

Weaving Accessibility Through an Undergraduate Degree

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ABSTRACT

Globally, increasing numbers of people experience accessibility issues related to technology use. At the University of Dundee, we have developed a degree programme that aims to graduate socially-aware computing scientists who can develop for a range of access needs. To achieve this, we engage our students on a supported pathway of exploration, empathy and understanding. Students collaborate with user groups of older adults, adults with aphasia, and users of Alternative and Augmentative Communication (AAC). This practical experience leads to an understanding of the needs of the end-user and the need to develop for ‘people who are not like me’.

Author Keywords

Accessibility; Education; Empathy; Disabilities; Ageing

INTRODUCTION

It is essential for societal inclusion that our increasingly ubiquitous technologies are accessible, and access needs become more complex when considering an ageing population. The University of Dundee (UoD) has a long history of accessibility research and has established a unique computing programme within Scotland that aims to graduate socially-aware developers who have an in-depth understanding of these complex access needs and user requirements.

We previously reported on embedding accessibility within the curriculum [25] and our development of a User Centre for older adults [12]. With experience gained from supporting the older adults group, we have expanded our User Centre to include additional hard-to-reach user groups that are engaged with both research and teaching: (1) ‘Bytes and Blether’ for older adults, (2) ‘The Straight Talking Group’ for individuals who use Alternative and Augmentative Communication (AAC), and (3) ‘Tap and Talk’ for adults with aphasia.

BACKGROUND

The goal of a computing science degree has historically been to equip students for a career as technical software developers and innovators [21]. This now includes knowledge of legal

[1, 2] and ethical issues [3], which contribute to inclusion and accessibility. This positively impacts student learning, with students creating more accessible software [8, 17]. However, accessibility is not solely the domain of computing and has been included in a variety of educational domains, e.g. engineering [8], web design [20] and design thinking [21].

The UoD has a rich history of accessibility research, pioneered by Prof Alan Newell who focused on ‘extra-ordinary users’ [16]. Most recently, focus is on AAC [24], designing for Autism Spectrum Conditions [18], speechreading acquisition [13], situational impairments [22, 23] and accessible design methods [10]. This places us in a unique position to include accessibility as a core strand within our curriculum. Our students are taught by academics with an expert knowledge of accessibility topics [19] and throughout their studies will interact with users who have a variety of disabilities (e.g., cerebral palsy, aphasia). Students interact with these users through “*The User Centre*” – an umbrella term for user groups within the computing department who are supported by computing research and teaching staff. Currently there are three groups:

1) Bytes and Blether is the older adults group [12], which was founded in 2005 to support members in learning to use new technologies. This group is self-organising and has formed a committee to manage day-to-day activities and finances. This committee includes an academic and a researcher who ensure an integrated strategy with computing teaching and research. There is a ‘gatekeeper’ (a member of support staff), who manages access to the group for ethical reasons, and is a liaison between the group and the computing department.

2) The Straight Talking Group was formed in 2010 and currently consists of six core members who all have severe speech and physical impairments. This group is supported in a more formal manner, due to the increased logistic requirements, e.g. members are typically accompanied by a carer and expenses needs to be reimbursed.

3) Tap and Talk is a group of users with aphasia, that was formed as a collaboration between the university and the NHS (National Health Service) to aid stroke rehabilitation. This group is supported by a speech and language therapist as part of ongoing NHS support.

The User Centre is situated at the heart of our computing activities, and as such, means that our students become more socially-aware developers who embrace the challenge of developing accessible software.

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STUDENT ENGAGEMENT

In Scotland, a degree programme takes four years to complete. Our students have a unique experience, with accessibility integrated throughout. It is woven around other core concepts, such as web development, requirements gathering and cybersecurity to provide a holistic education that aims to encourage our students to become socially-aware developers.

Year 1: Understanding People

Understanding users has long been an important element of computing education [11, 14]. We believe that understanding people is the basis by which our students can truly understand accessibility. In year one, we expose students to human factors and interaction cycles through exploring their own lives. Situational awareness is built through a series of experiments that shows how context can affect technology use, e.g. texting while walking. They are encouraged to reflect on their own experience of situational impairments, design interactions using a variety of modalities (e.g. sound, tactile), and explore how these can replace traditional mouse and keyboard interactions.

Year 2: Empathising with People

Building empathy with users is a key business strategy within industry, e.g. [7, 15]. We believe it is key to generating a complete understanding of the challenges faced and adaptations made by users with a variety of disabilities [19]. Students are exposed to Bytes and Blether and are tasked with designing technology solutions with this hard-to-reach group as partners in an iterative design process [6]. Teaching staff hold open focus group sessions and support smaller group meetings so that students can explore the challenges of ageing in a safe and structured environment. When meeting users in small groups, students are advised to have only one note-taker so that conversation can flow, thus building empathy with the group through “being with” them [6].

Year 3: Industrial and Research Exposure

By the time students reach year three of their programme, they have basic knowledge of accessible programming, such as in web development. We expand on this by exposing students to both industrial and research-based issues related to accessibility. For example, students are exposed to mobile interface development guidelines, e.g. [4, 5], and become proficient in exploring the WCAG guidelines [9]. Students complete an accessibility audit of a website, and are required to highlight how legal requirements, such as The Equality Act [2] or Section 508 [1] can influence development of the website being evaluated. This allows students to explore the language of accessibility and convince others of its importance.

Year 4: Bringing it Together

In year four, students are introduced to more complex and hard-to-reach users: The Straight Talking Group (users of AAC) and Tap and Talk (users with aphasia). These users may have physical disabilities as well as complex communication needs, and so this interaction is scaffolded and supported by ever-present research and teaching staff. This builds confidence for both the user and the student, particularly in situations where the student may be unfamiliar, e.g. waiting a long time for

a response from an AAC user. Students spend time with the users and are introduced to the AAC devices used in more detail, having the opportunity to use them to have a conversation with both users and peers. The aim is to understand both the technology (e.g., prediction) and how it is used (e.g., situational issues with sound-only output). By spending time with the users and their devices, the students can experience first-hand, the daily frustrations and challenges of the users.

DISCUSSION AND CONCLUSION

Across all years of our undergraduate programme, we support students to interact with a wide range of users, with a wide range of abilities. Interacting with users who use AAC or have aphasia is unique within Scotland and exposes our students to users that they may not meet in their everyday lives.

Students’ communication with the end users is important, to build confidence on both sides. Students engage with older adults first, as they can typically relate to them more easily and are encouraged to engage in a relaxed environment, e.g. only one note-taker is required. As students progress, they work with users with increasingly complex communication challenges. For students not familiar with disabilities, this can be a difficult experience, and so the communication is supported by teaching and research staff. In many cases, this is a way to provide reassurance and to model communication etiquette. For example, it can be difficult to adjust to the slower rate of communication when talking with AAC users and resist the temptation to speed it up on their behalf, e.g. complete their sentences. Students may have personal perceptions of what they expect from this group, but as they build a relationship with the users these initial perceptions are adjusted. This supports the work by Bennett and Rosner, which proposes “being with” users as part of the design and development process [6].

Ethics is central to the inclusion of user groups in teaching. Since the groups are small, they are a finite resource. To this end, a ‘gatekeeper’ (member of support staff) ensures that users are not fatigued and their time is used sensibly. However, this is balanced with the fact that students will make mistakes and can learn from them. Overall, the members of the User Centre are supportive and flourish in their role, but in turn they must be supported by the university staff.

Moving through the degree, students are increasingly given opportunities to select appropriate research methods for each user group, based on their understanding of the members and the accessibility challenges that they face, e.g. it is a good idea to send questions in advance to AAC users as it gives them time to prepare their answers. This gives opportunities for critical reflection and exposes students to the research challenges faced by researchers on a daily basis. Indeed, there is a natural link to research, since the user groups are typically involved in research projects, and students have opportunities to become involved in research at an early stage.

Overall, we expose our students to a variety of end-users as they progress in their studies. This gives our students motivation for the inclusion of accessibility in software development and we aspire for them to champion accessibility within industry and develop inclusive software as a result.

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