OCR
RECOGNISING ACHIEVEMENT

OCR RESPONSE TO 'COMPUTING IN SCHOOLS' CONSULTATION

Introduction

OCR welcomes this opportunity to submit evidence to the Royal Society's inquiry into Computing in Schools.

OCR as an Awarding Body delivers a wide range of ICT and Computing qualifications from GCSEs through to the more practically based OCR Nationals and the work-based National Vocational Qualifications. OCR provides a wider range of ICT and Computing qualifications than any other UK Awarding Body. Our market leading OCR Level 2 National in ICT is currently the 4th largest qualification in the UK.

OCR take a particular interest in the provision of Computing qualifications, and are proud to be the only Awarding Body in the UK currently offering a GCSE in Computing.

OCR is pleased to attach independent research data from Cambridge Assessment, detailing the take-up of ICT and Computing qualifications in schools from 2007 to 2009. This data demonstrates that whilst there are still a significant number of learners taking ICT and Computing qualifications, the profile of take-up is changing, particularly in respect of ICT.

This emphasises the need to be clear about terminology from the outset. Computing is not the same as ICT although there are points of common ground.

- **Computing** is largely understood by academics as a rigorous discipline that has a fairly long history and is concerned about problem solving methodologies. Many talk about computing as having no need for computers.

- **ICT** is a tool/set of tools to enable data analysis and manipulation in order to understand/interpret and communicate information from/about the world in which we live. Whilst this requires the demonstration of functional and problem solving skills it falls short of being recognised as a rigorous academic discipline.

OCR believe that establishing a clear distinction between the two subjects will allow the inquiry to address the changing take-up in demand which is demonstrated by the Cambridge Assessment data in a way that will enhance the offer available within schools.

1. Is computing a discipline, in the same way that mathematics, physics, chemistry are?

Yes, it is a discipline. It relies on developing functional and problem solving skills utilising underlying logical thinking. It is a discipline whose breadth and scope is changing and expanding very quickly. This leads to an uncertainty about what should be included in learning programmes and qualifications.

There is an underpinning core of “computational” or “algorithmic” thinking that is generally agreed by those who are computer specialists, but it is recognised that there are practical ramifications including some of these in computing courses.

2. Is programming a fundamental form of literacy for the modern age?

To a degree, yes. Algorithmic thinking is a proven and useful tool with which to develop the learners’ confidence in the application of logic to a multitude of problems in a variety of contexts. Algorithmic thinking is taught effectively through the medium of programming and as such, programming deserves a place in the fundamental skills taught to all children.

3. (a) What purpose should the teaching of Computing in schools serve?

In addition to providing students with the opportunity to develop skills that will enable them to progress further within the subject discipline, computing provides learners with the tools to develop their broader thinking, problem solving and analytical skills. The ability to de-construct into constituent parts a problem in order to create a solution and be able to test this through in a rigorous manner is a valuable discipline for many situations.

It is also helpful that learners are offered the opportunity to place computing within a broader context, looking at how it is having a significant impact upon all our lives and be able to consider the benefits and drawbacks of these changes.

(b) What purpose should the teaching of IT in schools serve?

ICT should provide learners with the tools to undertake data analysis, data manipulation and communication in a way that enhances their problem solving skills. The skills they develop should be transferable to other subjects, as well as in any future work and academic setting they experience.

4. Is the teaching of ICT (and accompanying qualifications, such as ICT GCSE) fit for purpose for all students? What should be done to address this?

There is strong circumstantial evidence that ICT is often taught by teachers who are not ICT specialists. This means that often delivery is undertaken by those who have a limited understanding of the fundamentals or skills involved. This in turn limits the capacity to deliver the subject well and respond to learners in a way which will ensure high levels of engagement and skill development, particularly at the higher and lower ends of the ability spectrum.

The rigid regulation of GCSE content has limited the ability to encourage students to experiment with a range of software tools resulting in them acquiring limited practical skills but missing out on acquiring the real knowledge of what ICT is capable of. OCR believes that the removal of QCDA from the development process will allow future qualification development to support broader use of ICT and its potential, through experimentation and application, to aid problem solving. Teachers should be freed to provide as wide a range of experience with ICT as is possible without being tied down by the tight constraints of QCDA imposed subject criteria.

OCR would point to the strong uptake of our Nationals suite in this area as evidence of how given these freedoms, it is possible to build a qualification that engages learners. The current GCSE subject criteria do not allow this freedom, and we will be engaging a broad range of stakeholders to address this lack of breadth when the current accreditation period ends.

5. Is computing and ICT best 'taught' in classrooms or 'learnt' by other means? How do learners learn computing and ICT skills?

Both ICT and Computing can be effectively delivered by specialist teachers in a classroom setting with the necessary time allocated within the timetable to support quality delivery. Too often one or more of these critical factors is removed from the process leaving learners and teachers alike dissatisfied with the outcomes. The pedagogical approach adopted within the classroom should be focused upon practical, problem solving learning to support skills development which can then be applied and amplified in other syllabus areas within the curriculum.

The acquisition of this knowledge by some process of osmosis in the delivery of other related subjects will not lead to a secure understanding of the required underlying knowledge and skills. A rigorous approach is essential to ensure learners are taught the tools of the trade and the terminology that goes with them so they can learn efficiently and apply this knowledge confidently in other settings.

6. What motivates students to study computing? Is it what they learn in school or something else?

Most students undertaking computing are by definition self-selecting. This would appear to be based upon an interest in developing the skills which will allow them to be able to make machines do what they want them to do, and as such is related to a strong drive for specific skill knowledge. They want to apply their own creativity to situations that interest them and experience the satisfaction that comes with solving problems. Much of this comes from recognition, on their behalf of the ubiquity of computers in all areas of their lives. There is also a strong link to the view that computing skills may lead to a successful career in an area that is already of interest to them.

7. How is computing presented at school, and is there a variation between schools? Why?

This is highly varied, according to the skills and enthusiasms of the teachers. The default level as described by the national curriculum is lamentable and low level, repetitive and tedious. Schools which are lucky enough to have enthusiastic and skilled staff take the subject much further and find ways in which to expand their pupils' horizons.

Themes already identified in response to Question 5 also have an impact in terms of variation between schools particularly in respect of level of take up and learner achievement.

8. **Who is teaching computing, and what qualifications do they hold? Are teachers sufficiently supported with subject-specific CPD? Are there enough specialist teachers? Why do they leave/join the profession? What are the barriers to improving the situation?**

   Most schools have difficulty in recruiting able specialists and this is exacerbated by the fact many teachers of ICT cannot write program code which does not allow for cross-deployment between the two subject areas.

   The pace of change within the sector is an additional problem. If a suitably skilled teacher is appointed, their awareness of, and confidence in exploring and explaining new developments and practices will reduce fairly quickly in comparison to other subject areas. There is a need for a well targeted CPD programme to address this. Similarly the disparity in income opportunities will mean that teaching will not be the first choice for many experts in this area.

9. **Why do some universities prefer their undergraduate applicants to have studied mathematics rather than computing at A-level?**

   The possession of logical thinking is a major requirement for a student taking a degree course in computing. Mathematics is a good indicator of this and it is understandable that universities may make it a requirement. Given the potential dichotomy between ICT courses and computing courses, it is unsurprising that HE may be unaware of exactly what is going on in computing teaching in schools. They may be concerned that schools will inculcate bad habits or they believe that students will arrive already so well versed through a computing A level that the first year of the university course will duplicate what they already know. There is also so much variation in University courses that they may or may not see A level computing as a useful precursor for their particular programme of learning.

   In view of the above, using Mathematics A level as an entry requirement allows Universities to access a more clearly defined skill base without requiring them to address their concerns about the suitability of A level computing for their particular course.

10. **What are the perceptions of computing and ICT amongst learners, teachers and head teachers? How can information, advice and guidance be improved?**

    For learners, the perceptions of the two subject areas are beginning to diverge. For those schools involved in delivering ICT in a ‘hands-on’ active manner, positive teacher feedback and learner engagement is proving to be extremely strong. The full range of practically based alternatives do not exist in computing and this has led to an overall feel that the subject is technical and dry. When well delivered, however, computing gains the enthusiasm of learners who supplement formal study with hours of additional study as part of their leisure time.

    IAG needs to be more informed about the differences between computing and its potential outcomes and mainstream ICT as expected by any employer.

    When looking at the perceptions of teachers and head teachers these are closely linked to the approach taken to the delivery of subjects within each school. Is the

teacher qualified to teach the subject? Has enough curriculum time been allocated? If they are specialist in the area, do they have a broad responsibility to other colleagues or other curriculum areas? Is the subject seen as high status within the school in terms of opportunities for promotion? All or any one of these factors can work against a positive approach to the delivery of what can be seen as a 'nice to have' rather than core part of the curriculum.

11. Are these issues unique to the UK?

There are examples of good practice in America, Australia and evidence of good take up of computing courses in many Asian countries. Computing in the Asia/Pacific area is seen as a route to a well paid career and it is also something that can quickly improve the GDP of such countries. Some UK based courses are being successfully sold to countries such as Malaysia and China and the market there is steadily growing.

What is unique to the UK is the level of impact the Regulator has been able to exert on subject criteria. It is to be hoped that with the removal of QCDA from the process Awarding Bodies will be able to consult with employers, HE and other stakeholders to develop a more interesting and engaging approach to GCSEs and GCEs in both subject areas.

12. What can universities do to improve the situation?

There is a need to recognise there are a number of excellent innovative courses being developed. Any closing of the gap between HE expectations, the demands of employers and the programmes of learning undertaken in schools would have a significant benefit for learners. OCR is currently actively involved in consulting directly with HE organisations to prepare for the next phase of GCE development.

13. Is there a case for curriculum reform? Is this the barrier?

OCR have just completed a redesign of the GCSE ICT and developed a GCSE in Computing. Within the constraints set down by QCDA throughout that process, we have sought to introduce greater emphasis upon application of skill particularly within the ICT GCSE where a new, less criteria-based approach to assessment has been introduced to reward students for a wide variety of approaches to solving problems using ICT.

The removal of QCDA from the development process will allow us to build upon this platform, allowing us to consult more directly with HE, employer and subject specialists to create innovative approaches to curriculum development in both subject areas.

14. Is there a need for an increased recognition of ICT and computing as part of the T in STEM, through representation in STEM forums and increased funding?

It is important to separate ICT from computing when considering this question. In many ways ICT is already recognised as an integral part of the Technology offer. Computing however, is clearly seen as falling outside the existing definition. Any

recognition of computing within STEM would therefore be a step forward, particularly if this resulted in greater access to current international discussions. We, in the UK, have much we could learn from initiatives that are being pursued in the US.

15. What happens if we do nothing?

The research undertaken by Cambridge Assessment provides evidence that whilst demand for ICT qualifications remains strong there is an ongoing gradual decline in the numbers undertaking computing qualifications. Based on these figures there must be a concern that computing as an academic discipline will wither on the vine and come to be seen as a minority interest. OCR would therefore welcome a strategy that raises awareness of the importance of teaching computing skills in schools to help address the deficit that is already developing with our international competitors in this area of the curriculum.

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