The Glasgow School of Art
Developing Graduate Attributes through Research-led Teaching

Introduction
This Glasgow School of Art (GSA) case study describes research-led undergraduate and graduate teaching linkages and the process of translating expert subject knowledge and information generated from research activity into material appropriate for undergraduate, post-graduate masters, and research student level teaching, and also potentially for distance learning and continuous professional practice (CPD) courses. The main focus here is on the development of graduate attributes in undergraduate students, but a brief discussion of related material developed for graduate students is also provided.

Background
Within the field of product design, The Glasgow School of Art is recognised for its expertise and research in the areas of human factors (the science of understanding human capability) and 'inclusive design' (an approach to design which is intended, as far as possible, to include as many sectors of the population as possible regardless of age or capability) and design for ageing populations. Within these areas, material acquired during staff practice and research includes, e.g., population demographics; models of health, ability and age; people modelling; life-course models; user-centred research methods and typologies; social attitudes to inclusion, ageing, and disability; origins and evolution of inclusive design philosophies; inclusive design exemplars; and the business case for inclusive design. Each of these areas is helping redefine and impact on design research and practice paradigms. Many aspects of this material have already been imparted, implicitly, through a long history of student teaching contact but with the development of GSA's Common Academic Framework (CAF) and the development of its and growth in its graduate programmes there was a need for GSA to create explicit subject-specific credit-bearing course material, and transfer research knowledge in order, explicitly, to develop graduate attributes.

Context
The mid-to-late C20th design paradigm with its emphasis on manufacturing values and its outmoded statistical modelling of people is no longer adequate to respond to the significant change in population demographics across the globe, with its much greater range of age and capability than previous generations, and the much improved consideration of those with disabilities and health- or age-related conditions. Much new design thinking has recently emerged which prioritises user- or people-centric values, where design processes are more participative and inclusive and the scope for design thinking is much broader than traditional design specialisms allow. Examples of this new approach can be found, e.g., in healthcare in "Health: co-creating services" project from the Design Council's Red unit was an innovative approach to addressing chronic issues of diabetes and a lack of population fitness, addressed through user-centred design methods and tools, capitalising on motivating end-users of healthcare to assist in the design of their own healthcare plan, and the tools and materials to achieve this. Developments in technologies have also opened up new possibilities for assistive devices. From a user-friendly and assistive technology perspective, people-friendly mobile phones for children and for older adults in Japan provide exemplars of a clear understanding of user capabilities and requirements and designs have utilised cutting-edge technologies.

Content
At GSA teaching content has been designed to provide students with an introduction to and understanding of the range of issues impacting on emerging user-centred design research practices that promote an 'inclusive' agenda in products, environments, and services at individual, societal, and global levels. This is intended to develop: an understanding of the concepts of human factors and inclusive design, and of the historical origins, issues and factors giving rise to these areas of design; an awareness and knowledge of inclusive user research methods, methodologies, and typologies; a comprehensive understanding of end users of designed products and services; and an informed approach to modelling and profiling of individuals and their needs. The teaching material has been designed and delivered with the nature of GSA's undergraduate students in mind, i.e., visually literate, practice-based students and has been presented in the form of case studies, of e.g.,products, service developments and innovations which have embodied 'inclusive' principles and approaches. This has allowed students to understand the potential applications of this area of knowledge in their own practice.

Developing graduate attributes in undergraduate students

The following example relates to material delivered to final year undergraduate students in GSA's product design engineering (PDE) programme. These students require to meet the high standards of the engineering profession but their unique skills-set includes an enhanced understanding of people-centred design. Human factors content was provided as a weekly short lecture and assignment-based course by a highly qualified practicing human factors consultant working in industry. The inclusive design content was developed and provided by the Senior Researcher School of Design, recognised for his standing in the field. Here, students were briefed through an introductory lecture outlining the nature of the expertise and the range of inclusive user research content available, and which would be made available to students on an informal 'on-demand' basis. To help students address a Royal Society of Arts (RSA) 'inclusive worlds' student design competition, an additional series of specialist inclusive design sessions was provided, where material appropriate to individual student projects was provided in response to their ideas and project needs.

One student proposed a concept for a product to enhance visually impaired users' navigation through city streets and which also allowed them to interact with 'smart' elements in the environment around them using a 'City Buddy' concept which won him an RSA Guide Dogs for the Blind Association Award (Figure 1). The student's intention was to give blind and partially-sighted users more control over the city environment, and increased confidence and independence. The concept, a wrist-mounted product using real-time Bluetooth™ wireless communication, would enable access to location data embedded in the city environment, interact with road crossing signals, provide bus time-table information and request taxi services. In discussing this example, it is the process of developing graduate-level attributes involving inclusive user research methods that is of interest here.

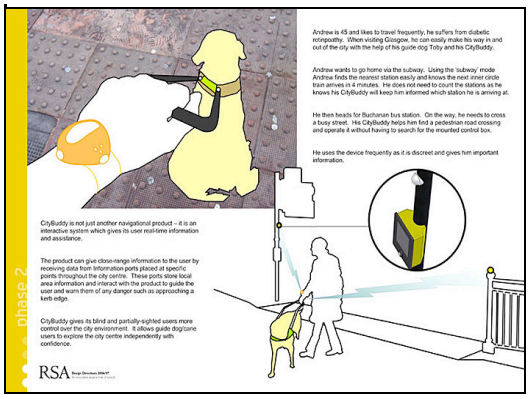

Fig 1. Craig Smith's 'CityBuddy' interactive wrist-mounted navigation device for visually impaired people. © Craig Smith 2007

Fig 2. The student using 'personal immersion' as an introduction to the issues encountered by cane users.
© Craig Smith 2007

In analysing the findings from a Guide Dogs UK survey, the student found that over 60% encountered problems associated with road crossing and that 55% experienced navigational problems. After an analysis of the survey statistics and of types of vision-impairment, the student utilised a number of user-research methods to inform the development of his design. For example, direct 'personal immersion', involved the student being trained in the correct use of a cane (Figure 2) by rehabilitation officers at a sensory training centre. Personally experiencing typical navigational problems was a crucial first step in his understanding of some issues. Another visit involved a similar 'immersive' experience at a Guide Dog training centre, again to help understand the issues first hand. This was followed by the interviewing, with prior guidance on protocols, of both cane and guide dog users. This led to the development of *"a number of navigational scenarios in the city centre … emulating the most common eye conditions suffered by blind and partially-sighted people."* This understanding was further enhanced using *"Visors* [emulating a number of eye conditions, which] *were placed in front of a video camera and recorded a series of scenarios that may occur in an urban environment (walking along a pavement, finding a shop, crossing a street). This not only helped in understanding the problems but also helped communicate the real*

nature of these problems to other students and lecturers when taking part in focus groups and brainstorming." Users were consulted throughout the research and development process, using structured questionnaires and semi-structured interviews, enabling the student to, e.g.*, "research the different user requirements between a guide dog user and cane user as the navigation techniques used by both are very different. This allowed the development of the final solution to consider navigation from both user group perspectives."* One of his methods involved developing a range of user profiles, sometimes referred to as 'personas' which highlighted individuals' separate needs, enabling the differentiation between, e.g., those who feel confident from those feeling vulnerable or those who are familiar with their surroundings from those in new situations. These aspects are distinct from the range of visual disabilities.

Data acquired from his research enabled the student to prioritise the target user groups, their range of specific needs, their different types of visual disabilities and capabilities, and features that his design would need to include to meet these needs and capabilities during everyday scenarios (Figure 3). Examples of these features included audio feedback, a means of indicating distance to a road crossing, high contrast visual feedback for those who had eye conditions other than total blindness - *"only 4% of the UK population with sight loss is actually completely blind"* - and the ability to interact with road crossing controls. Feedback to the user from the wrist-mounted device was proposed by: a) audio feedback, emitted from a small loudspeaker within the product; b) vibration feedback, emitted from a small vibration motor within the product; and c) discreet feedback sent to a small earpiece worn by the user for use when there was too much ambient noise such as heavy traffic (these particular aspects were detailed from the student's specialist technical knowledge developed elsewhere in the PDE programme).

Concept development included the making and testing of prototypes of the device. These were tested with a range of users at the sensory centre, acknowledging the ethical considerations involved in conducting these tests. For these tests, full-scale wrist-mounted models were used to determine user preferences for the location and shape of controls (Figure 4), such as power and volume buttons, or controls that would allow interaction with e.g., road crossing controls. Other tests involved the use of audio feedback recordings, and the preferred quality and nature of these. The design further evolved through a number of the everyday journey scenarios mentioned at the start of the process, to ensure that the product features met the requirements of a variety of users, both those who used guide dogs and canes, in a variety of everyday situations.

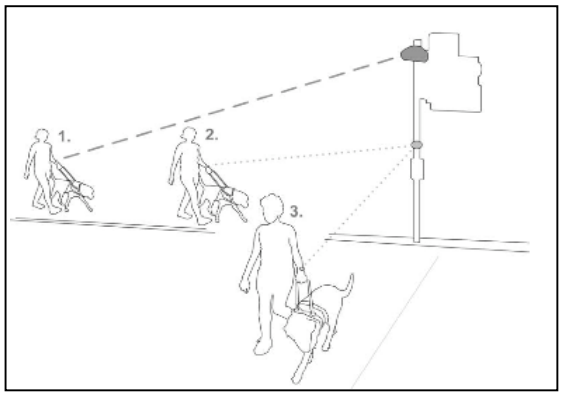

Fig 3. Craig Smith's 'CityBuddy' interacting with smart elements at a traffic crossing. © Craig Smith 2007

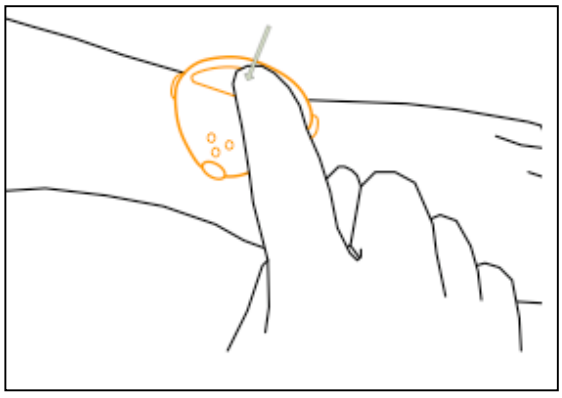

Fig 4. Determining the position of an interaction control. © Craig Smith 2007

Assessment

Assessment criteria are largely common across the range of GSA programmes. The human factors and associated inclusive user-research content discussed here is a stand-alone assessable 10-credit course within the final year PDE programme, but assessed alongside other requirements specific to the final PDE project such as the technical content, the smart technologies proposed, and materials from which the product is manufactured. The assessment and grading criteria reflect requirements for professional registration and employment, or progression to masters and PhD level programmes. Staff at this level of teaching are practitioners and/or leading researchers to ensure that graduating students are aware of emerging with leading edge practice and knowledge from the field.

Graduate level teaching material

Beyond the undergraduate programme, graduate level material was developed with support from GSA's Learning and Teaching Innovation Fund (LTIV). With the development of GSA's postgraduate CAF, a 15 credit taught masters-level course entitled 'Inclusive User Research' was developed specifically for an elective course within Stage 2 of the Masters of Research (MRes) programme, but under the CAF this stand-alone course could be made available to any appropriate masters level students. In this course, students were expected to prepare material for a weekly discussion based on weekly assignments which were time-released via GSA's Virtual Learning Environment (VLE): each contained a bibliography with seminal texts, papers, web-links and case studies. The ambition was that, as a result of these assignments and through the resulting weekly dialogue between student and lecturer, a discourse would emerge which would identify an original (*i.e.* to the field) area of research that the student could pursue and present as a 'case for support' (CFS), based on an established format used in research bids. In this way, the lecturer was able to impart the means and process of establishing original areas for design research related to both the field and a student's interests and practice. Referring specifically to one MRes student's work, the series of assignments informed his final presentation, providing a clear discussion of the student's understanding of the field, and the research questions that emerged for him. The student provided a CFS for a 15-week research proposal for developing a research tool to evaluate the nature of information systems in train stations from the user's point of view using Glasgow Central station as the specific context for his research. For this, he defined a number of research methods including personas, observation, user scenarios of journeys, combined with user workshops all related to fieldwork at the station. Assessment of this level of masters' work used criteria which were consistent within masters courses across GSA, determined by the School's CAF.

Benefits

As a result of this research-led teaching practice, GSA is able to see clear evidence of the uptake of human factors and inclusive user research knowledge, both informally and formally delivered, separately assessable but also embedded in studio-based project activity of final year PDE undergraduates to a standard appropriate and attractive to their profession. The undergraduate student discussed above went on to employment in a design-manufacture company. At the graduate level, the placing of teaching material on the VLE was of great benefit in providing time-released assignments for the masters' level teaching and freed-up the researcher from the requirement to be present for this, enabling more valuable time to be allocated to the discussions of findings arising from the assignments. The particular graduate student discussed, who had studied on a practice-based design course in his undergraduate degree, progressed directly to study at PhD level.

Challenges

It would be fair to say that the course content is fairly innovative within this type of programme but the format of using the VLE currently falls short of being innovative. To exploit the VLE's potential more appropriately, it would benefit the course if additional material in various formats of a more visual nature were uploaded as GSA caters for visually literate students. Given that much material used has copyright issues which are not problematic in normal lecture or studio tutoring situations, these become problematic in a VLE environment. Supplying web-links rather than images is one way of overcoming this.

Outcome

GSA achieved its primary objectives of transferring research knowledge in the subject specific areas of human factors and inclusive user research methods into the undergraduate and graduate curricula. In the latter case this was delivered as a coherent and stand-alone credit-bearing course at a taught graduate (MRes) level although there is no reason why this could not be more formally structured for the undergraduate level, although PDE studio here is centred around practice-based activities. The material has also been used informally by GSA's PhD students. Its potential for use as CPD material for GSA has yet to be explored, but a separate project award held by the GSA inclusive design researcher, part of which is concerned with inclusive design curriculum development located in Japan and separately funded by a Japanese foundation, has shown the potential for this type and area of material to be used in short stand-alone masters-level and CPD courses both at home and abroad.