioned that recruitment would be higher if efforts were made at undergraduate level to target computer science students before graduation, to make them more familiar with opportunities in teaching.

3 respondents cited the prevailing influence of the 'bad reputation' ICT had as cause and more could be done to "improve the standing of the subject" so graduates would recognise the relevance of their studies to the profession as "many computing professionals are not aware of the changes and are surprised by the content of the new curriculum".

In rather stark contrast, 3 primary staff were "Not sure" how recruitment could be increased and only 1 mentioned the need for "improved salary", 1 other cited the need for more advertising and another the need for grants as incentives.

TEACHING & LEARNING:

Training –

Access to training or re-training was the only constant feature in the responses across both levels of education. The up skilling had been achieved using a variety of means; in-house CPDs, external facilitators, local Government and personal study.

At primary level only the senior member of staff had received external training with the Local Educational Authority (LEA), then passed on skills to the 5 other members of staff using in-house workshops. 2 other respondents from different institutions had also received external training, one with their LEA and the other with BT Barefoot. The Barefoot training focussed solely on the use of its resources in schemes of work, not generic Computing skills. Only 1 cited having to resort to self-study to improve their skills base.

The range of software application cited were Rising Stars, Scratch, 2Paint, Movie Maker, programmable toys, Snap!, Kodu and Barefoot Computing. Of these, only Scratch was a constant feature in all responses.

At secondary level the evidence of training was much more extensive. 16 of the respondents confirmed having received extra training either to up skill or to become more familiar with the examining bodies requirements.

7 indicated that they had received no training at all. 1 was because the school had not provided any such opportunities, 3 indicated it was because they did not require it, as they were of a relevant subject background, "As I'm a Computer Science graduate most of the training available is at too low a level." Implying that perhaps most courses on offer were not designed to extend the skills of those already familiar with the subject, rather those who were unfamiliar?

The remaining 2 did not see the value in training, as they were familiar with computing content "We've taught A-Level Computing for the last 8 or so years, so little training was needed." The final 2 who had not received any official training instead used the route of self-study through textbooks and Internet resources. Whether this was due to the organisation's inability to provide access to training or otherwise, was not clarified.

The organisations providing the extra training were similarly varied. Top of the list was Computing At School (CAS), where respondents had taken a range of evening classes as well as used their schools as hubs for training. It was mentioned 7 times. Other private organisations mentioned were PIXL, CodeAcademy and CourseEra. Massive Open Online Courses (MOOCS), run by universities such as UEA, Warwick and Wolverhampton, were mentioned twice and training from the Government or LEA, thrice. It highlighted the issue that perhaps not all local government bodies had available funds to provide training for teachers in their boroughs.

With regards to training to better understand new exam requirements, OCR was mentioned a total of 4 times. Other listings from respondents were generically referenced as 'exam board(s)' or 'private company'.

The range of new applications and languages trained and introduced to learners were likewise more extensive than at Primary level; ranging from Python, Scratch, C#, VB, JavaScript, PHP, HTML, CSS, SQL, GDevelop, LiveCode, Microbit, JustBasic, Lego robots, Raspberry Pi, C++, Visual Studio and XAMMP, amongst other IDLE environments not specified by name.

The application listed consistently by respondents was Python, a total of 12 times.

None of the primary teachers mentioned CAS at all, either due to not being aware of their existence or services provided. This could also be due to CAS not actively marketing to the primary sector.

Students' learning -

On the question of gaps in learners' knowledge that required bridging, there were similarly marked differences at primary and secondary level.

All 5 respondents from the same primary school were in agreement that their issue was a lack of basic digital skills such 'highlighting, copying and pasting' due to a lack of access to computer devices in the school. To overcome this challenge, more time in lessons with opportunities to use laptops to encourage familiarity, was introduced. It also presented further challenges in terms of finding extra time to teach higher-level Computing concepts such as logic and decomposition. Of the remaining 3 in other institutions, they first identified unwillingness by the pupils to develop computational thinking without stating exactly why, the second was trying to get the pupils already in the system before the curricula change to catch up on their ability to program and understand its foundational concepts, whilst the third cited Special Educational Needs (SEND) as the only factor affecting pupil learning and engagement.

The main gap identified at secondary level was a lack of computational thinking abilities. The inability to apply logic, decomposition, abstraction and programming techniques were listed 8 times. Reasons given for this varied from the novelty of the curricula changes without enough time to prep students. Further, it was perceived as a 'foundational skill' that should have been learnt lower down in the Key Stages.

2 added further that students had demonstrated a lack of ability to think and act independently. They lack the "ability to make logical leaps by themselves. Too much scaffolding given."

The lack of basic IT skills such as file management, copying and pasting of data and the effective utilisation of lower-end software such as Microsoft Office was listed 4 times.

Of these, 3 of the respondents laid the blame at primary school level, indicating that it was the place for it to be taught, not at secondary. The other blamed it on low literacy skills, highlighting that the students could not differentiate between the use of capital and lowercase letters, consequently affecting ability to code, "Low literacy, for example, not being able to see the difference between P or p."

The adverse impact of poor Mathematical skills was cited 3 times as the main barrier; it affected ability to apply logic and abstraction techniques to problem solving and programming techniques, "Mathematics is a gateway subject. Poor Maths, no chance at independent programming."

Subject Perception -

The Government's suggestion that the name change would improve the "reputation" of the subject and be viewed as a rigorous academic discipline also seems unrealised.

At primary 5 respondents agreed that perception had changed but that was amongst teachers, not parents or pupils. One positive impact highlighted was that it had persuaded teachers to change their teaching style/methods from solely teaching how to use applications to introducing

logical and sequential thinking; cognitive traits as opposed to practical skills.

2 explicitly stated it had become more challenging to teach due to no specialist teacher training at that level “Yes, its scarier for teachers who aren’t experts which translates to less confident students” and “Yes most are scared to teach computinh”

This raises points as earlier discussed about the level of training required, particularly for primary school teachers, who do not have to specialise in any particular subject as training is more in general teaching methodologies.

Only 1 stated that not much had noticeably changed as the subject was still often referred to by its former appellation, “Not as far as I can tell. It is still often referred to as ICT.”

At secondary level responses were more complex. 10 indicated that nothing had changed in perception of the subject and that this was due to the changes not being clearly understood by teachers, parents or students. It was still referred to inter-changeably as ICT and some teachers had not understood the fundamentals of what Computing entailed in contrast with ICT. “The biggest issue is that, in my view, even Computing teachers (as they’re mostly Business Studies trained) don’t understand what Computing is – i.e. its underlying philosophy – even though they might know what binary, Boolean logic, etc., are.”

7 indicated that perceptions had changed based on the experience that less parents were complaining about subject content, with more pushing for their children to do it as it was now seen as a more “rigorous” and “harder” subject. One mentioned that it was due to it being included in the Triple Sciences under the EBACC syllabus in their school.

FINDINGS & ANALYSIS:

The responses highlight to a great degree the concerns raised in the public consultation held before the subject change.

There is still a large number of staff ill-prepared to deliver the subject requirements to the world-class degree Government is hoping for. Most importantly, adequate provision has not been made to bridge skillset amongst teaching professionals, as not all seem to have access to training particularly from local government.

Those that cannot afford rather high private fees, an example mentioned was £300 per session, are left to their own devices. In this regard the recent cuts to educational funding seems to be a vey counter-intuitive decision to the realisation of the objectives that drove the change.

It is particularly lacking at primary level with little effort to revise teacher training at this level so as to make it more suited for purpose. That primary teachers themselves have indicated how daunting it is to teach the new subject is evidence enough of the need for extra training to be made a priority in the agenda of change. As the question it poses is, if the foundations are weak, then how can we expect learners to fare better as they climb the educational ladder?

The nature and content of training programs also deserve consideration as based on some of the responses, they are not ideally suited for those already adept at Computing and IT. It was general knowledge that most ICT teachers were not of a relevant background, so it seems training has been more geared to their needs rather than rather than differentiated course(s) to further stretch the abilities of the already cognizant.

Very little is being done to attract the candidates with the right type of background, meaning the

on-going shortage could seriously impact learner's abilities in many years to come. The call to transform it into a 'rigorous' subject is not reflected in the salaries on offer.

The changes do not appear to have been communicated clearly enough such that confusion still exists, even amongst teaching professionals, which is a concerning indictment on the Government; that perhaps change was too quick without due consideration of concerns raised.

Some cohesiveness in content is starting to emerge across the Key Stages that need to be taken advantage of expediently. Programs such as Scratch have the potential to bridge learning across the Key Stages as it used at both levels.

It also affords the right aptitude required to encourage computational thinking in a very visual manner that can facilitate learning at Primary and continue into Secondary. It is ideally suited as a precursor to learning a more text based programming application such as Python, the most prevalent at secondary level.

LIMITATIONS & RECOMMENDATIONS:

The survey sample size was small and although it provides a snapshot of current views held by some, a larger sample size spread over all corners of the country would give more depth as to how widespread these concerns really are.

Due to financial constraints of being a self-funded survey, charged monthly to keep online, follow-ups to the initial survey to probe further the reasons for some of the answers was not possible. This would have allowed for further investigation to add depth and references to some of the answers provided.

A similar, wider ranging study across a larger demographic would easily identify recurring issues across the country and provides areas to target for improvement. Another can explore the reasons why some applications are currently popular in the teaching of the subject and how to streamline it such that continuity of learning stretches across the Key Stages to make learning progressive, rather than a patchwork of learning different applications that does not aid transferability of learning.

CONCLUSION:

It is quite evident that the concerns raised at consultation stage have borne fruit. Even though at a very early stage in the change, it also reminds us of the urgency to implement relevant solutions to meet these challenges.

Noting from the range of training courses available, it is clear the need for up skilling was considered, however it only focussed on a particular need, largely ignoring those with relevant skills who could up the ante further.

It is improbable for Government to want Computing to share the same 'high regard' Maths, English and Science enjoy yet be unwilling to fund it accordingly. As it stands, it will continue to be a less attractive option for graduates as opposed to industry based on salaries alone.

Teachers have demonstrated great tenacity in adapting to fit the new demands placed upon them. As many as the challenges are, there are also great opportunities to fine tune and streamline learning in a progressive way to be beneficial across all Key Stages. They must be seized

upon and implemented now before 'bad habits' set in and professionals settle into cosy routines that they would loathe changing later on down the line.