

# 3. Innovative AI for Equity, Diversity, Inclusion, and Accessibility (EDIA)

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## Abstract

This chapter explores the use of [SMARTIE EDIA Redesign Assistant](#), an innovative AI application, to re-design inclusive learning activities by incorporating Universal Design for Learning (UDL) principles, focusing on the unique needs of undergraduate and graduate students from diverse backgrounds, including those with dyslexia and visual impairment and auditory impairment in asynchronous, synchronous and in-person course delivery mode. This chapter discusses the implementation of inclusive teaching in higher education academic settings and how to revamp learning activities by leveraging AI-enhanced technology.

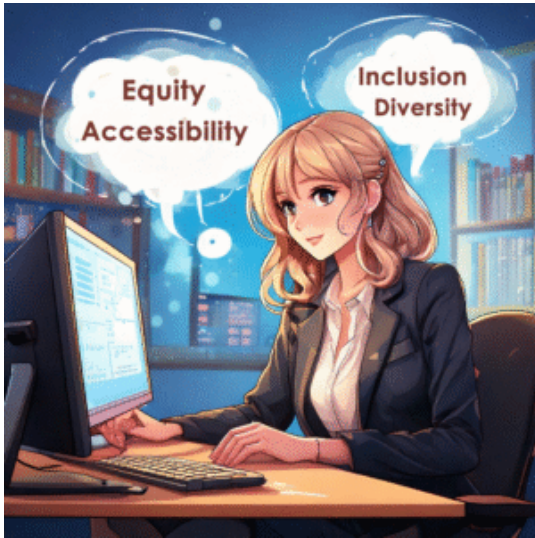
## Introduction

Creating inclusive learning activities to support **multilingual students**, those with **dyslexia**, **visual impairment** and **auditory impairment**, is a significant challenge for instructional designers (IDs) as they need to balance the accommodation and academic standards. Embedding the Universal Design for Learning (UDL) principles to learning activities can help **IDs** support each student's unique needs and achieve the learning objectives from an academic perspective.

SMARTIE EDIA Redesign Assistant takes learning activity instructions as input and produces a comprehensive redesign recommendation list as an **EDIA**-aware learning activity that can incorporate Universal Design for Learning (UDL) principles and considers the unique needs of students from diverse backgrounds, including those with **dyslexia**, **visual impairment**, and **auditory impairment**. The SMARTIE EDIA Redesign Assistant includes undergraduate and graduate students as the targeted learners, and the primary delivery mode of the course, such as **Asynchronous**, **Synchronous**, and **In-person**, to be selected.

**Figure 1**

[Equity, Diversity, Inclusion, and Accessibility](#)



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**Audio:**



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## Learning Objectives

### *Learning Objectives*

- Inclusive Teaching Strategies for Diverse Learners:
  - Universal Design for Learning.
  - Students with dyslexia, visual impairments, auditory impairments and multilingual students.

- Learn how the SMARTIE EDIA Redesign Assistant supports creating inclusive and accessible learning environments.

## Case Study: Inclusive Teaching Strategies for Diverse Learners

### UNIVERSAL DESIGN FOR LEARNING

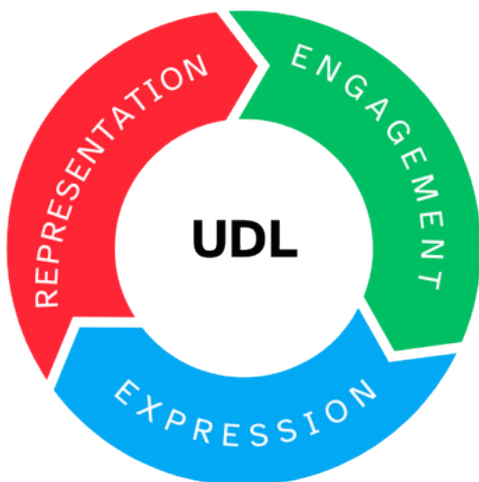
Universal Design for Learning is a set of principles for curriculum development that give all individuals equal opportunities to learn (CAST, 2024).

It is helpful to consider the principles of UDL as they will help all learners, not just those with disabilities:

- Provide **Multiple Means of Representation** by presenting information and content in different ways such as text, audio, video, infographic, etc.
- Provide **Multiple Means of Engagement** by simulating interests and motivation for learning, such as discussions, peer collaboration, authentic activities, etc.
- Provide **Multiple Means of Action and Expression** by differentiating how learners can express what they know, such as student choice for assignment topics and the format like podcast, video, poster, etc.

Figure 2

#### Universal Design for Learning Principles



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### STUDENTS WITH DYSLEXIA

Students with **dyslexia** have difficulty reading and processing information due to their learning disabilities. They need accommodations to demonstrate their knowledge, such as extended exam time, alternative content formats such as audiobooks or assistive technology like speech-to-text and text-to-speech software (International Dyslexia Association, 2020).

**Figure 3**

#### Dyslexia



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## STUDENTS WITH VISUAL IMPAIRMENTS

Students with **visual impairments** are individuals who experience some degrees of vision loss that cannot be fully corrected with glasses, contact lenses, or surgery. These impairments can range from mild vision difficulties to complete blindness. Visual impairments include conditions such as low vision, where a student may still have some usable sight but requires accommodations like enlarged text or high-contrast materials. On the other hand, students who are blind may depend on non-visual tools, such as Braille or screen readers, to access information.

**Figure 4**

### [Visual Impairments](#)



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Students with visual impairments require specific accommodations in academic settings. For instance, all course contents should be provided in accessible formats, such as digital texts compatible with screen readers or large-print versions. Educators should also describe aloud any visual information during a lecture, such as graphs or diagrams. By taking these steps, students with visual disabilities can fully participate in learning activities. Furthermore, providing alternatives, such as a visually based assignment that allows an oral presentation rather than a written assignment, will enhance inclusivity in the learning environments (Council of Ontario's Universities, 2017).

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## STUDENTS WITH AUDITORY IMPAIRMENTS

Students with **auditory impairments**, also referred to as hearing impairments, are individuals who experience partial or complete hearing loss that can affect their ability to perceive spoken language and other auditory information. These students may be Deaf, hard of hearing, or deafened (losing hearing after acquiring speech). Students who are Deaf typically rely on sign language (such as American Sign Language, ASL) as their communication, while those who are hard of hearing may use a combination of residual hearing, hearing aids, or cochlear implants along with lip reading and auditory devices.

**Figure 5**

[Auditory Impairments](#)



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Students with auditory impairments, including Deaf and hard-of-hearing students, can benefit from inclusive teaching strategies. Educators can utilize visual aids, captioning on videos, and sign language interpreters to provide full participation of these students in learning activities. This also entails ensuring that lines of communication are clear,

including students' line of sight to the educators and to any visual presentations. Written copies of spoken instructions or information should also be provided. Those practices create classes more inclusive to these students for full participation and engagement (Council of Ontario's Universities, 2017).

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## MULTILINGUAL STUDENTS

**Multilingual students** come from diverse linguistic and cultural backgrounds whose first language is not English. These usually face challenges in learning environments, specifically in academic writing. Instructional designers and educators can follow some suggestions to support multilingual students, such as providing clear and specific instructions that can minimize cultural bias. Providing specific examples of how students are expected to produce work, interact with peers, and cite resources, along with detailed rubrics, can significantly benefit multilingual students (Hobza & Kennell, 2020).

**Figure 6**

[Multilingual & Multicultural](#)



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## SMARTIE EDIA REDESIGN ASSISTANT

SMARTIE promotes Equity, Diversity, Inclusion, and Accessibility (EDIA). This simple AI user interface empowers educators to create learning activities that are easy to access and inclusive for all learners. “This is about moving in the direction of creating courses that allow everyone to succeed, regardless of their background, personality or ability” (Sabbaghan, 2023).

### **Figure 7**

[SMARTIE](#)

# EDIA Redesign Assistant

The EDIA Redesign Assistant is an interface to assist users in creating inclusive learning activities. Please input your learning activity when prompted, and let the assistant handle the intricate task of producing your EDIA-aware learning activity!

## Please enter the required information:

Please provide the instructions for the learning activity:

Write the instructions for the learning activity here.

1

What the primary delivery mode of the course? ? 3

- Asynchronous
- Synchronous
- In-person

Who will primarily take this course? 2

- Undergraduate students
- Graduate student

How would you like the learning activity to be redesigned?  
(You can select more than one) 4

- Embed Universal Design for Learning Principles ?
- Redesign for Multilingual Students ?
- Redesign for Students with Dyslexia ?
- Redesign for Students with Visual Impairment ?
- Redesign for Students with Auditory Impairment ?

Process

Note. Screenshot of SMARTIE EDIA Redesign Assistant. Screenshot used with permission from Dr. Soroush Sabbaghan ([SMARTIE](#)). I dedicate any rights I hold to this image to the public domain via [CCO](#).

[SMARTIE EDIA Redesign Assistant](#) includes the following selections:

1. Learning Activity Instructions.
2. Targeted Audience by selecting Undergraduate or Graduate students.
3. Course Delivery Mode: **Asynchronous**, **Synchronous**, and **In-person**.
4. EDIA-Aware Learning Activity preferences for diverse learners, and more than one can be selected to be processed.

**Audio:**



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**Vignette**

Dr. Turner, a faculty member at Crestview University, was thinking about creating a new activity for their undergraduate course, “Students with Diverse Learning Support Needs.” This course aimed to equip future educators with the skills and knowledge needed to support students who might require additional academic or personal support.

Dr. Turner had always been passionate about the well-being of their students, both academically and emotionally. They knew that future teachers needed to be prepared to address the growing mental health needs of students in educational settings.

While working on the course syllabus, Dr. Turner realized that there was a critical gap in addressing how educators could effectively connect students with mental health resources. With rising concerns about mental health among young people, they wanted to design an activity that would help their students become familiar with local mental health resources.

They developed the following activity for her course:

**Activity – Mental Health Resources**

This learning activity will help you prepare for situations where you may need to provide mental health resources to someone, either at school or in your personal life. Please complete the following steps:

1. Conduct an Internet search for mental health resources in your region using the term “mental health in [your location].”
2. Review the information on the pages listed in your search and determine the ones that are most helpful and relevant. Note why you selected some resources over others.
3. Note down important phone numbers in an easy-to-find location.

Dr. Turner believed that by actively engaging in this search and evaluation process, their students would feel more confident in offering critical resources to others when the time arose. They were hopeful that this exercise would

also encourage them to reflect on their own well-being and consider how they might benefit from accessing similar resources in the future.

Dr. Turner also wanted to ensure that the learning activity they created was as inclusive as possible, particularly for multilingual students, as well as those with dyslexia, visual impairments, and auditory impairments. They were keen to incorporate Universal Design for Learning (UDL) principles to make the activity accessible to all students. Recently, they learned about the [SMARTIE EDIA Redesign Assistant](#), an innovative AI tool designed to help re-design learning activities with UDL principles, focusing on the unique needs of diverse learners in various delivery modes such as asynchronous, synchronous, or in-person. Dr. Turner was excited to explore how this tool could enhance the inclusivity of their learning activity design.

### SMARTIE EDIA Redesign Assistant: Example

Dr. Turner used this innovative AI assistant by providing the above learning activity instruction, selecting an **In-person** mode of delivery for **undergraduate students**, and **embedding Universal Design for Learning (UDL)**.

Figure 8

The screenshot displays the SMARTIE EDIA Redesign Assistant interface. At the top, it reads "EDIA Redesign Assistant" and provides a brief description: "The EDIA Redesign Assistant is an interface to assist users in creating inclusive learning activities. Please input your learning activity when prompted, and let the assistant handle the intricate task of producing your EDIA-ready learning activity!"

The main section is titled "Please enter the required information:" and contains several input fields and options:

- Activity - Mental Health Resources:** A text area containing instructions: "This learning activity will help you prepare for situations where you may need to provide mental health resources to someone, either at school or in your personal life. Please complete the following steps: Conduct an internet search for mental health resources in your region using the term 'mental health in [your location]'; Review the information on the pages listed in your search and determine the ones that are most helpful and relevant. Note why you selected some resources over others. Note down important phone numbers in an easy-to-find location." A green arrow points to the bottom of this text area.
- Who will primarily take the course?:** Radio buttons for "Undergraduate students" (checked) and "Graduate student". A green arrow points to the "Undergraduate students" option.
- How would you like the learning activity to be redesigned? (You can select more than one):** Checkboxes for "Embed Universal Design for Learning Principles" (checked), "Redesign for Multilingual Students", "Redesign for Students with Dyslexia", "Redesign for Students with Visual Impairment", and "Redesign for Students with Auditory Impairment". A green arrow points to the "Embed Universal Design for Learning Principles" checkbox.
- What the primary delivery mode of the course?:** Radio buttons for "Asynchronous" (checked), "Synchronous", and "In-person". A green arrow points to the "Asynchronous" option.
- Process:** A red button with a green arrow pointing to it.

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### EDIA-Aware Learning Activity

#### Suggested re-design incorporating UDL:

Below is a table outlining the recommendations for improving the “Mental Health Resources” activity using universal design principles, where these recommendations should be implemented within the activity, and how they can be implemented.

**Table 1**

| Recommendations                              | Where in the Activity to Implement     | How to Implement   |
|--|--|--|
| Provide Clear Instructions                   | Introduction and Step-by-Step Guidance | Use simple language and provide a checklist or guide for each step.                          |
| Offer Multiple Means of Engagement           | Step 1: Conduct an Internet search     | Allow use of various devices (computer, tablet, smartphone) and encourage group discussions. |
| Incorporate Multiple Means of Representation | Step 2: Review information             | Provide audio/video resources, infographics, and a list of online resources.                 |
| Facilitate Accessibility                     | Throughout the Activity                | Ensure digital content is screen reader-friendly and offer printed/large print materials.    |
| Allow for Multiple Means of Expression       | Step 3: Note down important numbers    | Permit documentation in written notes, audio recordings, or digital formats.                 |
| Provide Support and Scaffolding              | Throughout the Activity                | Offer templates for organizing information and access to a facilitator for guidance.         |
| Encourage Reflection and Personalization     | Step 2: Review information             | Include prompts for reflection on resource selection and allow personalization of lists.     |
| Ensure Cultural Relevance and Sensitivity    | Step 2: Review information             | Provide guidance on finding culturally sensitive resources and consider cultural factors.    |

This table was copied from the SMARTIE EDIA Redesign Assistant and used with permission from Dr. Soroush Sabbaghan (SMARTIE).

By following these recommendations, the “Mental Health Resources” activity can be made more inclusive and effective for a diverse range of learners, enhancing their ability to find and utilize mental health resources.

Dr. Turner used [eLearning Expert \(Instructional Designer\) GPT](#) to create the **second draft** based on the above recommendations.

**Activity: Exploring Mental Health Resources**

*This activity will help you prepare for situations where you may need to provide mental health*

resources to someone, either at school or in your personal life. Follow the steps below to identify and organize helpful mental health resources in your area.

**Instructions:**

**1. Conduct an Internet search**

Using a device of your choice (computer, tablet, or smartphone), search for mental health resources in your region. Try using keywords such as “mental health support in [your location].”

- You may work individually or in groups to gather and discuss findings.
- **Tip:** If you need help structuring your search or selecting keywords, refer to the template provided.

**2. Review the information**

Explore the results from your search, focusing on the resources that seem the most helpful and relevant.

- Consider the types of services offered, accessibility, and whether the resources are culturally sensitive and inclusive.
- As you review, reflect on why some resources stand out more than others. Ask yourself:
  - Are these resources easy to access?
  - Do they address specific needs (e.g., youth, families, or culturally diverse communities)?
- To support your learning, you may use any of the following formats to review and organize information:
  - Written notes
  - Audio or video reflections
  - Infographics or mind maps
  - **Optional:** Explore provided audio, video, and infographic materials for additional context on available services.

**3. Document important contact information**

Identify and record key phone numbers, websites, or locations that would be useful in a mental health crisis.

- Choose a format that works best for you—this could be written notes, an audio recording, or a digital file (e.g., saved on your phone, computer, or cloud storage). Templates are provided to help you organize this information.
- **Accessibility tip:** If needed, print or enlarge materials to ensure easy access later.

**Reflection and Personalization:**

After completing the activity, take a moment to reflect on the resources you’ve chosen. Think about:

- *How well they meet your community's needs.*
- *How you can use or share these resources in your personal or professional life.*
- *Did the resources you found include culturally relevant or sensitive information? What could be improved?*

Dr. Turner can now start customizing this draft to create the final draft.

SMARTIE EDIA only accepts text input and cannot handle file uploads. Additionally, not all activity recommendations and suggestions provided by EDIA have a “copy to clipboard” option. It is recommended to copy the recommendations and paste them into a word processing software, such as an MS Word document, after they are generated. “The idea is to help you think, not to copy and paste. We don’t want teachers to rely on AI. We want it to give them recommendations so they can make their own judgments and decisions” (Sabbaghan, 2023).

## Responsible use of AI

When using AI tools like SMARTIE EDIA in teaching, it is important to consider their impact on learning. Teachers should ask key questions to ensure that they are using AI in a fair and beneficial way. First, how does this tool affect students’ independence? Does it empower them to take control of their own learning, or does it lead to passive listening without engagement?

Additionally, consider whether the AI may exhibit biases. For instance, does the content provided by SMARTIE EDIA present diverse viewpoints, or does it focus solely on mainstream cultural ideas? To mitigate these risks, it is essential to allow students to provide anonymous feedback, protect their personal information, and regularly check AI outputs for bias.

By using AI thoughtfully, educators can enhance fairness and accessibility in learning while ensuring the safety and support of inclusive classrooms.

## Future Research and Innovation

Dr. Sabbaghan has created seven apps to help with course structure, learning activities, and rubric design. Unlike other GenAI tools that search the internet broadly, SMARTIE connects only to reliable inclusivity sources. Each app is thoroughly checked before it is released.

OpenAI introduced Generative Pre-trained Transformers ([GPTs](#)) that anyone can create with no knowledge of coding. GPTs are more helpful for specific tasks and purposes. “**Explore GPTs**” in the ChatGPT will store all as they are built. OpenAI includes privacy and safety measures to protect the user’s data. Universal Design for Learning (**UDL**) GPTs are available that can be further trained in the future to be useful for **IDs** to enhance the inclusivity of their design.

#### Universal Design for Learning (UDL) GPTs: **Examples**

- [BusyCher UDL Advisor](#) that applies UDL principles to lessons.
- [Lifelong Learner, Expert Teacher, Skills Coach](#) that is a specialized chatbot designed with Universal Design for Learning baked into its knowledge base. It can provide key assistance in human learning, offering expertise in areas like personalized learning strategies, educational technology, project-based learning, and more.
- [UDL Rubric Generator](#) that creates detailed UDL-aligned rubrics based on instructions.
- [UDL-Universe](#) that is a guide to applying UDL for inclusive learning.
- [UDL Coach](#) that is designed to support and enhance the teaching experience in the Middle Years Programme (MYP) following Universal Design for Learning (UDL) principles.
- [ScholarEd Course Designer](#) that assists higher education professionals in designing engaging, standards-aligned courses with UDL principles.

#### ScholarEd Course Designer Active Learning Activity Design: **Example**

**Prompt:** Recommend two active learning activities for undergraduate computing science students by incorporating Universal Design for Learning (UDL) principles.

**Answer:** Here are two active learning activities for computing science students that incorporate Universal Design for Learning (UDL) principles, ensuring that they address multiple means of engagement, representation, and expression:

##### **1- Collaborative Problem-Solving with Multiple Representation Options**

- **How it works:** Present students with a complex computing problem (e.g., optimizing an algorithm, designing a system, or debugging a piece of code). Instead of requiring everyone to code immediately, offer different ways for students to represent their problem-solving process. They can choose to:
  - Write pseudocode.
  - Create a flowchart or concept map.
  - Use a visual modeling tool (e.g., UML diagrams for system design).
  - Write a narrative explanation or storyboard of their solution.
- **UDL Principles:**

- **Multiple Means of Representation:** By offering various ways for students to approach the problem (pseudocode, visuals, narrative, etc.), you cater to different cognitive styles and preferences for information processing.
  - **Multiple Means of Engagement:** Students can choose a representation method that is most engaging for them, fostering interest and motivation.
  - **Multiple Means of Expression:** Allowing different output formats (e.g., diagrams, written explanations, or code) gives students various ways to demonstrate their understanding based on their strengths.
- **Benefits:** This activity allows students to approach the problem from different angles, reducing barriers for students who may struggle with coding syntax but excel in conceptual thinking or visual design. It fosters inclusivity by accommodating diverse learning preferences.

## 2- Peer Programming with Scaffolds and Flexible Communication

- **How it works:** Pair students for a **peer programming** session, but with UDL-inspired scaffolds. Instead of traditional pair programming, offer flexible options for how pairs collaborate and communicate:
  - Allow students to either work side-by-side, remotely, or asynchronously via shared code platforms (e.g., GitHub or collaborative coding environments like Replit).
  - Provide additional tools, such as code templates or commenting scaffolds, where students can add their thought process directly into the code to make their thinking visible.
  - Encourage students to use both verbal and written forms of communication (e.g., speaking aloud while coding, using text comments, or providing code annotations).
- **UDL Principles:**
  - **Multiple Means of Representation:** Offering flexible working arrangements (e.g., in-person, remote, asynchronous) increases access for students who might have different needs or preferences regarding time, space, or communication style.
  - **Multiple Means of Engagement:** Providing scaffolds like code templates and the option to comment on code helps students break down complex problems into manageable steps. It also supports different learning styles by allowing both visual and auditory learners to engage.
  - **Multiple Means of Expression:** By allowing students to express their understanding in different formats (oral discussion, written comments, or direct code), you enable them to communicate in ways that best fit their abilities.
- **Benefits:** This peer programming activity is inclusive by design, offering various ways to engage, collaborate, and demonstrate understanding. The flexibility in how and where students work also accommodates those with accessibility needs, time constraints, or different communication preferences.

Both activities promote deep understanding of computing concepts while integrating UDL principles to ensure that all students, regardless of their learning style or needs, have equal opportunities to succeed.

## Summary

This chapter discusses using the SMARTIE **EDIA** Redesign Assistant to create inclusive learning activities in higher education. This simple user interface AI tool utilizes Universal Design for Learning (**UDL**) principles to assist instructional designers in accommodating students with diverse needs, including those with dyslexia, visual and auditory impairments, and multilingual backgrounds.

The chapter outlines UDL principles where students with **dyslexia** benefit from alternative content formats like audiobooks, while **visually impaired** students may need screen readers or high-contrast materials. Similarly, **auditory-impaired** students might require visual aids and captioned media, and **multilingual students** can be supported with clear, specific instructions.

The SMARTIE EDIA Redesign Assistant provides recommendations based on the course type, targeted learners, and selected **EDIA** needs. Its interface is designed for educators to refine rather than replace human judgment, emphasizing AI as a supportive tool rather than a replacement in educational settings.

The original version of this chapter contained H5P content. You may want to remove or replace this element.

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## Acknowledgements

Special thanks to [Dr. Soroush Sabbaghan](#), the creator of [SMARTIE](#), who authorized the author of this chapter to share and adapt its materials, including screenshots and video recordings. The author of this chapter acknowledges the use of ChatGPT, GPTs for generating examples and summarizing some readings, Google Text-to-Speech AI, Adobe Firefly for AI text-to-image generation, Grammarly for checking grammar, and SMARTIE to demonstrate corresponding EDIA-aware (Equity, Diversity, Inclusion, and Accessibility) learning activities.

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## Media Attributions

- Equity, Diversity, Inclusion, and Accessibility
- UDL Principles
- Dyslexia have difficulty reading and processing information
- Visual impairments
- Firefly auditory impairments, also referred to as hearing impairments poster elements with no text
- Firefly Multilingual and multicultural elements with no text in the image
- SMARTIE EDIA Redesign Assistant
- SMARTIE EDIA Redesign Assistant – UDL