Journal of Technology-Integrated Lessons and Teaching
(2023) Volume 2, Issue 1

"Learning in the Dark" Simulation to Teach about Accessibility

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Overview

The purpose of this instructor-led lesson is to raise preservice teachers' awareness of the significance of accessibility in PK-12 education. In the lesson, students develop empathy to understand the experiences of learners with vision-related disabilities through a simulation activity and competencies to achieve accessibility in their specific teaching contexts. Multimedia and open educational resources are utilized to introduce accessibility, inclusive education, Universal Design for Learning, assistive technology, and accessibility evaluation. Students participate in several learning activities, such as a collaborative document to identify effective technologies to address accessibility issues faced by learners with disabilities and an e-portfolio assessment to evaluate the accessibility of e-learning tools in PK-12 classrooms.

Topics: Accessibility, Assistive Technology, Learners with Disabilities, Universal Design for Learning

Time: 3-hour lesson.

Materials

- Internet-enabled computer and projector
- Sleep masks, A4 blank papers, and M&M's for the "Learning In The Dark" Simulation Activity
- Digital devices for learning activities
- "Learning in the Dark" PowerPoint Presentation
- "Learning in the Dark" Inaccessible Document
- Open book chapters: "Evaluating Accessibility" and "Universal Design for Learning"
- YouTube videos, websites, and other external resources

Context-at-a-glance

Setting
The lesson was developed for preservice teachers at a suburban, mid-size, public university in the Midwest, United States.

Modality
Face-to-face

Class Structure
The 3-hour lesson was one of the modules in an undergraduate-level teacher education course. The instructor had the autonomy to update the course content to achieve desired learning outcomes.

Organizational Norms
The program prepares educators to become change agents to promote social equity and justice. The course was required to equip preservice teachers with knowledge and skills to integrate technologies to create accessible and inclusive PK-12 classrooms.

Learner Characteristics
Learners were mainly sophomores and juniors from diverse education majors and had limited technological knowledge and teaching experience.

Instructor Characteristics
The instructor received a Ph.D. in Instructional Technology with expertise in instructional design and technology integration in PK-12.

Development Rationale
The lesson was crucial to equip preservice teachers with competencies to identify the most appropriate technologies and strategies to address the accessibility barriers faced by learners with disabilities in PK-12.

Design Framework
Backward Design Framework

DOI: 10.13001/jtilt.v2i1.7453

Setup

This lesson was delivered in an in-person manner. There were 25-28 students in the class. The instructor applied the idea of active learning to set up a learning space where students could participate in lesson presentations, whole-class discussions, and group activities. Five to six tables with chairs were available for small groups. Depending on different situations, instructors will need 30 minutes to set up the environment effectively, including distributing blank papers and packages of M&M's to each table.

Standards

The lesson aligns with the International Society for Technology in Education (ISTE, 2017) Standards for Educators 2.2.b, 2.2.c, 2.3.a, and 2.5.a.

Context and Setting

This lesson is one of the modules in an undergraduate-level teacher education course, *Technological Applications in Education*. It is mandatory for students who are majoring in teacher education at the university, such as science, math, art, literacy, early childhood, and special education. The purpose of this course is to equip preservice teachers with the needed knowledge and skills to integrate the most appropriate technologies to support student engagement and success in PK-12 classrooms, as indicated in communication, presentation, multimedia development, emerging technology, and assessment. The instructor designed the course based on the ISTE (2017) Standards for Educators.

Around 15% of the student population are individuals with different types of disabilities, such as learning disabilities, speech impairments, health impairments, and others (NCES, 2022). These learners often face various barriers and challenges at educational institutions, as indicated in the accessibility of facilities, sense of belonging, and learning experiences (Banfield-Hardaway, 2010). Accordingly, the Americans with Disabilities Act enforced each institution to provide accommodation services and increase the accessibility of learning environments for individuals with disabilities (U.S. Department of Justice Civil Rights Division, n.d.). However, teachers who do not have sufficient expertise in

accommodation and accessibility face challenges in their teaching activities. Therefore, it is crucial to equip preservice teachers with essential knowledge and skills to effectively accommodate the needs of these learners in their future teaching practices, including classroom setup, instructional materials, learning activities, and homework.

Inclusive education aims to build a student-centered learning community where students with various capabilities and needs can enjoy quality education and meaningful learning experiences in the same space (Jokinen, 2018; Koenig, n.d.; Ponomareva & Ugnich, 2018). Since the course focuses on technology integration in education, the introduction of pedagogical and technological knowledge is necessary for preservice teachers to appropriately address the accessibility barriers faced by students with disabilities.

The backward design framework was utilized to guide the course design and development. First, the list of learning objectives was developed, written in terms of what the students will be able to do:

1. Discuss the importance of accessibility in education.
2. Discuss the effective methods to achieve inclusive education.
3. Implement appropriate assistive technology tools and practices to address accessibility in different scenarios.
4. Evaluate the accessibility of digital technologies.

At the time of design, the Center for Disability Services at the university organized a simulation activity, "Dining in the Dark." It aimed to invite students, faculty, and staff to have a blindfolded meal experience to recognize and respect the daily experiences of individuals with vision-related disabilities. The instructor of this lesson participated in the event and was able to gain a deeper understanding of accessibility and appreciate the lived experiences of individuals with disabilities. Visual impairments including blindness, one of the disability categories defined by the Individuals with Disabilities Education Act, can negatively affect students' academic performance (Center for Parent Information & Resources, 2017). Therefore, the instructor decided to adapt the "Dining in the Dark" simulation as a starting point to raise students'

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awareness of the importance of accessibility in education. In this lesson, it was expected for students to experience the challenges and barriers faced by students with vision-related disabilities in a schooling context.

Guided by the four learning objectives previously developed, another group activity was created for students to research effective strategies to achieve accessibility in different scenarios, including identifying appropriate assistive technology tools and implementing practices to make instructional materials accessible. Moreover, two assessments were developed for the students' LiveText portfolios (an e-portfolio and assessment management system to track students' learning artifacts for the certification purpose), including a voiceover presentation to discuss strategies to achieve an accessible learning environment for students with learning disabilities and an accessibility evaluation report for an e-learning tool used in PK-12 classrooms. Based on these learning activities and assessments, the content of accessibility, inclusive education, Universal Design for Learning, assistive technology tools, and accessibility evaluation, as well as the stories of individuals with disabilities, was included in the "Learning in the Dark" PowerPoint Presentation (attached). During this lesson, italic text identifies information and prompts given to the students.

Learning Representation

Preparation and Implementation

The instructor sent students an email to inform them that there would be a simulation activity in the classroom a week before the class started. In the email, the instructor told students that *they will wear a sleep mask for a 30-minute blindfolded learning experience and to please bring their personal digital devices for in-class activities. If they feel uncomfortable with wearing a sleep mask, they can still participate in the activity. If they have any questions or concerns, they are welcome to contact the instructor.* The instructor also prepared enough sleep masks, A4 blank papers, and M&M's and set up the classroom before class time. An A4 blank paper is a standardized copy paper, with a dimension of 8.27 x 11.69 inches.

Introduction (10 minutes)

Before the class, students were asked to line up outside of the classroom and wear a sleep mask. The instructor helped students find a seat. Students were randomly assigned to different tables. Five to six students shared the same table. The instructor introduced the topic for today's class, learning objectives, course agenda, and instructions for the simulation activity.

"Learning in the Dark" Simulation Activity (40 minutes)

For the first learning activity, students wore sleep masks all the time and did not know who else was sharing the table with them. The instructor asked students to first explore the surrounding area and introduce themselves to their team members, such as their names, description of their appearance, and present feelings.

Second, students participated in a paper folding activity with the A4 blank papers. The instructor briefly explained the procedures, asked students to look for the A4 blank paper on the table, and read the following instructions for students to make a paper boat (see more details on How to make a paper boat video on YouTube; Latter Day Kids, 2022):

1. *Fold the paper in half.*
2. *Unfold the paper and rotate it.*
3. *Fold it in half again.*
4. *Flip the paper to make the fold open to you.*
5. *Bring the bottom up to fold it against both sides.*
6. *Take the bottom corners and fold them in.*
7. *Make the triangle into a square.*
8. *Fold up the bottom of both sides.*
9. *Rotate and open up the bottom.*
10. *Pull out the two sides of the square.*

Third, the instructor asked students to count the number of individual M&M's in a small package on their own and work with other team members to calculate a total number.

Fourth, the instructor used a screen reader tool to deliver the content within the "Learning in the Dark" Inaccessible Document (attached).

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Finally, students took off their sleep masks and shared their simulation experiences with their team members and the whole class guided by a list of reflective questions, including:

- *What are your current feelings?*
- *How is this experience different from your general learning experience?*
- *What have you learned from this experience?*
- *What are some challenges faced by you?*
- *What does accessibility mean to you?*
- *Why do you believe accessibility is important in education?*

Debriefing

After students' discussions, the instructor further explained the purpose of the simulation activity: *for students to experience the difficulties faced by people with vision-related disabilities in a classroom environment, rather than reinforcing their misconceptions and discrimination towards disabled people.*

Lesson Part 1: Accessibility, Inclusive Education, and Universal Design for Learning (UDL; 40 minutes)

After the simulation activity, the instructor played an accessibility mindfulness video (LAPU eLearning, 2021) to further raise students' critical consciousness of accessibility and foster their deep understanding of the importance of addressing accessibility in PK-12 classrooms.

Then, the instructor started the "Learning in the Dark" PowerPoint Presentation (attached) by first discussing the definition and importance of accessibility, inclusive education in PK-12 classrooms, and UDL. For instance, accessibility means that people with disabilities can access educational materials and technologies to "acquire the same information, engage in the same interactions, and enjoy the same services" (U.S. Department of Education, 2010, para. 4.). Inclusive education refers to a student-centered learning community where students with diverse capabilities and needs feel welcomed and respected and enjoy equal participation in learning opportunities (Koenig, n.d.). In the "Learning in the Dark" PowerPoint Presentation, the instructor also explained different strategies to achieve inclusivity in PK-12 education, as indicated in "accessibility, universal design, reasonable accommodations, and individual support" (Jokinen, 2018, p. 72).

The instructor then asked students to read a portion of an open book chapter, "Universal Design for Learning" (Michela, 2018), and played a 15-minute TEDx Talks (2017) video explaining the use of UDL principles (representation, action and expression, and engagement) to achieve maximum inclusion in education. UDL is an instructional design model that emphasizes flexibility and adjustability in learning to accommodate the various needs of learners from diverse backgrounds (Elias, 2010; Rogers-Shaw et al., 2018). In the "Learning in the Dark" PowerPoint Presentation, the instructor further summarized the principles in representation, action and expression, and engagement areas as well as potential pedagogical and technological considerations to achieve these principles (Coolidge et al., 2019).

Lesson Part 2: Assistive Technology and Accessibility Evaluation (30 minutes)

Assistive technology refers to "any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities" (ATiA, n.d., para. 3). In the "Learning in the Dark" PowerPoint Presentation, the instructor introduced the characteristics of assistive technology, the importance of assistive technology, examples (e.g., sign language interpretation technology, speech-to-text software, and tools for individuals with learning disabilities), and implementation strategies and challenges.

Links to some open educational resources discussing assistive technology were provided to students:

- "Assistive Technology for Students with Learning Disabilities" (Taylor, 2019, Chapter 24).
- "Assistive Technologies in the 21st Century" (Gatchalian, 2019, Chapter 25).

Furthermore, students read Section II, "Best Practices" of the open book, *Accessibility Toolkit* (Coolidge et al., 2019, Chapters 3-11), covering the best practices for making learning content

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accessible, as indicated in images, links, tables, formulas, multimedia, and more. In addition to this section of the book, other resources were provided to students regarding basic principles to develop accessible instructional materials:

- *Introduction to Web Accessibility: Essential Accessibility for Everyone* (Digital Education Strategies, The Chang School, 2019).
- *Content Creation: Create Accessible Digital Products* (GSA Section508.gov, n.d.).
- *Understanding Document Accessibility: A Reference for Creating Accessible Office Documents* (Digital Education Strategies, The Chang School, 2020).

Then, the instructor asked students to read the Evaluating Digital Tools and Apps portion of the open book chapter, "Evaluating Accessibility" (Federico et al., 2020). While reading the chapter, students had the opportunity to complete some activities related to the POUR model (instructions described in the chapter) to understand how to evaluate the accessibility of technologies. For instance, students learned how to analyze accessibility statements and apply the POUR evaluation model to identify the accessibility of technologies.

Learning Activity 2 (50 minutes)

In this second learning activity, the instructor developed three scenarios, in a collaborative document on Google Docs, adapted from an open book, *Accessibility Toolkit* (Coolidge et al., 2019). Students worked with their team members to come up with solutions to resolve the accessibility problems in these scenarios. The three scenarios were:

1. The "Learning in the Dark" Inaccessible Document was attached for students to investigate its accessibility for learners who are blind.
2. An inaccessible video (e.g., no captions/transcript, no sound, text on screen with no sound/captions) was linked for students to investigate how to make it accessible for learners who are deaf.

Several math equations and graphs (see Figure 1) were included for students to explore effective approaches to make them accessible.

Instructions

Please work with your team members to analyze the accessibility of these instructional materials and discuss accessibility issues. You need to conduct research before identifying strategies and developing a plan to implement different solutions to make them accessible, such as the application of appropriate assistive technology tools and other best practices to create accessible content. You will use Google Docs as a collaborative learning space to share your solutions with other groups and prepare a five-minute presentation to report your accessibility plans.

For the assistive technology you selected, please introduce it in detail in the collaborative document and share it with your classmates. You may include but are not limited to the following aspects:

- *The description of the technology (e.g., the names, images, functions, platforms, instructions, advantages, and limitations).*
- *The implementation of the technology (e.g., case examples, scenarios, grade levels, and impacts).*
- *Additional information (links to external resources: websites, blogs, videos, or teacher's guides).*

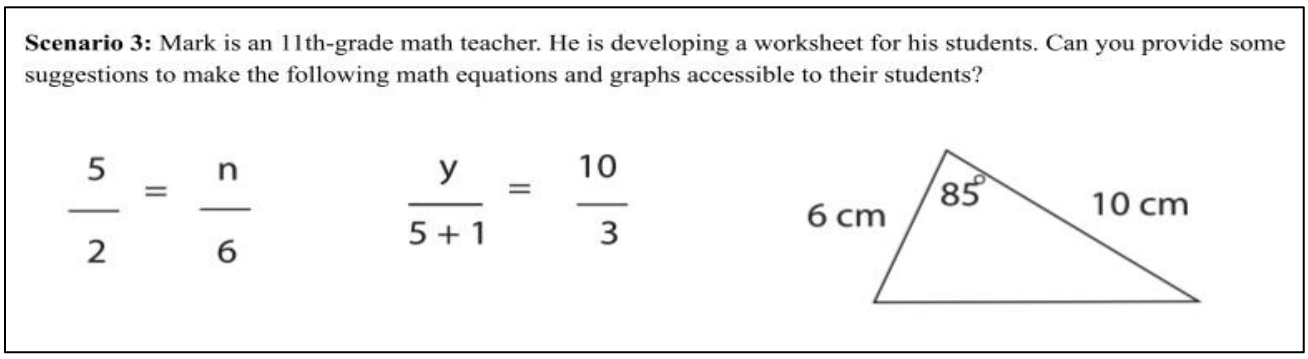

Figure 1. A screenshot of the third scenario in math education.

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Wrap-ups, Debriefing, and Final Thoughts (10 minutes)

After completing Learning Activity 2, the instructor wrapped up the lesson by briefly summarizing the course content, further emphasizing the importance of accessibility in PK-12 classrooms, sharing final thoughts, and encouraging students to ask any questions they might have after the lesson presentations and learning activities. Finally, the instructor explained two assessments that students needed to complete for their LiveText portfolios to align with the ISTE (2017) standards.

LiveText Portfolio Assessment 1

In the first assessment, the instructor shared some stories of students with learning disabilities (see stories in the "Using Personas" chapter of the *Accessibility Toolkit)*, and inspired students to research the categories of learning disabilities. Instructions included: *Each student should pick one category and explore the signs and symptoms of students with a specific learning disability, such as autism spectrum disorder and attention deficit hyperactivity disorder. Research and explain how these symptoms influence students' learning abilities, behaviors, practices, preferences, experiences, and outcomes (Meyers & Bagnall, 2015). Investigate effective methods to address accessibility barriers faced by students with this type of learning disability in a classroom and create a 10-minute presentation with voiceover to share with the whole class.*

LiveText Portfolio Assessment 2

Based on the open book chapter, "Evaluating Accessibility," (Federico et al., 2020) students were asked to conduct an accessibility evaluation for the technology in their specific teaching contexts. Instructions included: *Each student should select one technology they are familiar with and examine its accessibility based on the accessibility statement (if applicable). Use the perceivable, operable, understandable, and robust (POUR) model for the analysis. In an accessibility report, provide the analysis as well as potential suggestions and solutions to improve the accessibility of the selected technology for learners with disabilities.*

Critical Reflection

This lesson has been implemented two times at the university. According to my observations, at the beginning of the simulation activity, some students were confused and uncomfortable and needed more time to adapt to the unfamiliar learning environment. In their discussions, they also mentioned that they felt unsafe, nervous, and frustrated when wearing sleep masks to complete exercises. The purpose of this blindfolded simulation activity was to allow preservice teachers to experience the difficulties faced by individuals with vision-related disabilities in a classroom setting and raise their consciousness of accessibility in course design and delivery. With this in mind, to some extent, I believe many students achieved the first predefined learning objective of this lesson by recognizing and discussing the importance of accessibility to accommodate the needs of learners with disabilities in teaching practices.

Students were also able to achieve other learning objectives by participating in the designed learning activities and assessments. For instance, in the LiveText Portfolio Assessment 1, most of the students were able to deliver an informative presentation to teach their classmates about the learning experiences of students with learning disabilities and some techniques to accommodate their special needs. Thus, they could successfully meet the second learning objective, discuss the effective methods to achieve inclusive education.

In the second learning activity, Learning Activity 2, students worked with their team to research and identify effective strategies to achieve accessibility in three different scenarios. In the collaborative Google Docs, each group shared their creative solutions to address accessibility issues and provided a detailed introduction to diverse assistive technology tools, such as speech-to-text tools, talking calculators, and audio description applications. Therefore, students were able to achieve the third learning objective, implement appropriate assistive technology tools and practices to address accessibility in different scenarios.

In terms of the LiveText Portfolio Assessment 2, without sufficient knowledge of user/learner experience design, some students could not come up with effective suggestions to improve the accessibility of the technologies they selected. However, they were able to successfully find the

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accessibility statements and analyze the accessibility based on the four POUR principles, which they could apply for technology selection in their future teaching practices. It is reasonable to believe that students met the fourth learning objective: evaluate the accessibility of digital technologies. According to this reflection, it is indicated that the lesson presentations, learning activities, and assessments in this lesson were helpful to support the achievement of the four predefined learning objectives.

Moreover, the lesson was well aligned with the ISTE (2017) Standards for Educators 2.2.b, 2.2.c, 2.3.a, and 2.5.a. For instance, in the LiveText Portfolio Assessment 1, preservice teachers were able to create presentations with voiceover to introduce effective strategies to alleviate the accessibility barriers faced by learners with disabilities to ensure "equitable access to educational technology, digital content and learning opportunities" (ISTE, 2017, Standard 2.2.b). For the Learning Activity 2 and LiveText Portfolio Assessment 2, preservice teachers learned to adopt assistive technologies to create accessible learning contexts and evaluate the accessibility of e-learning technologies, which is associated with the ISTE standard 2.2.c, "model for colleagues the identification, exploration, evaluation, curation and adoption of new digital resources and tools for learning." Additionally, the simulation activity aimed to raise preservice teachers' awareness of the experiences of learners with disabilities and helped them realize the importance of accessibility in education, which is related to the ISTE standard 2.3.a, "create experiences for learners to make positive, socially responsible contributions and exhibit empathetic behavior online that build relationships and community." Finally, the introduction of assistive technologies and practices to develop accessible and inclusive learning environments supported preservice teachers to achieve the ISTE standard 2.5.a, "use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs."

Lessons Learned and Implications

Even though this lesson supported the predefined objectives and standards, it did have some limitations. For instance, disability simulations have been widely applied as an active learning technique to teach practitioners about disabilities and develop their empathy for people with disabilities. However, some researchers argue the drawbacks of poorly-designed simulation activities reinforce stereotypes and discrimination against individuals with disabilities (Silverman, 2015). Therefore, instructors need to carefully design and manage the simulation activity to avoid these negative consequences. For example, instructors need to provide clear explanations and debriefing to guide positive learning experiences among students. Also, not every student is willing to participate in this activity. Instructors need to adapt the instructions and activities to engage and benefit these students. For instance, instructors could provide some guided questions, such as what have you learned from observing your classmates in the simulation activity? Moreover, if the conditions permit, instructors could consider working with professionals to incorporate some skills mastery exercises, interaction opportunities with students with disabilities, and lived experiences of disabled people into simulation activities for better learning outcomes, such as learning braille reading, using canes to navigate, and inviting guest speakers (Silverman, 2015).

Since I am not an expert in the field of special education, the lesson I designed might not be perfect to equip preservice teachers with all the essential competencies to design accessible instruction to meet the needs of students with various disabilities. For instance, the simulation activity primarily focuses on blindness as opposed to teaching about other types of disabilities. Thus, other educators could consider developing effective learning activities to teach about the life experiences of learners with various types of disabilities. Other instructors could also adjust course content and assessments in their lesson plans based on their specific contexts, learners, and subject areas, such as creating instructional materials aligned with accessibility considerations in multimedia development and visual literacy courses. Furthermore, owing to the growth of e-learning in teacher education, modification is also needed to deliver positive disability-simulated experiences in technology-enhanced instruction, such as interactive videos and virtual reality.

Owing to the limited scope of this lesson, I, as the instructor, was not able to cover all important topics within the three-hours allotted. To further improve the effectiveness of teaching practices on accessibility, other educators could consider including lesson presentations and learning activities regarding remediation strategies to make learning materials created in different software compatible with

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assistive technologies. Although I included a section discussing effective practices for students to learn about how to create accessible instructional materials, within a limited time, students might not develop sufficient competencies to remediate accessibility issues available in their own teaching resources. Therefore, other educators could consider developing learning modules focusing on the accessibility of multimedia design and learner experience design. For instance, they could include instructions and hands-on activities to enhance students' capabilities to address the accessibility problems of course content and learning technologies in their future teaching contexts.

In conclusion, the lesson fits the course objectives by discussing assistive technology tools to create accessible and inclusive learning environments. The simulation activity allowed students to better understand the difficulties faced by learners with disabilities while performing daily learning tasks. The lesson presentations, learning activities, and assessments were effective to raise preservice teachers' awareness of accessibility and help them develop a mindset to take accessibility into consideration in course design, development, and delivery in their future teaching careers. The lesson was not designed to teach students about how to use every assistive technology, but how to solve pedagogical problems in a just-in-time manner, especially where and how to find appropriate technologies to enhance teaching practices. The lesson plan also aimed to encourage more teacher educators to recognize the importance of accessibility in education and increase their interest in researching, adopting, and developing innovative pedagogical strategies to foster teaching effectiveness and learning efficiency in the field of accessibility and technology integration.

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