Improving professionalism in first year computer science students*

Teaching what can't be taught

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ABSTRACT

Professionalism is a philosophy or a notional standard by which a person can be judged or can aspire to be perceived in their approach and behaviour in the context of professional practice. Far from being a tangible object, which one can see, hear or touch, it is a philosophically and socially constructed ideal.[i] We argue that professionalism is essential in computing to protect the public as computing is ubiquitous and reaches into every sphere in society. Teaching professionalism is always a challenge. It is acknowledged that there is no agreed definition of what constitutes a professional in any profession, despite the concept being around for centuries.

As computers become more crucial to our existence it is vital that we ensure our computer science students have a deep understanding, but, more importantly, they adopt professional practice in their endeavours.

The foundation for this research project was conceived from concerns that although we teach students professionalism in the curriculum, this may not be sufficient to encourage adoption of professional practice, we argue that for students to be truly professional they have to drive their own learning outside as well as inside curriculum activity.

We cannot require our graduate students to be members of a professional body, but it is a requirement of a professional body such as the ACM or the BCS that we make visible the teaching and learning of professionalism in the curriculum. This objective is more easily achieved if we have distinct professionalism visible across a degree course[ii]

As academics, more focus should be on the evidence that students are committed to professional practice rather than to passing assessments. This may require an attitude shift on the part of academics as well as students.

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While we can teach skills and impart knowledge, only by adoption can a professional attitude be achieved. In an attempt to incorporate an early intervention for computer science students, this research examined a self-selecting group of first year computer science students who volunteered to drive their own professional development through a co-creation of activities inside and outside the curriculum.

This research aimed to establish student motivation, the availability and prioritisation of opportunities and the impact of outcomes. The research also sought to discover what attracted the students to this initiative and how they assessed any personal development when the project ended.

The findings from this preliminary research will be followed up with a further study into the development of a framework to establish a competency based approach to programme learning outcomes to support the teaching and learning of professionalism. Learning outcomes that will not be specifically linked to modules or individual subjects, but will be a requirement for students to demonstrate professional development at the end of each year of their programme of study. A similar approach is used by closed, statutory, professional bodies, such as doctors and nurses, where continuous professional development and practice has to be demonstrated for a member to retain membership and continue to practice.

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Professionalism, Student-centred, Development

1 Introduction

Professionalism is a philosophy or a notional standard by which a person can be judged or can aspire to be perceived in their approach, attitude and behaviour in the context of professional practice. It is philosophically a socially constructed ideal, and has no material properties, it can't be seen, heard or touched,[iii]. As computing becomes more integral to society we argue that professionalism is essential to protect the public.

It is acknowledged that there is no agreed definition of what constitutes a professional, in any profession, despite the subject being around for centuries. Teaching professionalism is a challenge, its very lack of an accepted definition means it is a more difficult subject to convey to students most of whom prefer subjects with more definite right and wrong answers. However, as computers become ever more crucial to our existence it is vital that we ensure our computer science students have a deep

understanding of the issues within computing, but, more importantly, that they adopt professional practice in their endeavours into the future.

This article sets out to define and justify a current pilot project that aims to discuss a student driven approach, to an early intervention, that supports professional development of students, on an undergraduate computer science degree programme.

The foundation for this research project was conceived from concerns that although we teach students professionalism in the curriculum, this may not be sufficient to encourage adoption of professional practice. We argue that for students to develop professional attitudes and behaviours they must drive their own learning outside as well as inside curriculum activities.

Some statutory professional bodies have control over their industry, resulting in closed professions, where, by law, members are required to uphold their own professional behaviour and development or they cannot continue to work in their profession. We cannot require our graduate students to be members of a professional body, but the impact of computer science projects in society has massive impacts on how we live in the world,[iv].

The BCS attempts to control our education systems to ensure professionalism is both visible and assessed in the higher education teaching and learning environment. This is achieved by contributing and advising on national benchmarking for computer science degree programmes and by ensuring that all accredited courses are audited for subject content. This objective is more easily achieved if we have distinct modules teaching professionalism across a degree course, but many academics favour the scattering of teaching professionalism within all subjects.

As academics, we should focus more on the evidence that students are committed to professional practice rather than solely to passing assessments. This may require an attitude shift on the part of academics as well as students. We can teach skills and impart knowledge but a professional attitude can only be achieved by adoption.

In an attempt to incorporate an early intervention for computer science students, this research examines a group of first year computer science students who volunteered to drive their own professional development through a co-creation of activities inside and outside the curriculum. The research aimed to establish student motivation, the availability and prioritisation of opportunities and the impact of outcomes.

We also sought to discover what attracted the students to the project and how they assessed any personal development when the research was concluded.

The findings from this research will be followed up with a further study into development of a framework to establish a competency based approach to programme learning outcomes, including professionalism. Learning outcomes that will be assessed at the end of each year of study, rather than individual modules or subjects, with the requirement for students to demonstrate professional development. A similar approach is adopted by closed, statutory, professional bodies, such as medicine, where continuous professional practice has to be demonstrated in order for a member to maintain membership and the right to practice.

2 **Challenges to teaching professionalism**

Having taught professionalism to computer science degree students for over 18 years numerous challenges have been identified during that experience, for example:

a) Making the content of the teaching fit with real world scenarios, so that students can see the impact of professional development in practice. Lots of good practice has been published on this challenge. [v]

b) Competing against software and hardware subjects for students' attentions. Professional development is deemed a 'soft' subject. 'Soft' can be translated by students to not hard and therefore, easy. This can result in the subject's political power being lessened by the implied interpretations. Designing programmes of study to meet requirements for accreditation. All degree programmes have to make difficult decisions regarding what to include and exclude. Time limitation for teaching across a degree programme mean we cannot include every subject so the political power of a subject is very important when a programme is in the design stage.

c) Embedding learning into modules so that the learning continues with the students post assessment. Since modularisation of degree programmes, we strongly align all our assessment to module learning outcomes and to programme learning outcomes; this is known as constructive alignment[vi]. We argue that students are assessment driven; therefore what gets measured gets done; and thus a tick list approach rather than deep learning approach ensues.

3. Raising professionalism from modules to programmes

The hardest challenge for any subject is embedding learning into study so that the students continue with that learning throughout their degree programme and beyond. Students generally focus on hardware and software subjects and obtaining a degree of at least 2:1 which means developing themselves as professionals may not be very high on their agendas.

To aid more continuous professional development it is proposed to add level learning outcomes to the programme of study. This approach would mean that at the start of each year the students would carry out a skills audit focusing on the skills necessary for the degree and those that would transfer directly to their career aspirations. The resulting skills audit could then be analysed by the student, with tutor support, to set out goals to be achieved in the coming academic year.

At the end of the year student could then be graded on their professional development progress. This outcome could then be submitted as part of their HEAR statement[vii]. The statement is designed to be over and above the degree content and to be used to signal endeavours beyond the educational setting, for example employment opportunities.

It is not the intention to remove professionalism from the curriculum but to add to it by way of extra-curricular activities. Students have many opportunities to develop beyond the curriculum, there are summer internships, students into schools, industrial and professional body competitions and many good students' union association activities.

We have all seen examples of proactive students who take up these opportunities; some of these students are fearless and focused in what they do during their degree years but not all students are so outgoing and positive in nature. By having this additional competence within their degree it is argued it will help all students work towards becoming a professional member of society and thus improving all our futures in terms of technology developments and implementations.

Of course, it is recognized that as with all initiatives there will be costs and resources required, and if any new endeavour is to succeed it will need higher management commitment and champions to sustain the embedding of the practice to degree structures.

Furthermore, as with any solution it will not solve all issues: there will still be students who do only what is necessary for their degree, rather than what is required to be a professional; those students hit their target but miss the point.

4. Flipping the classroom

The suggested approach could be deemed as flipping the classroom. There have been many examples of changing the focus of teaching from the teacher to the students. [viii]. One of the aims of student driven learning is to enable ownership of their learning by the students. It is argued when children start out in education they are ultimate learners but our approach of putting the 'sage on the stage' can drive the joy of learning out of the experience somewhat. By engaging students in their professional development at the start of their degree, we are creating more opportunities for them to own their futures right at the start of their higher education experience.

Why flip the control over to student, the answer lies in that much of what we say is available via the Internet, so why do students need to listen to us? Also, not every lecturer is an entertainer; there are many entertainers in the world producing videos on YouTube etc.; whether the content and direction of these videos are appropriate and educational is another set of questions. We need to not just impart knowledge but also ensure that the knowledge is good, is used and perpetuated by students. We need to change our practice to reflect the massive changes that we are experiencing as a result of technological innovations.

As Mayer[ix] argues:

"Learning is the relatively permanent change in a person's knowledge or behaviour due to experience. This definition has three components:

1) the duration of the change is long-term rather than short-term;

2) the locus of the change is the content and structure of knowledge in memory or the behaviour of the learner;

3) the cause of the change is the learner's experience in the environment rather than fatigue, motivation, drugs, physical condition or physiologic intervention."

If our students are to take technology into the future, they should do so by leading by example for the rest of the world to follow which means depth of learning and high professionalism. As a society we are in the midst of massive changes to the way we operate, we are no longer wholly dependent on our own physicality to meet our needs as humans.

5. Status of the project

This pilot study began in September 2018 and ends in December 2018. Analysis of finding to take place in January 2019 and further article to be publish in 2019.

Eight volunteers, all first year computer science students are currently engaged in the study. Ethical approval has been granted. The approach to the project is by action research.

Stage one - students to carry out a skills audit

Stage two – each student is allocated a tutor to work with the student to set profession development goals

Stage three – a focus group of all the students and tutors is to be convened to share good practice on what the students have found to be useful, and usable to further their own professional development. The next phase of the student engagement is to be determined.

Stage four – thematic analysis of findings to be carried out by tutors and findings to be considered by students.

Stage five – Second focus group to determine next phase of the project.

Last stage – Write up findings by tutors.

6. Benefits of the project

If this project is adopted by degree programmes, it will obviously have benefits for the culture of the lived experiences student will have. Students will see the importance put upon the subject of professional development, and increased resources and management commitment will be evidence of this enhancement to tutors. We argue that a single change can make a massive difference so for example just as modularisation changed programme development, the university championing the annualised programme-learning outcomes can enhance our programmes further.

7. Conclusion

This paper argues that we need to change the approach we take to teaching professionalism in higher education on computer science degree programmes. This is to enable students to own their development from day one, and to perpetuate reflective practice into their professional lives following graduation.

The foundations of a scheme is proposed to enhanced degree programmes, to enable study and learning to exist outside of modular and programme structure. It is recognized there are costs and resources required for such initiatives and the proposal will be changed as a results of this pilot study, but the rewards will positively affect not just the students but also the industry if our ambitious aims are met.

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