Level 4 Project - Developing a Proof-of-Concept Primary School CS Curriculum

BGE Computing Curriculum Pain Points

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1 Introduction

There are a number of pain point with the current Broad General Education [BGE] Computing Science Curriculum in Scotland. These pain points relate to both the limited and repetitive experience of pupils, and the challenges that primary school teachers face when attempting to formulate lessons. These are not limited to Scottish curriculum and are faced by other curriculum frameworks [1]

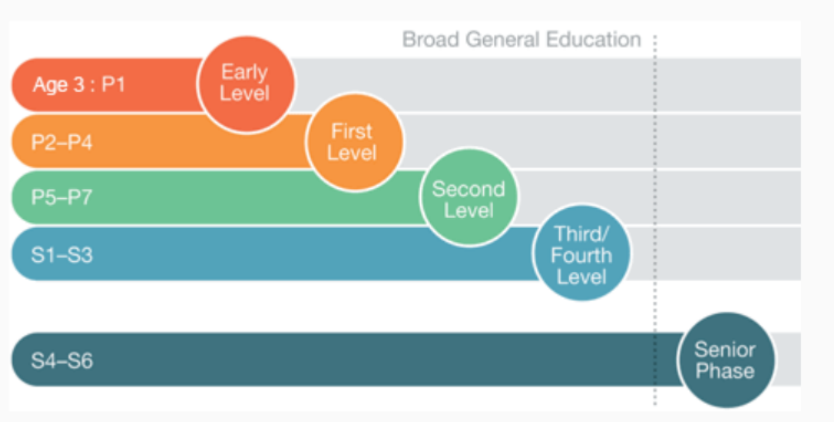

Figure 1: Broad Generation Education Stages *Education Scotland (2023)*

2 Pain Points

Vague and Undetailed Lack of detail in the curriculum specification, making is challenging for teachers to interpret

Restricted Time Limited time in Computing Science makes it difficult to gain and build skills and conceptual understanding

Lack of Teacher Understanding Teachers do not have an adequate understanding of Computing, and therefore struggle to teach it effectively

Technical Language While the curriculum uses less subject specific language than other frameworks, it still makes use of terms that without definition, teachers may struggle to understand

Lack of Justification While Computing Science can be used to develop and build a number of core foundational skills for use in multiple areas, this is not always known by teachers.

2.1 Vague and Undetailed

The current curriculum for Technologies, which Computing is categorised under, are presented in an objectives and experiences document, which categorises Computing Science into 3 main organisers, with one learning statement per organisers for each BGE Stage [7]. Each BGE phase covers 2-3 years of primary education (Figure 1), meaning there is 1-3 statement for teachers to attempt to base up to three years of lessons off of. While there is a limited amount of time spent on computing education, around 10 hours a year, this is still not enough detail to be able to understand where a pupils knowledge and understanding should be at a certain year, and what new concepts and content should be targeted and taught.

This can lead to students being taught the same content over and over, often taking the form of pre-made tutorial/follow along materials from external sources. While using this kind of material in context is not an issue, using it without explaining or supporting the concepts taught can make it feel repetitive and that students are not learning anything (SOURCE).

2.2 Restricted Time

The majority of the Scottish curriculum is taken up by literacy and numeracy content, making up around 2/3 of contact time. The remaining 1/3 of time is then split amount all the other curricular areas, resulting in around 10 hours (DOUBLE CHECK) a year devoted to the technologies curricular area, which equates to a 1 hour lesson every 3-4 weeks. This is not enough time, or frequent enough to allow students to develop and build up a strong foundation of Computing knowledge and skills ([6, 1]). Teachers themselves feel there is a requirement to teach 1-2 hours of Computing Science content a week [3].

2.3 Lack of Teacher Understanding

Many primary school teachers have little to no experience or background with Computing Science as a discipline, with primary teachers having low confidence and limited understanding of the subject. This makes it challenging for them to create and teach lessons on computing.

This is made worse by the lack of detail in the Experiences and Outcomes Document (as highlighted in 2.1), giving teachers very little to base their lessons off of. This is made particular challenging if they are trying to build off pervious stages, where they don't know exactly what the students will have been taught or know, as well as the teacher not having any knowledge of the concepts taught in earlier levels.

Research on primary teachers suggests that on-top of building the teachers knowledge and experience in computing, teacher require access to resources and support material to be able to confidently delivery computing lessons [5, 6]. This is something that is currently not widely available or advertised to teachers. While there are many online resources, these can often be based on the English Curriculum. This means teachers need to spend time both finding this content, and then evaluating it to ensure it is relevant to the Scottish Curriculum, which is challenging with both the teachers limited computing knowledge, and the lack of detail on what the Scottish curriculum covers.

2.4 Technical Language

While the Scottish curriculum uses less technical and subject specific language than other international computing education frameworks (notably the US K-12 Framework [2]), it still makes use of a number of statements what without additional detail or clarification could be unclear to a teacher without any computing knowledge or background.

An example is the below Statement, on Computational Thinking for First Stage. While this statement is clear and concise, a teacher may not know what the core concepts that make up Computational Thinking are, requiring extra preparation and external research to understand.

> I can explore and comment on processes in the world around me making use of core computational thinking concepts and can organise information in a logical way. [7]

2.5 Lack of Justification

Computing Science as a subject can be used to teach many core foundational skills, that can be used in many areas of life. Many teachers are unaware of the potential that CS education has to build core skills, and as a medium to teach other subjects through. It is important that teachers understand the importance of computing education, in order to motivate them to take part in development opportunities, and seek support in creating and teaching computing lessons [5, 6, 4]. The current curriculum does not make it clear how the core skills and knowledge build through CS education, can be used to both enhance students learning in other areas, and give a solid foundational knowledge for future learning and work.

3 Conclusion

The computing curriculum suffers from many pain-points, hindering the quality of computing education in primary schools across Scotland. In order to have a successful curriculum there need to be solutions considered for all of the pain points; improving the vague and undefiled curriculum, mitigating the limited curriculum hours for computing, and tackling the lack of teacher understanding of the concepts, materials, language and justifications of Computing Science Education within primary.

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