For Membership as a MirandaNet Fellow

EXPERIENCES OF THE COMPUTING CURRICULUM IN A UK PRIMARY SCHOOL

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INTRODUCTION:

The focus of this study was to explore how teachers and pupils had adapted and responded to the implementation of these changes to their curriculum. Conducting it at primary school level was particularly important as it had been one of the main areas of contention in the consultation process as some felt such changes would be especially daunting and largely inappropriate.

The study was undertaken against a backdrop of national curricula changes, three years after the implementation of Computing as a curricula subject. The study was initiated to explore the impact of these changes on teaching and learning in a primary school.

Many Naace members will know the history of the introduction of the new Computing curriculum but I will describe here, from my perspective, as the background to my research project. This new Computing curriculum was introduced into schools by the UK government in 2014 to replace Information & Communications Technology (ICT), following a public consultation in 2013 by the then secretary of state for Education, the Rt Hon Michael Gove. The consultation closed on 16 April 2013.

Computing replaced ICT with under section 84 and 85 of the Education Act 2002 by the government as "ICT as a subject name carries strong negative connotations of a dated and unchallenging curriculum that does not serve the needs and ambitions of pupils. Changing the subject name of ICT to computing will not only improve the status of the subject but also more accurately reflect the breadth of content included in the new draft programmes of study."[2]

The new programmes of study for the novel curriculum were devised in association with industry experts from the Royal Academy of Engineering and the British Computer Society and the subject content informed by the classification of content in the Royal Society's report on computing in schools called 'Shut Down or Restart'.

Some of the key findings arising out of that report identified that delivery of Computing education at the time was "unsatisfactory" and "uninspiring" with the content "nothing beyond basic digital literacy skills such as how to use a word-processor or a database." [5] The report put this down to a range of factors including an ICT curriculum that was too open to interpretation and as such could be taught by non-subject specialists, a shortage of teachers with adequate skills to teach beyond "basic digital literacy", lack of continuing professional development for teachers of the subject and institutionalised structures and prevailing attitudes that inhibits "effective teaching of Computing." [5]

The drive for change was therefore to re-brand the subject as a 'rigorous academic discipline of great importance to the future careers of many pupils' such that its status would be raised and recognised by government and senior management in schools. This would be in contrast to the one-stop-shop for all that ICT had gradually devolved into with hardly any recognition of its importance in the digital societies of today.

For the children, "Some respondents raised the question of how it would be possible to teach young children with very basic levels of literacy and numeracy how to programme." For the teachers, "Some respondents felt that the proposed curriculum may be daunting for primary teachers who are not specialists in computing and would not be equipped to teach it." [2]

BACKGROUND CONTEXT TO THE STUDY:

This research project was conducted as my main project for a leadership course I was enrolled on with the National Union of Teachers that run from November 2016 until July 2017. The aim was to explore the experiences of primary school teachers and their students with the new Computing curriculum as well as the impact it was having on teaching and learning, to identify from the research findings changes for improvement that could be implemented or issues that required addressing. The school used to conduct the research is a non-denominational, mixed North London primary school, one of the largest in the United Kingdom.

RESEARCH METHODS & SAMPLING:

A questionnaire on Survey Monkey was used to capture the teachers' responses to the transitioning to the new curriculum and a focus group meeting was used to informally question and elicit students' responses with one of the teachers present.

The students were in Year 5 and had experienced the changeover in curricular requirements from ICT to Computing that occurred whilst they were in Year 3. There were a total of 6 pupils; 4 boys and 2 girls.

In total, 6 teachers responded to the survey and of these 2 were teachers with responsibilities and 1 the subject leader for Computing. One additional teacher was present during the focus group meeting who was also informally questioned to add further context to the pupil's responses.

FINDINGS & ANALYSIS:

Teachers:

All the teachers who responded indicated that they had not received any external training nor taken up opportunities to develop subject knowledge via organisations or forums such as 'Computing At School's portal or hubs indifferent parts of London.

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ll training had been provided in-house to staff and as a result the newly introduced software onto the curricula consisted of Scratch, Movie Maker, Snap, Kodu, 2 Paint and programmable toys (Bee-bots). The programmable toys were for the Mathematics department and the Computing department only used them in the early years to give pupils a basic feel for logic in programming, but access was limited. They were mainly used to assist in counting tasks to get children to appreciate Mathematical operations like Addition, Subtraction and Multiplication.

The curricula has been reformulated such that programming and logic only started in the latter years from year 4 (KS2) upwards as teachers had identified that it was the stage at which pupils could most adequately deal with the topics and their cognitive demands.

In the earlier years (KS1), they introduced the pupils to basic digital literacy applications, mainly the Microsoft Suite of programs as well as functions such as folder management.
Their concerns in this regard were not far removed from those identified during the Government's consultation about the reality of children deal with programming concepts and computational thinking.

All teachers had identified, and responded as such, that the gaps in learner's knowledge identified that was making it difficult for pupils to access the computing curriculum were mainly from not being familiar with the usage of computers. They could not perform basic skills such as saving a document in the appropriate place, knowing how or where to retrieve it, saving duplicates and so on.

"Spending time on basic computer skills, although this then makes it difficult to cover the higher-level aspects of the curriculum due to lack of time."

" I expected them to be difficult, but perhaps not to this extent. For students without basic typing and touch pad skills, the new curriculum expects a lot from them."

"The basic such as highlighting, copy and paste they do not know."

"They have been excited by the prospect, but basic skills, for Microsoft Word, Powerpoint and Excel have been neglected."

"Developing the pupils basic Computing skills in KS1 when using Microsoft programs such as Word and Powerpoint."

Their comments also reflected a socio-economic dynamic to the various pupils' progress in their learning and this was confirmed during the focus groups for the pupils. Those with access to computers and relevant software at home demonstrated a better understanding of tasks and could articulate it much more clearly than their peers and more will be covered on this in the relevant section of this article.

On the question of recruiting specialists into the profession, the teachers felt this to be necessary as *"The curriculum takes on a whole new area of expertise which many teachers are not familiar with, therefore a specialist could help train teachers."* Again a direct inference to issues that had already been highlighted in the consultation stages but seemingly had not been addressed such that they were still present 3 years later, after the implementation of the new curriculum.

Only 1 out of the 6 teachers stated that the new curriculum seemed to be enjoyed more by the boys than the girls, without providing definite reasons why, suggesting that there was not much disparity in gender take up or interest in the subject in the school.

The teachers had been very responsive to the new curricular requirements in terms of ensuring it to be a smooth fit with the students and adapting to the new challenges posed, as already highlighted with the introduction of new programs and software.

In addition considerations had been made for meeting other challenges such as the lack of time to cover all curriculum requirements and improve basic skills with the introduction of iPads and laptops to improve finger/touch and typing efficacy and get around no access to computers at any given time. Similarly, incorporating basic skills through Microsoft Office and the programmable toys in the early years to give their pupils an appropriate entry point into Computing.

Pupils:
The pupils were in agreement that it was *"fun"* and *"easy"* in Year 3, when Scratch was introduced, as all the things they used it for then were simpler- getting a character to move and rotate, simple computations.
In Year 4 and 5 it had become more *"challenging",* their most recent project was in using it to create *''Tessellations''* for which they had to calculate relevant angles and lengths to fit all pieces together to create shapes.
They were all clear on the role and use of Mathematics to attain these objectives using the program and this was made much clearer because the project had started off on paper, where they had to first draw the shapes by hand and rulers before recreating them using the software.

The correlations with Mathematics were further reinforced across other projects as well where they had to create structures, scenes and landscapes. For the spaces they had to calculate the *"surface area"* so they could determine how many steps their *"sprites"* (characters) would need to walk from one point to another, so the relevance of Mathematics was intrinsically built into various stages of the project and it was perfectly clear to all the pupils too as they could articulate it clearly in their descriptions of the work they did.

What was most impressive was their familiarity with and use of appropriate Computer and Mathematical terminology as referenced above, even to the surprise of their Year 5 teacher present during the interviews.

One male pupil who stated he had access to Scratch on his home computer, had managed to build his own mini-game with interactive elements to the user such as a function to tally up points scored, all on his own from what he learnt in class.

In the same vein, after using a 3-d builder program *"Spec"* in school, he had managed to create an entire scene of a train track connecting 2 different stations and he had to calculate the size of the tracks in relation to those of the trains so they could fit and run on them. His aptitude for Computing seemed much higher than his peers with the only explanation pointing to the fact that he also actively engaged with the various software at home and his higher level skills were due to extra time spent individually learning the software. This correlated directly with the comments by the teachers about a majority of their pupils lacking basic computer skills because they *"had no access to it at home"* . This particular boy reflected the very opposite of this trend, due to his access at home he had developed his ability much more than his peers and was subsequently using it for more challenging tasks.

The pupils had used *"Spec"* to build buildings and urban scenes as a class activity with the added task of budgeting the cost of materials and the entire cost of the construction. When asked what real life skills they were learning from this project, they suggested *"Engineering"* and what they enjoyed most about the project was that it was just like creating virtual spaces in Mindcraft. What this further highlighted was the impact external activities pupil participated in outside of school could have on their engagement and learning. As Mindcraft had similar aspects to *"Spec*", it seemed to be a contributing factor to their enjoyment and engagement in using it at school.

A similar trend was noted in their level of enjoyment with Computing projects that had discernible real life relevance. So in Year 4 when they used Scratch in a 'weather casting' project, it felt to them that they were being *"like the weather man on TV".* Similarly on a music production project in the same year, they could barely hide their excitement recounting the process involved in making their songs, with one boy excitedly remarking, *"I felt like a DJ".*

What it made explicit was the fact that they clearly enjoyed the projects they discern as a 'real-life, concrete endeavour', even better if it was one they were familiar with, rather that abstract projects that were outside their zone of comprehension, experience or knowledge of.

What the study also made clear was that there exists great opportunities for the new Computing curriculum to foster much interdisciplinary learning, in such a way that different subjects can compliment and reinforce each other.
So in the instance of Mathematics, there could be a convergence of some of the lessons rather than separate ones. Schemes of work could merge subjects together to deliver them in a unified approach e.g. Tessellations could be incorporated into a Maths and Art lesson even, to further afford a deeper understanding of angles and transformations and provide the opportunity for pupils to identify the synergy between Mathematical rules and the production of Artistic pieces, using Computing to facilitate this.

LIMITATIONS:
The project started halfway through the Spring term at a period when many teachers were preparing their cohorts for the SATs exams so there was not enough time to meet with all respondents who participated in the survey to get clarifications and elaborations of some of their responses. This would have been useful to facilitate a more in-depth exploration of the reasons for the answers to particular questions, such as why one teacher felt it was only boys who were showing a keen interest in Computing as opposed to the girls.

The opportunity to have examples of the pupil's work on display during the focus group interviews would have been useful for further exploration of how deeply ingrained their understanding of computing was and the degree of computational thinking employed.

RECOMMENDATIONS:
A study stretching over an academic year will be most useful in identifying how different projects may encourage computational thinking as well as those that specifically affords pupils' learning of other subjects. This would allow educationists the opportunity to devise future projects that are more holistic in their approach and can contribute to making computing a more engaging and interesting subject to pupils.
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Comparative studies that research the virtual external activities of pupils and the impact it can have on their learning. This will be useful data to inform for the commercial and educational sectors.

CONCLUSION:
It is fair to say the Computing curriculum is relatively new and still needs work in identifying best fit within the National Curriculum, to make it fulfil the grand vision the UK government has for its impact on future generations.

Teachers have embraced it and making the best with what they have or have been provided with. An interesting observation however was that none of the teachers in the school referenced or even seemed aware of the Computing At School initiative and how useful it has been to others in providing free training to build skills and knowledge base. It would have been an additional resource the school could have used in capacity building and suggests the government needs to step up its advertising and promotion to schools across the UK to encourage further uptake.

The new curriculum presents vast opportunities for interdisciplinary learning, especially with Mathematics. Based on how projects are devised, pupils can clearly identify what other subjects

are being facilitated in their learning, therefore more research is required to understand what aspects of a learning project allows the child to make these connections.

As most primary schools mainly employ a single teacher per year group, there is ample opportunity for a different approach to how subjects could be learnt. Rather than separate lessons dealing with specific subjects all the time, an opportunity exists to integrate some subjects topics with Computing to make these interconnections even clearer.

Due to the ubiquity of electronic devices and equipment, it also affords a path to bridging bricks and mortar teaching with social learning and for this to be achieved, a synergy must be achieved between commercial concerns and educational needs.

As 'new' as Computing may be on the lower spectrum of the curriculum, with great care and strategic delivery it could transform the learning culture of the UK in many ways as yet unrealised. If this opportunity is not acted on with urgency, then it runs the risk of becoming the neglected dinosaur that its predecessor ICT became.

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