

TPM: Using Experiential Learning to Support Accessibility in Computing Education

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Abstract—This tutorial will introduce our *Accessibility Learning Labs* (ALL). The objectives of this collaborative project with The National Technical Institute for the Deaf (NTID) are to both inform participants about foundational topics in accessibility and to demonstrate the importance of creating accessible software. The labs enable easy classroom inclusion by providing instructors all necessary materials including lecture and activity slides and videos. Each lab addresses an accessibility issue and contains: I) Relevant background information on the examined issue II) An example web-based application containing the accessibility problem III) A process to emulate this accessibility problem IV) Details about how to repair the problem from a technical perspective V) Incidents from people who encountered this accessibility issue and how it has impacted their life.

The labs may be easily integrated into a wide variety of curriculum at high schools (9-12), and in undergraduate and graduate courses. The labs will be easily adoptable due to their self-contained nature and their inclusion of all necessary instructional material (e.g., slides, quizzes, etc.). No special software is required to use any portion of the labs since they are web-based and are able to run on any computer with a reasonably recent web browser. There are currently four available labs on the topics of: Colorblindness, Hearing, Blindness and Dexterity. Material is available on our website: <http://all.rit.edu>

This tutorial will provide an overview of the created labs and usage instructions and information for adaptors.

Index Terms—Accessibility Education, Computing Education, Computing Accessibility

I. INTRODUCTION/OVERVIEW

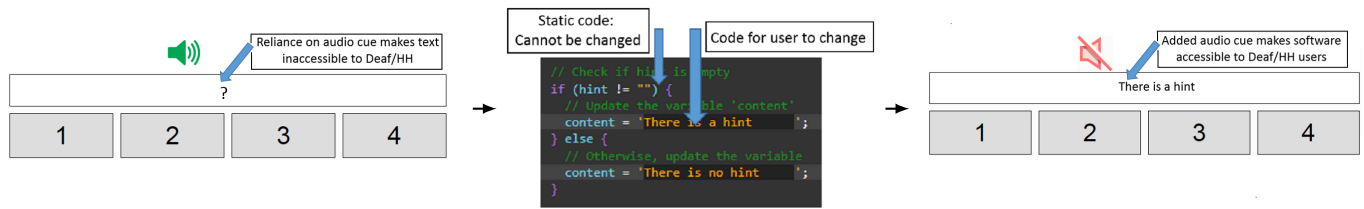
Approximately 15% of the world population has a disability [5]. Unfortunately, despite widespread legislation [1], [3], [2] much of the software created today is inaccessible for many people such as those with visual, cognitive, hearing, dexterity and other disabilities [13], [6], [9], [10], [7]. Our world needs to create more accessibility inclusive software. To address this problem, we need an accessibility literate workforce that not only understands how to create accessible software, but also recognizes the importance of creating accessible software. Unfortunately, although accessibility is a crucial computing topic, it is often excluded from education [12], [4].

To fill the existing void in accessibility education, we have created a *comprehensive collection of laboratory activities that are essential to accessibility education*. These labs are collectively referred to as the *Accessibility Learning Labs* (ALL).

These systematically developed educational accessibility labs have the primary goals of creating student awareness of the need to create accessible software, and to inform students about fundamental accessibility concepts. The labs are easy to integrate into a variety of existing introductory computing courses (e.g., Computer Science I & II) due to their easy to adopt, self-contained nature. No special software is required to use any portion of the labs since they are web-based and able to run on any computer with a reasonably recent web browser. Each lab has a designated difficulty rating (Low, Medium, Advanced) to help impact assorted levels of course specialization and student experience. This will enable the labs to reach a diverse set of audiences, ones with different needs and experience levels.

Each lab addresses an accessibility issue and contains: I) Relevant background information on the examined issue, II) An example app containing the accessibility problem, III) A process to emulate this accessibility problem (as closely as possible), IV) Details about how to repair the problem from a technical perspective, and V) Information from actual people about how this encountered accessibility issue has impacted their life. For example, when addressing an issue such as color blindness (Deuteranope), a user with this condition discusses how inaccessible apps has impacted their computing experiences. This will help to create empathy for disabled users and will serve to help motivate students to create accessible software, preparing them with technologies and software design methods that address those concerns. Previous research has demonstrated that creating student empathy for users with sensory, cognitive and motor disabilities is frequently a very difficult task [14]. These supplementary materials in our Accessibility Learning Labs will help to address this challenge.

The labs enable participants to directly experience both the impact of inaccessible software and the impact that their modifications have on making the software more accessible. As an example, for ensuring that software is accessible to users with hearing impairment, a common best practice will be to not rely solely upon audio cues since this can adversely impact the experience of Deaf/Hard of Hearing users — participants could repair the application through the use of text or visual aides in addition to any audio notifications [8], [11]. Figure 1 provides an example of this process. Figure 1a demonstrates the inaccessible version of the software, while Figure 1b



(a) Inaccessible software since user cannot hear notification and the visual message is not relevant

(b) Mock IDE used through browser

(c) Software made more accessible by student adding informative visual message.

Fig. 1: Example of student repairing accessibility problem using simulated IDE

shows the simulated IDE to change the source code, and Figure 1c demonstrates the repaired, accessible version of the application.

II. PROPOSED ACTIVITIES

The tutorial will provide participants with a mechanism to I) Learn about our provided educational accessibility material, II) Provide feedback and guidance on any necessary modifications to the labs, and III) Share common challenges and best practices for including accessibility in computing education. Tutorial participants may choose to participate by discussing and reflecting on included topics, or may use their own laptop to experience the material in a hands-on manner. No prior input from event participants will be required.

A. Expected Audience

Instructors of computing and non-computing courses who are interested in including foundational accessibility concepts. While the labs are specifically targeted towards undergraduate introductory computing courses (CS1 & CS2), they may be used in a variety of other courses ranging from 9-12 grade high school courses, to upper level undergraduate courses, and even in graduate-level curriculum.

There is no strict restriction on enrollment as participants will be supplying their own computers and no special hardware, software, or pre-configuration is required. The optimal audience size for the tutorial is approximately 20-30 participants, but we are flexible on the number of participants.

III. PRESENTER BIO

Samuel Malachowsky is the Co-PI of the project that is developing the described accessibility labs. Malachowsky is a Sr. Lecturer at RIT and has authored 9 pedagogically focused publications. He holds a Project Management (PMP) certification and has authored a textbook on team leadership [15].

Daniel Krutz is the PI of the NSF-funded project [16], [17] that is devoted to creating the presented labs. Krutz has taught approximately ten different graduate and undergraduate software engineering courses and is the author of over twelve pedagogical research papers.

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