Defining the Goals of Computing Education in Higher Education: What Should Universities Aim to Achieve?

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As digital technologies become further embedded within every aspect of modern life, education systems must keep pace to prepare students for the world they currently live and learn in, but also the world in which they will inhabit. Hence, the nature of computing education is an increasingly important topic. But this calls to question what these education systems should aim to achieve? This blog post considers how we may define the purpose of computing education, particularly within higher education, and how curricula and teaching methods should be structured to meet that purpose? This blog will therefore explore three frameworks for undergraduate computing programs and consider their applicability in the contemporary landscape.

Curriculum Frameworks for Computing in Higher Education

One approach to answering these questions is through the lens of existing frameworks, such as the Association for Computing Machinery (ACM) and Institute of Electrical and Electronics Engineers (IEEE) Computer Science Curricular Guidelines (Kumar, et al., 2023), which provide comprehensive recommendations for computer science programs within higher education institutions as the discipline itself evolves. These guidelines stress a balance between theoretical knowledge, practical skills, and professional dispositions, recognising "it is increasingly difficult for programs to be all things to all people" (p.21). However, the guidelines provide 17 knowledge areas and the development of a competency model relating to the knowledge, skills, and dispositions needed to complete any given task which can be used to help develop or revise curriculum (Kumar, et al., 2023).

The integration of knowledge, skills, and behaviours (KSBs) in degree apprenticeships reflects a similar philosophy, combining academic learning with work-based experience. For instance, the Digital Technology Solutions Degree Apprenticeship has 'core' KSBs alongside six pathways which each have their own KSBs (Institute for Apprenticeships and Technical Education, 2023). The pathways include data analyst, software engineer, network engineer, cyber security analyst, business analyst, and IT consultant. Here, we see an emphasis on competency development that attempts to match the needs of specific labour market roles within the discipline.

The Quality Assurance Agency (2022) Subject Benchmark Statements for Computing provide another vital framework for ensuring computing degrees in the UK maintain high academic standards while addressing the dynamic nature of the field. These benchmarks define personal, professional, and academic skills for computing graduates, such as agile working, and entrepreneurship, as well as subject-specific skills for computing.

While aligning curricula with these standards presents opportunities such as equipping graduates with the skills needed for leadership and innovation, it presents challenges for

institutions. For example, the constant need to update programs to reflect new technological developments and balance professional expectations.

From Technical Proficiency to Lifelong Learning: Reassessing Computing Education Goals

While these frameworks offer useful guidance, they also highlight a deeper philosophical issue of what exactly should the 'end goal' of computing education be? As illustrated, defining the ultimate outcome of computing education is not straightforward. It combines a vast array of technical skills alongside what is traditionally called 'softer skills'. This issue is exacerbated when considering the rapid pace of change in the digital landscape. As technologies and methodologies evolve, so too must our understanding of what skills and knowledge are most valuable. For instance, the recent rise of large language models such as ChatGPT has led to the evolution of the skill of 'prompt writing' (Giray, 2023). We don't know what other skills will become important as technology evolves. The tension between a structured curriculum and the need for flexibility complicates efforts in the creation of an effective computing education program.

A curriculum centred on today's trends may not prepare students for the long-term changes defining the future. Here, the broader aim of education such as to teach students to think critically, solve complex problems, and adapt to change, becomes essential. While technical skills are crucial, computing education should also foster creativity, ethical reasoning, and an understanding of computing's wider societal impact.

Hence, we need to consider the importance of context, as discussed by Allison (2021) who indicates that practitioners and policymakers must define the goals of computing education in a way that balances immediate needs with future adaptability, and design curriculum, assessment, and teaching methods accordingly. Misalignment may result in graduates who are well-trained for short-term roles but unprepared for long-term career progression or changes in technology. Technology will keep changing, so we need to act now and think deeper about what the goals of computing education should actually be.

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Biography:

Dr Jordan Allison is a Senior Lecturer in Computer Science within the School of Business, Computing and Social Sciences at the University of Gloucestershire, where he teaches on a range of cyber security modules at both undergraduate and postgraduate level. Jordan is a Fellow of the Higher Education Academy (FHEA), a Professional Member of the Association of Computing Machinery (MACM), and a Professional Member of the British Computer Society (MBCS), the Chartered Institute for IT. His research primarily focuses on computing education pedagogy, curriculum design, and teacher development, with an emphasis on qualitative research.

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