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# Characterizing Graduateness in Computing Education

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## ABSTRACT

In my research, I employ a highly qualitative, narrative methodology to explore the sense students make of their own educational experiences within their wider learning trajectories. By taking such a holistic perspective on a Computing Education, I hope to be able to identify and distil aspects of successful Computing programs, whose effects may only emerge over time.

## Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Education – *computer science education*.

## Keywords

qualitative research, narrative methodology, student experience

## 1. PROGRAM CONTEXT

I am a PhD student in the first year of my program in computer science in the School of Computing at the University of Kent and am part of the local computing education research group. To date, I have identified my area of research, conducted a pilot study with students at my undergraduate institution, and worked over the past few months to better understand the context of my work. My next steps going into the fall will include recruiting and conducting interviews with participants from the university here.

## 2. CONTEXT AND MOTIVATION

Computing is a notoriously fast-moving discipline, where large technical advancements can quickly alter relevant disciplinary knowledge. The ACM curriculum recommendations, for instance, highlight the importance of lifelong learning: “Curricula must prepare students for lifelong learning and must include professional practice (e.g., communication skills, teamwork, ethics) as components of the undergraduate experience.” [3] Indeed, graduates will be unlikely to use many of the specific applications and techniques they learn after they leave University, although the intellectual utility of algorithms, theories and principles will persist.

At the same time, it is hard for academic departments to understand the cumulative effect of the undergraduate experience they provide. Educators only have access to immediate, short-cycle, feedback on separate modules through end-of-year outcomes and surveys. There is little opportunity to either reflect

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on, or gather data on, the totality of an undergraduate education. Consequently, it is hard for educators and departments to make informed decisions about large-scale changes to curriculum or environment and, when such decisions are made, they are based on partial, time-bound evidence.

Nevertheless, student trajectories are, without doubt, influenced and shaped by educational institutions: different institutions yield different characteristics in different graduates. The goal of this study then is to leverage students’ conception of their own education to characterize “graduateness”. Graduateness, as a concept, is defined as encompassing disciplinary knowledge, skills related to the type of discipline studied, and generic capabilities (of cognition or presentation for example). With this work, however, I am proposing a more nuanced examination of meaning and contribution of an undergraduate education as a whole in the diverse and changing discipline.

## 3. BACKGROUND & RELATED WORK

The question of just how students change in college has been a frequent topic of research. Pascarella and Terenzini, for instance, published what is now a third decade of research in their “How College Affects Students” series. Their comprehensive, albeit quantitative, review exposes the reader to a large number of studies – with the goal of identifying effects that are uniquely caused by college. [6]

Indeed, for many students, college is a time of fundamental personal growth and identity development. And “the prevalent institutional culture, navigation of identity, and development of skills are among the factors contributing to the individual growth of students.” [1] However, as Pascarella and Terenzini contend, “rendering tone, tint, texture, and nuance [of the college experience] may require the finer brushstrokes characteristic of qualitative approaches”. I take such an approach in my work by employing a highly qualitative, narrative methodology.

This approach is grounded in the work of psychologist Dan McAdams, who posed the question “what do we know when we know a person?” [5] According to his research, there are multiple levels at which differences in personality may be described. One of them is the *life story* that we, as adults, “[continue] to author and revise over time to make sense, for [ourselves] and others, of [our] own life in time.” Eliciting this life story, then, permits us to explore how students make sense of their own experiences – including those pertaining to education.

Of course, a multitude of factors affect the process of constructing this story. For example, master narratives, which are embedded in the prevalent culture in which the narrative is told, provide scripts that serve as scaffold for stories. [2] In his work, Phil Hammack describes a model of identity that bridges cognitive, social, and cultural perspectives. He argues that we construct personal narratives to make sense of our experiences by integrating stories of culture (that is, cultural scripts available to members of a

particular group) with our daily experiences. It is, in his words, “an enculturated, socially situated, and fully contextualized person that [this] research approach seeks to illuminate”.

Another approach relevant to this work is Smith’s concept of *institutional ethnography*. [7] Smith broadly examines how work in institutions is coordinated through texts and discourse. She describes how readers interact with and interpret texts (which are otherwise passive), become their voices and agents. She also highlights how institutional categories established by these texts may stand in sharp contrast to people’s lived experiences.

These two approaches, master narratives and institutional ethnography, will serve as frameworks for analysis in my work and will provide a lens into students’ personal experiences, as well as into the larger, institutional and disciplinary contexts.

## 4. PROBLEMS, GOALS, AND METHODS

The aims of this work are to:

- investigate Computing students’ conception of their undergraduate education, within their wider learning trajectories,
- discover what sense individuals make of their education, of their own “graduateness”, and
- distil and disseminate guidelines on (otherwise unapparent) aspects of policy and practice that characterize graduates of successful Computing programs.

I focus on students’ lived experience and seek to uncover a rich, integrated, view of their relationship to their learning over time, closely situated within a disciplinary context. These aims are not well-suited to quantitative investigation and so this study is designed using a narrative methodology, and comprises two related studies, one focussed and one broad. Both studies will draw on a protocol adapted from Dan McAdams [4], which was first used with teachers in the context of the Sharing Practice project ([www.sharingpractice.ac.uk](http://www.sharingpractice.ac.uk)) and subsequently piloted with students at Olin College in a 2013 summer internship project.

The **focussed study** will concentrate on a single Computing department. Two cohorts will initially be recruited:

- a. final-year students in the Computer Science degree at the University of Kent, and
- b. alumni of the same program.

I plan to undertake narrative interviews with participants from each group to detail their “learning trajectories”. Using a narrative approach is a significant methodology in this context as it uniquely allows individual sensemaking. Investigating two cohorts allows me to ask questions both of disciplinary content and student experience, and the importance of each over time. It may be that different aspects become prominent whilst others diminish.

The **broad study** takes advantage of social media and distributed data gathering. This will comprise a web-based version of the protocol which may be completed remotely. It will be publicized on Computing-specific mailing lists and through social media such as Facebook groups. This will inevitably represent multi-institutional data as respondents may come from any Universities and any Computing degree program. The broad study will provide

a wider contextualization, both for the data from the focussed study and of the general nature of Computing graduateness.

As in all interpretive work, this project is structured, but not constrained, by its aims. The data may suggest quite other avenues for investigation and I will be open to them.

## 5. DISSERTATION STATUS

At this point, I have:

- Conducted a pilot study with undergraduate students at Olin College. We explored these students’ learning trajectories and identified a number of developmental themes. [1] I am looking to return to these participants and interview them again within a year’s time.
- Undertaken a literature review on narrative approaches, which provides methodological grounding for my work.
- Worked to understand the context of a computing education over time by interviewing participants of the major ACM curriculum reports over the past five decades. And in a publication currently under review, my supervisor and I explore how these reports are crafted through community involvement, and what pedagogic perspectives they have taken over the years.

Both the research into methodology and the exploration of context will each form a chapter in my dissertation. Going forward, I plan to recruit and interview participants for the focussed study next.

## 6. EXPECTED CONTRIBUTIONS

There are two ways this work may directly benefit practice. Firstly, it will provide a deep investigation of a degree program over time, indicating strengths (and weaknesses) that are otherwise invisible. At the moment, what parts of their education students value when they are embarked on their careers is unknown. Secondly, it will permit interrogation of “what works”. While we may not be able to apprehend components of successful degree programs immediately, they may come to prominence over time, in the years after students’ graduation. If such features are identified, they will be distilled to guidelines and more widely disseminated to the educational Computing community.

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