Research and Education in Accessibility, Design, and Innovation (READi) Training Program: Preparing Graduate Students for Careers in Accessibility Research and Design

Jin Kang

Carleton University, School of Information Technology, jin.kang@carleton.ca

Chantal M. J. Trudel

Carleton University, School of Industrial Design, chantal.trudel@carleton.ca

Audrey Girouard

Carleton University, School of Information Technology, audrey.girouard@carleton.ca

Adrian D. C. Chan

Carleton University, Department of Systems and Computer Engineering, adrian.chan@carleton.ca

In this workshop paper, we present an innovative training program—Research and Education in Accessibility, Design, and Innovation (READi)—dedicated to prepare graduate students of diverse disciplines for employment in the growing number of markets defined by accessibility requirements. The program has strategically designed five training components to promote experiential, affective and cognitive learning towards accessibility. Its flagship component, called the Action Team Project (ATP), bridges the link between theory and practice by offering students the opportunities to work and learn with external community partners. We briefly introduce each training component and discuss our future assessment plan of the program. Our motivation for this paper is to open a dialogue among HCI educators and scholars on future directions of accessibility education.

CCS CONCEPTS • **Social and professional topics~Professional topics~Computing education~Computing education programs**

Additional Keywords and Phrases: Accessibility Education, Education, Experiential Learning

ACM Reference Format:

Jin Kang, Chantal M. J. Trudel, Audrey Girouard, and Adrian D. C. Chan. 2021. Research and Education in Accessibility, Design, and Innovation (READi) Training Program: Preparing Graduate Students for Careers in Accessibility Research and Design. In Proceedings of 3rd Annual EduCHI'21 Symposium. May 15, 2021, Virtual Conference, 9 pages.

1 INTRODUCTION

Approximately 15% of the world population has a disability [20] and yet most technologies, services, and products are inaccessible to people with disabilities [2,7,17]. The unmet needs of people with disabilities in every facet of their lives (e.g., employment, education, transportation, healthcare, sports and leisure, art and culture) has fueled

the demand for individuals accomplished in finding and generating knowledge related to accessibility and skills that advance the field [10,12]; that is, someone who can conduct human-centered research and design with empathy to create barrier-free services, products, spaces, and more. Accessibility is a human right and designing inclusively to remove barriers is not an option but a necessity [14]. Joining in the effort of other leading HCI educators and scholars to create an inclusive and prosperous society, we created the Research and Education in Accessibility, Design, and Innovation (READi) training program to prepare graduate students for careers as accessibility researchers, designers, or educators in the areas of information technology, design, engineering, human-computer interaction, computer science, and more. The creation and maintenance of our own accessibility training program reflect our efforts to address the dismal state of current accessibility education—accessibility has been and continues to be excluded from formal education [4,9,18]. This exclusion can be attributed to various factors, including faculty's lack of knowledge on accessibility and not enough resources to teach accessibility (e.g., textbook) and not enough interest from students and departments [12]. If our goal is to build an inclusive and prosperous society for people of all ages, genders, and abilities, we need to place a premium emphasis on educating the future generation of professionals who can create accessible technologies, products, and services.

We contribute to EduCHI's Teachable Moments discussion by sharing our innovative pedagogical approach towards educating graduate students on knowledge, skills, and attitudes essential to succeed as accessibility professionals. Our training program is unique in several ways: (1) it situates graduate students in their home degree program and provides them with the opportunity to apply theories, methods, and technologies to address real-world accessibility issues (i.e., learn-by-doing approach), (2) it has incorporated experiential learning in every major component where students are active participants (vs. passive participants) [13], (3) its training components promote cognitive and affective learning that fuel student enjoyment and intrinsic motivation to do well in the program, (4) it trains students on professional skills that are equally valued as technical skills by hiring managers and employers [11], and lastly (5) it offers an impressive scope of training that equips students with both theoretical and practical knowledge. Existing opportunities for education in accessibility provide only some forms of experiential learning (e.g., [4,15]) or primarily offer a social sciences perspective that focuses on the examination of disability as a social construction (e.g., [3]), READi stands apart by providing the most immersive form of experiential learning (i.e., service learning) combined with education on inclusive design principles and theories. In the end, we hope our pedagogical approach can help other HCI educators and scholars address "*what* should we teach on accessibility?" and "*how* should we teach accessibility?" and we encourage them to use our program as a guide in developing their own accessibility training program, material, and curriculum [5,6,8,16]. In what follows, we outline the program's five unique training components, followed by outlining targeted professional skills and our future program assessment plan.

2 RESEARCH AND EDUCATION IN ACCESSIBILITY DESIGN, AND INNOVATION TRAINING PROGRAM

The Research and Education in Accessibility, Design, and Innovation (READi) is a training program led by three institutions in collaboration—Carleton University, University of Ottawa, and Queen's University—and it is supported by the Natural Sciences and Engineering Research Council (NSERC) of Canada through its Collaborative Research and Training Experience Program (CREATE). This funding program supports an innovative educational training program designed to prepare graduate students in the STEM disciplines for careers in industry, government, and academia. READi started in September 2017 and in the past four years we have had a total of 53 students who have come from diverse majors, including Human-Computer Interaction, Design, Music and Culture,

History, Cultural Mediations, Biomedical Engineering, Mechanical Engineering, Computer Science, and Information Technology. This diversity in our student background is one core strength of the program; each student benefits from other student's diverse and rich experiences, knowledge, and backgrounds. There are five major training components in READi: (1) a graduate course on accessibility and inclusive design, (2) the Action Team Project (ATP), (3) a Retreat, (4) Workshops, and (5) a Symposium. Figure 1 presents an overview of the program. Each of these components have been strategically designed to foster affective learning (emotion/feeling) and cognitive learning (knowledge/skills). Specifically, social components embedded in each training component can foster positive attitude, enjoyment, and intrinsic motivation to do well in the program, ranging from interaction with community partners and past READi students to READi faculty and program coordinators. These social components instill a sense of 'learning community' in students which can promote peer learning and peer support.

There are five learning outcomes in READi. By the end of the program, students should be able to (1) apply inclusive design principles to ideate and create products, services, and environments accessible to people of all ages, gender, and abilities; (2) employ a human-centered design process to advance the current state of accessible design standards and principles; (3) interact with people of all ages, gender, and abilities in their research; (4) recognize and empathize with people with disabilities; and (5) discuss accessibility from multiple perspectives (e.g., technical, social, individual, legislative).

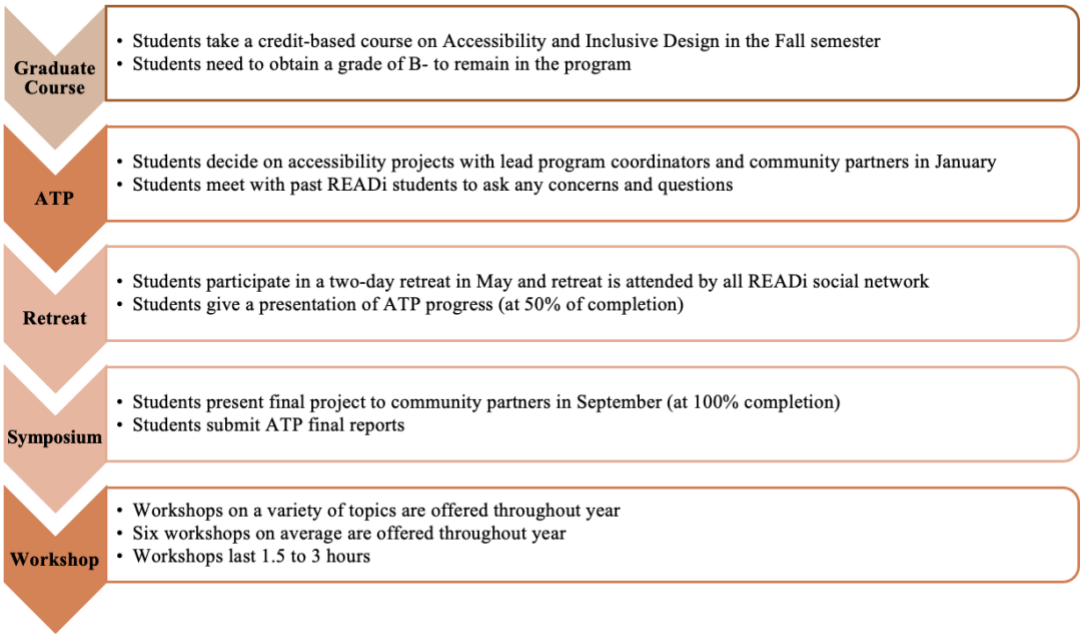

Figure 1 An Overview of READi: Five Major Training Components.

2.1 Training Component 1: A Graduate Course on Accessibility and Inclusive Design

Students take a graduate course in the Fall academic term. While this is a compulsory component for READi students, this course is open to all students and we have had non-READi students in the course in the past. This course provides students with foundational knowledge on accessible, inclusive, and human-centered design

principles, so that students are ready to tackle real-world accessibility challenges for their ATP. There are four learning objectives in this course: (1) students will understand inclusive and accessible design principles crucial to create inclusive products and services; (2) students will develop empathy and appreciation for diversity; (3) students will become proficient in conducting qualitative and quantitative human-centered design research; and (4) students will be able to define different models of accessibility (e.g., medical, ethical, and social). Major course topics covered are the history of inclusive design, ability-based design: concepts and principles, approaches to estimating how people may be excluded, legislation on accessibility, and emerging assistive technologies.

Figure 2: An Exemplar Case Study: The Student Group Created Affinity Diagram Representing Themes for Three Leaders.

In this course, students complete a team case study. Students form a group of 2 to 3 and interview design leaders and people who are at the forefront in championing for accessibility in the areas of engineering, ICT, architecture,

design, the arts, therapy and advocacy. Through this assignment, students seek out the stories of people with experience in creating and facilitating accessibility in their work, as well as their thoughts on the role of teams in designing for accessibility. Below, we provide an exemplar case study from one student group who interviewed three leaders in design. Leader A was diagnosed with Parkinson's disease and designed a school program to raise awareness about the disease. Leader B is a museum manager and passionate about making a museum accessible for everyone. Leader C is an assistant professor who educates about and conducts research on everyday accessibility. The group uncovered six themes revealing the leaders' perspective towards accessibility: Education, Community, Vision, Policy, Process & Approach, and Lived Experience (Figure 2). The final deliverables are research reports which document the findings from this exercise captured in techniques such as thematic analysis and affinity diagrams. All case studies, such as this one, are uploaded and available on a READi website for the public.

2.2 Training Component 2: Action Team Project (ATP)

This is the flagship component of READi and offers students the theory-practice link. The ATP is inspired by the premise of community-engaged pedagogy which involves students applying their skills to learn about the needs of local community organizations and generate ideas in partnership [19]. Students form Action Teams (~3 to 4 members) engage in an 8-month interdisciplinary learning experience. They explore real-world accessibility issues, identified with community partners. The students are not expected to fully solve complex accessibility issues (they are often wicked problems which have no single solution and require students' exercise of creativity to arrive at possible solutions) [1]. The intention is that their ideas and concepts will help 'move the needle forward'. At the end of the project, students offer community partners tangible insights for future studies and improvement. Our READi community partners come from diverse backgrounds, such as: not-for-profit organizations who are dedicated to build inclusive community space for children and youth; a hospital that aims to improve services for patients who require sub-acute geriatric or palliative care; national institutes who support people who are blind or partially sighted; and organizations that create customized assistive devices to support people with disabilities. To ensure students gain meaningful hands-on learning experience and to ensure our partners have helpful project outcomes, we ask community partners to actively participate and collaborate with students on the ATP. Community partners are encouraged to have a 2 to 4-hour meeting on average once per month with the student groups. Table 1presents a brief description of past READi students' ATP.

Table 1: A Short Description of ATP from Past READi Students

Student Group	Project Description
A	The students worked with an organization that fosters computer-based employment readiness and skills for adult clients with physical and/or developmental disabilities. The students recommended the organization to continue to build client confidence and increase networking to build community.
B	The students improved the accessibility of an organization's art gallery website. They developed a more user-friendly and accessible archive database interface and recommended to make the organization's physical and online space more accessible to people with a wide range of disabilities.
C	The students worked with an organization that supports social activities and connections among seniors and evaluated the organization's existing practices in encouraging connection. They identified qualities that make the social environment engaging and collaborative for seniors and highlighted the importance of communication and the value of keeping people who are aging safe within their own homes.

2.3 Training Component 3: A 2-day Retreat

Students participate in a 2-day (one overnight) intensive learning experience with the ATP partner and READi faculty members. This occurs mid-way through the ATP (around May). Formal elements include students' interim ATP progress report and workshops on leadership and innovation, and a lived experience testimony and discussion. Informal elements include social interaction with other READi trainees, the ATP partners and faculty members. These social elements are crucial to promote affective learning: students seem to develop greater empathy towards their partners and end-users through this event and develop positive attitudes and enhanced intrinsic motivation to complete the ATP and the program.

2.4 Training Component 4: Workshops

Interactive workshops are offered throughout the year, which cover a variety of topics including: web and document accessibility; design thinking; assistive and adaptive technologies; attitudinal barriers to accessibility; entrepreneurship; networking with industry and accessibility experts (government representatives, disability advocacy groups, and researchers); disability in art, sports, and leisure; and knowledge mobilization. Subject matter experts are invited to educate READi trainees on these topics (e.g., READi faculty, program committee, community partners), with workshops being typically around 1.5-3 hours in duration. In addition to the Retreat, these workshops foster affective learning by incorporating social interactions. READi students are required to complete at least 6 workshops.

2.5 Training Component 5: An Annual Symposium

Students present their final ATP projects to community partners and the public (e.g., trainees, partners, community members). They outline their learning journey (e.g., what they have learned about accessibility, personal revelations, issues and opportunities) and present the accessibility issue that was explored, and the knowledge and ideas that were developed. The symposium invites a keynote speaker to provide a current national/global picture of accessibility. We also invite a member from the local disability community to share their lived experienced. Students are encouraged to develop a conference paper or other knowledge dissemination work with the collaborator as appropriate, beyond the symposium. Table 2 highlights some of these professional skills.

Table 2 Targeted Professional Skills for READi Students

Targeted Skill	Description	Provider
Communication	Students develop written and oral communication skills by presenting to multidisciplinary audiences.	ATP, Graduate Course, Retreat & Workshops
Ethics, Regulations	Students learn about ethics, privacy, and confidentiality, human rights and legal obligations with respect to disability and accessibility.	Graduate Course, Retreat & Workshops
Project Management	Students learn about team management, resource allocation and planning.	ATP & Retreat
Teamwork	Students learn to work as a member and leader in a multidisciplinary team.	ATP & Retreat
Knowledge Mobilization	Students facilitate knowledge sharing between stakeholders, including researchers and end-users.	ATP, Retreat & Workshops
Lifelong Learning	Students identify limits of knowledge, knowledge needs, and skills on knowledge acquisition.	ATP, Graduate Course, Retreat & Workshops

2.6 Other Training Components

There are two additional components that can benefit READi students who are at a doctoral level: (1) Immersive experience - PhD students immerse themselves fully in the working environment of READi community partners. In addition to the ATP, this provides an additional layer to their experiential learning on accessibility; and 2) Mentoring - PhD students become a mentor to guide new READi trainees and this advances their understanding on accessibility by reinforcing their prior knowledge and skills with new READi cohorts.

3 FUTURE ASSESSMENT PLAN

READi has entered its 4th year and we have actively taken steps to improve the program each year. We have a Program Committee that meets at least twice a year to help guide the strategic direction of the program. The Committee includes representatives from external stakeholders (industry, government, not-for-profit), students, and READi faculty. We have facilitated an opportunity to allow students to provide feedback on the program itself: we do a mid-project debrief at the READi retreat and a final debrief to assist future students after the Symposium. To give our readers an example of program improvement, we have recently launched a mentorship program, matching individual students with people working in the area of accessibility (government, industry, not-for-profit). This mentorship programs gives students the opportunities to ask questions related to their interests on accessibility (e.g., how to find opportunities to engage in accessibility work in their careers). Aside from making these annual improvements to the program, we plan to interview all major stakeholders—past and current students and community partners—to get a comprehensive understanding of how the program has influenced each group's education and career (for students) and organizational goals (for partners). If our sole objective of the program is "has the program prepared students for employment in the accessibility labor market?" then it is paramount that we revisit our past students and have discussion on where they are currently professionally.

In near future, we hope to share our initial assessment of the program with the HCI community, including the effect of our annual program improvements.

4 CONCLUSION

We presented an innovative training program that trains graduate students in diverse disciplines on fundamental knowledge, skills, and attitudes essential for professionals who create, design, and champion for inclusive and accessible products, services, and environments. The extensive scope and in-depth training that READi offers will prepare students well to meet the increased demand for accessibility professionals in a range of areas including wearable computing, Internet of Things, and pervasive health monitoring. Our presentation of READi to the EduCHI community can initiate discussion with other HCI educators and scholars on *what* should be taught on accessibility and *how* should accessibility be taught and thereby breaking down teaching barriers for some who may not have enough resources to approach accessibility education within their own departments.

ACKNOWLEDGMENTS

This work was supported and funded by the National Sciences and Engineering Research Council of Canada (NSERC) through the Research and Education in Accessibility, Design, and Innovation (READi) CREATE Training Program (497303-2017) and the Collaborative Learning in Usability Experiences (CLUE) CREATE grant (2015-465639).

REFERENCES

[1] Richard Buchanan. 1992. Wicked Problems in Design Thinking. *Des. Issues* 8, 2 (1992). DOI:https://doi.org/10.2307/1511637

[2] Allyson Calder, Gisela Sole, and Hilda Mulligan. 2018. The accessibility of fitness centers for people with disabilities: A systematic review. *Disabil. Health J.* 11, 4 (2018). DOI:https://doi.org/10.1016/j.dhjo.2018.04.002

[3] Carleton University. Minor in Disability Studies. Retrieved from https://calendar.carleton.ca/undergrad/undergradprograms/disabilitystudies/

[4] Yasmine El-Glaly, Weishi Shi, Samuel Malachowsky, Qi Yu, and Daniel E. Krutz. 2020. Presenting and evaluating the impact of experiential learning in computing accessibility education. In *Proceedings - International Conference on Software Engineering*. DOI:https://doi.org/10.1145/3377814.3381710

[5] Ed Gellenbeck. 2005. Integrating accessibility into the computer science curriculum. *J. Comput. Sci. Coll.* 21, 1 (2005).

[6] Gian Maria Greco. 2019. Towards a pedagogy of accessibility: The need for critical learning spaces in media accessibility education and training. *Linguist. Antverp. New Ser. Transl. Stud.* 18, (2019).

[7] Emily Grisé, Geneviève Boisjoly, Meadhbh Maguire, and Ahmed El-Geneidy. 2019. Elevating access: Comparing accessibility to jobs by public transport for individuals with and without a physical disability. *Transp. Res. Part A Policy Pract.* 125, (2019). DOI:https://doi.org/10.1016/j.tra.2018.02.017

[8] Christos Katsanos, Nikolaos Tselios, Athanasios Tsakoumis, and Nikolaos Avouris. 2012. Learning about web accessibility: A project based tool-mediated approach. *Educ. Inf. Technol.* 17, 1 (2012). DOI:https://doi.org/10.1007/s10639-010-9145-5

[9] Suzette Keith, Gill Whitney, and Andrea Petz. 2009. Design for All as Focus in European ICT Teaching and Training Activities. In *Proceedings of Inclusive design into innovation: Transforming Practice in Design, Research and Business*, 1–6.

[10] Government of Ontario. 2020. About accessibility laws. Retrieved from https://www.ontario.ca/page/about-accessibility-laws

[11] Mary Anne Raymond, David E. McNabb, and C. Frederick Matthaei. 1993. Preparing Graduates for the Workforce: The Role of Business Education. *J. Educ. Bus.* 68, 4 (1993). DOI:https://doi.org/10.1080/08832323.1993.10117613

[12] Kristen Shinohara, Saba Kawas, Andrew J. Ko, and Richard E. Ladner. 2018. Who teaches accessibility? A survey of U.S. computing faculty. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education*, 197–202. DOI:https://doi.org/10.1145/3159450.3159484

[13] Manilla D. Svinicki and Nancy M. Dixon. 1987. The Kolb Model Modified for Classroom Activities. *Coll. Teach.* 35, 4 (1987). DOI:https://doi.org/10.1080/87567555.1987.9925469

[14] United Nations. Convention on the Rights of Persons with Disabilities (CRPD). Retrieved April 2, 2021 from https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html

[15] OCAD University. Inclusive Design (MDes). Retrieved from https://www.ocadu.ca/academics/graduate-studies/inclusive-design

[16] Ye Diana Wang. 2012. A holistic and pragmatic approach to teaching web accessibility in an undergraduate web design course. In *Proceedings of the ACM Special Interest Group for Information Technology Education Conference*, 55–60. DOI:https://doi.org/10.1145/2380552.2380568

[17] Sue Watling. 2011. Digital exclusion: Coming out from behind closed doors. *Disabil. Soc.* 26, 4 (2011). DOI:https://doi.org/10.1080/09687599.2011.567802

[18] WebAIM. 2018. Survey of Web Accessibility Practitioners #2 Results tle. Retrieved from https://webaim.org/projects/practitionersurvey2/

[19] Linda D. Webster and Edward J. Mirielli. 2007. Student reflections on an academic service learning experience in a computer science classroom. In *Proceedings of the 2007 ACM Information Technology Education Conference*, 207–212. DOI:https://doi.org/10.1145/1324302.1324347

[20] World Health Organization. 2020. Disability and health. *World Health Organization*. Retrieved January 2, 2021 from https://www.who.int/news-room/fact-sheets/detail/disability-and-health