## SECTION B. PROJECT NARRATIVE
## I. SIGNIFICANCE
### i. Problem Statement

Creating graphic novels from text-only narratives has emerged as a promising intervention to support neurodivergent individuals, who often benefit from visual aids in enhancing reading comprehension and engagement (Smith & Strick, 2016; Smith et al., 2021; Fenty et al., 2020; Morrison, 2017). Research indicates that graphic novels can significantly improve the reading experience for individuals with dyslexia, autism, and other neurodivergent conditions by providing visual context and reducing textual overload (Glenberg and Langston, 1992; Helfgott, 2018). Recent figures indicate that nearly a million ages 3-21, had autism in 2021 (NCES, 2023). An estimated 20% of youth have dyslexia (Shaytiz et al. 2021). Studies indicate that these learning conditions are more common in males; however, recent studies suggest that these conditions are underdiagnosed in females (Hallady et al., 2015; Rutter et al., 2004)). EZ-Read aims to become an assistive technology for reading comprehension that caters to neurodivergence. Additionally, the tool will be used to expand research into the impact of using images and simplified text on reading comprehension among neurodivergent individuals.

While the benefits of graphic novels for enhancing reading comprehension among neurodivergent readers are well-documented, the economic barriers to creating these resources manually and en masse remain a significant challenge, requiring time-intensive layout, design, and illustrations. Addressing these cost issues, using Generative AI, is crucial for making graphic novels a viable and accessible tool for all neurodivergent individuals. (Johnson et al., 2020; Mendelson, 2019). In addition, the diverse preferences and requirements for visual aids among neurodivergent individuals highlight the challenge of a universal solution (Talbot, 2021). EZ-Read will employ Machine Learning to tailor the platform to accommodate the distinct needs of neurodivergent users and their cultural identities adds layers of complexity but significantly enhances the reader's experience.

Legal and ethical considerations are paramount in EZ-Read's success. To mitigate this, EZ-Read will attribute sources and use content that is either licensed or falls under fair use, adhering to guidelines by the Copyright Alliance (2019). This ensures all content used for training the model or as input is appropriately licensed or categorized as fair use, fostering respect and recognition for creators' contributions (Kim, 2022). EZ-Read will also employ the concept of transformative use, making generated comics distinct from source materials and qualifying as new, original works. Further, the tool will anonymize data used in AI training to respect copyright materials and will feature an artist-centric resource library, not just sourcing materials from the internet but utilizing components crafted by artists specifically for the platform. This ensures fair compensation and credit for artists, aligning with economic justice principles in the creative industry (Perloff & Wachtel, 2001). For copyright-free literature, the Phase I prototype will use novels from Project Gutenberg (gutenberg.org) for training material and initial content.

Furthermore, while there is an abundance of technology designed to aid individuals with physical disabilities in reading, there are relatively few options available for those with learning disabilities. EZ-Read, with its capabilities to adjust text and reading levels as well as create images, can be seen as both a translation tool and an assistive technology specifically catered to the needs of neurodivergent users. Legal precedents around disability accommodations suggest such tools are necessary and reasonable adjustments (Blanck, 2016). The legal interpretation of translation can extend to actions making content more accessible or understandable (Angelelli, 2004). Accommodations are modifications enabling equal access for individuals with disabilities,

including neurodivergent conditions, often recognized under legal frameworks like the Americans with Disabilities Act (ADA) (Bagenstos, 2009; Americans with Disabilities Act of 1990). Modifying text to aid comprehension for neurodivergent individuals aligns with EZ-Read's goal under these frameworks (Armstrong, 2010). Through thoughtful design and adherence to legal and ethical standards, EZ-Read aspires to offer a more inclusive and effective reading experience. In Phase II, the company will explore selling the platform to publishers, working with contemporary authors, integrating the tool into Learning Management Systems (LMS) and addressing the legal concerns of using the tool as assistive technology.

**ii. New Product to be Developed if Phase I and II Funds Were Provided**

This initial Phase I SBIR proposal outlines the development of EZ-Read. It will leverage Natural Language Processing (NLP) and Generative AI to dissect stories, derive essential metadata and context, and transform traditional text-based literature into interactive graphic novels. The use of this tool will be studied to assess whether integrating visual aids with simplified text enhances reading comprehension—a complex cognitive activity (Elleman et al., 2019).

For its initial phase, EZ-Read will be a cost-effective, web-based solution priced at $25 per month per user, $5 per book, or as a library for schools at $100 per month. Additionally, a free library will provide up to 5 books for potential users to try the product. Though mobile formats will be explored, it will be ideal for use on school computers and laptops. Upon starting the program, users will choose a novel from a collection, which then loads into the EZ-Read platform. A user-friendly and accessible interface with settings that will enable customization of text amount, and the style and complexity of the accompanying graphics.

Drawing on strategies from "Nine Ways to Reduce Cognitive Load in Multimedia Learning" by Mayer (2003), EZ-Read will incorporate universal design methods like off-loading, segmentation, pre-training, weeding, and more to facilitate learning. Additionally, the product will be designed in line with W3C Web Content Accessibility Guidelines (https://www.w3.org/TR/wcag-3.0/), a shared set of accessibility standards that ensure websites and applications offer equitable access to people with a diverse range of hearing, movement, sight, and cognitive ability.

The process of creating a graphic novel in EZ-Read involves: 1.) NLP and sentiment analysis to pinpoint crucial narrative elements like characters and settings, 2.) gathering relevant context from online databases, 3.) allowing readers to tailor the story presentation and layout to their preferences, and 4.) employing AI to craft characters and scenes. As users interact with the tool, data on their reading pace and customizations will be collected to refine the interface and provide quantitative data for research.

After each session with the tool, participants will undertake comprehension tests and provide feedback, which will be compared against baseline data based on short passages and vocabulary from the original text-only version to gauge improvement.

Should the research indicate that the integration of graphics or a combination of simplified text and visuals significantly boosts comprehension, individuals and educational professionals could use EZ-Read to supplement existing educational practices to support readers with texts above their current reading level. Long-term use of the tool could potentially accelerate reading development and provide further evidence of the use of graphic novels as assistive technology.

While the initial focus is on students (grade level 6-8) who are neurodivergent, the tool has potential applications for a broader audience, including second language learners and students across various grade levels. Future iterations (post Phase I) will refine the tool to support

academic use, employing strategies like summarization and questioning to foster deeper textual understanding. Future versions might include study guides and related teaching materials.

Alex, a 16-year-old student diagnosed with Autism Spectrum Disorder (ASD), selects "The Great Gatsby" from the EZ-Read library. This book, which was assigned to his classmates, presents a challenge for him due to its complex language and narrative style. Upon opening the novel in the system, he is presented with an assessment that uses passages and vocabulary from the novel to create a baseline for his comprehension. EZ-Read performs the following steps that enhance Alex's reading experience: 1.) EZ-Read shows consistent representations of characters like Jay Gatsby, locations such as New York City, and themes like the American Dream. The graphics capture the mood of the story and emphasizes important characters and moments. 2.) The tool provides historical context about the 1920s, and the author F. Scott Fitzgerald, enriching Alex's understanding of the story's backdrop. 3.) Alex uses the settings on the web-based application to adjust the reading and graphic style complexity that appeals to their visual preference.

After Alex reads each section—the length of which is determined by his preference—the tool tracks his progress and presents him with a second comprehension test and displays his progress. Additionally, Alex will respond to prompts asking about his engagement and enjoyment of the tool. This collected data will be used to track comprehension and improve usability.

**iii. Prior Existing Research that Relates to the New Product to be Developed, and any Prior Related R&D (if applicable)**

Not applicable.

**iv. Theoretical and empirical support**

The theoretical and empirical underpinnings for EZ-Read are well-founded in the scientific literature, drawing from cognitive theories and empirical studies in multimedia learning, dual coding, NLP, and AI in education. EZ-Read, an innovative approach to the following theories could significantly enhance the engagement and comprehension of neurodiverse readers.

**1. Cognitive Theory of Multimedia Learning:** Mayer's Cognitive Theory of Multimedia Learning (2009) suggests that people learn better from words and pictures than from words alone. This theory posits that the use of both verbal and visual materials engages two separate cognitive channels, thus enhancing learning and understanding. (Mayer, 2009)

**2. Dual Coding Theory:** Dual Coding Theory, proposed by Paivio (1986), argues that visual and verbal information are processed in distinct channels in the human mind, creating separate representations for information processed in each channel. Combining visual (illustrations) and verbal (text) elements allows learners to build mental connections between the two, potentially leading to better recall and understanding. (Pavio, 1986)

**3. Natural Language Processing (NLP) and Reading Comprehension:** Studies in NLP have shown that text simplification can aid in reading comprehension, especially for non-native speakers or individuals with reading disabilities. (Siddharthan, 2014)

**4. Generative AI in Educational Technology:** Generative AI, particularly in creating visual content, can cater to diverse learning styles and needs. It can generate personalized illustrations that align with the context and content of the text, potentially making the material more relatable and understandable. (Holmes, et. al., 2019)

**5. Empirical Studies on Graphic Novels and Comprehension:** Research has indicated that graphic novels can be an effective medium for enhancing comprehension and motivation in

reading. They provide contextual clues through visuals, aiding in understanding and retaining complex information. (Schwarz, 2006)

**6. Text Simplification and Comprehension Efficacy:** Empirical studies have also explored the impact of text simplification on reading comprehension. Results generally indicate that simplified text can improve comprehension rates, particularly for readers with lower baseline proficiency. (Crossley et. al., 2014)

**v. Market Competitors and Potential Commercial Application**

Despite the array of tools available, the market lacks applications that are focused on a reader's experience, that integrate graphics with simplified text, that can create consistent images from large amounts of text, a niche EZ-Read aims to fill.

The generative AI market is experiencing significant growth and is projected to continue expanding in the coming years. In 2023, the market size was valued at approximately USD 12.1 billion and is anticipated to grow at a compound annual growth rate (CAGR) of over 30.3% between 2024 and 2032 (DemandSage, 2024)

Existing tools like AI Comic Factory (https://aicomicfactory.com/), ComicGAN (Proven-Bessel, et. al., 2021), ComicAI (https://comicai.ai/), and AI Comic Generator (https://www.plugger.ai/tasks/ai-comic-generator) target graphic novel creators and have complex user interfaces that require a large time investment. In contrast, EZ-Read focuses on enriching the reader's experience and comprehension, offering a personalized, immersive reading experience, and a classic literature library.

A plethora of successful applications aim to bolster reading comprehension, primarily leveraging text-centric understanding and assessments. For instance, Newsela, with an estimated annual revenue of $104 million in 2022, provides articles on current events at five different reading levels, complete with quizzes and writing prompts, allowing educators to assign and monitor progress (Reich, et al., 2018; Growjo, 2022). Similarly, CommonLit, with an annual revenue of $916 million in 2021, offers a diverse array of reading passages across genres, accompanied by questions and discussion prompts to facilitate deep analytical conversations and comprehension exercises (Brown, et al., 2017; ProPublica, nd). However, these tools lack a dynamic and graphic novel format that could benefit neurodivergent individuals as assistive technology.

Text to images (T2I) tools like DALL-E 2, MidJourney, and Imagen have progressed towards creating images resembling photographs and hand-drawn art by translating text into data representations. Yet, they struggle with capturing complex emotions and subtleties, often producing images that are mere composites of learned elements rather than nuanced interpretations (Ramesh, et al., 2021). While AI has the capacity to generate images from text, emulating the intricate creative decision-making, stylistic consistency, and emotional depth characteristic of human artists poses significant challenges (Oppenlaender, 2022). These models often struggle with maintaining semantic consistency between text and the generated image, especially with large amounts of text and a complex story, such as with novels (Zhu, 2022). To mitigate this, EZ-Read incorporates human oversight, diverse training datasets, and a balance between AI creativity and consistent storytelling, enhanced by a curated, artist-generated library for comprehensive graphic novel creation.

Upon completion of its development phases, EZ-Read intends to commercialize by offering flexible pricing and bulk purchase discounts to educational institutions, alongside a subscription model targeted at parents of neurodivergent individuals, aged grades 6-12, homeschoolers, and

neurodivergent adults . The market for educational applications, particularly in reading comprehension, is poised for significant growth. Forecasts predict a substantial expansion in the education apps and technology markets, indicating a robust and expanding sector ripe for innovation and investment (Technavio, 2023; Grand View Research, 2023; IMARC Group, 2023; Emergen Research, 2023).

These projections affirm the burgeoning potential for educational applications, especially those enhancing reading comprehension, making it a prime moment for strategic development and investment in this evolving market.

## II. PHASE I WORKPLAN

### i. Development of the prototype

The work plan for the initial prototype functionality will follow an iterative, Agile methodology. The critical elements of the Phase I that will allow our team to evaluate our prototype include: 1.) a WCAG 3.0 compliant, user-friendly interface that adheres to Universal Design Principles; 2.) a refined NLP model that parses metadata from novels, provides context for characters, themes and locations, and simplifies text; 3.) a refined Generative AI model that efficiently produces consistent, stylistically and culturally diverse imagery and graphic novel layouts.

The Work Plan below outlines our milestones, teams, work focus and deliverables.:

| Team | Work Focus | Deliverable |
|---|---|---|
| **Milestone 1– Basic Platform Set Up:** Jun. 30 - Jul. 27, 2024 (28 work days) | | |
| SaaS platform | ● Set up local development environments, version control systems, SaaS hosting services, and CI/CD pipeline<br>● Authentication and accounts (reader and admin roles) pages<br>● Reading interface with simplified and original text comparison. | Working infrastructure and interfaces for accounts and text display |
| AI engineers | ● Set up machine learning operations environments, experiment tracking, databases<br>● Collect and preprocess text data<br>● Develop workflows for running experiments, testing results, and comparing models<br>● Calculate readability and complexity scores using tests like Flesch-Kincaid<br>● Develop method to adapt text to desired reading levels<br>● Develop metric to find the similarity of the meaning and context between two texts<br>● Extract important elements from long-format text such as speech, characters, objects, locations, and themes<br>● Begin integrating text generation with SaaS platform | Weekly demos of progress |
| UX/UI | ● UX research with non-pilot users, teachers, and parents. To include interviews, user personas, task/workflows, and user journey maps<br>● Competitive analysis | Findings and recommendations document |
| Illustrator | ● Create model sheets for character components | Library of |

| | | |
|---|---|---|
| | | component |
| **Milestone 2–Text Simplification Prototype:** Jul. 28 - Aug. 24, 2024 (28 work days) | | |
| SaaS platform | ● Informal reading comprehension quiz per section<br>● Diary study inputs for engagement, comments, and reflections<br>● API integration | Weekly demos of progress |
| AI engineers | ● Build image generator that is specific to using long-format text<br>● Label images to ensure consistency and quality<br>● Experiment with combining artist generated character models library with generated art<br>● Develop method to import text on speech bubbles<br>● Develop model to generate and combine backgrounds with characters and important objects<br>● Enhance models to improve quality and reduce errors<br>● Begin integrating image generation with SaaS platform | Weekly demos of progress |
| QA | ● Manual and automated testing to check that the text flows logically and coherently after simplification and refinement<br>● Manual and automated testing for platform functionality | QA testing plan and findings |
| UX/UI | ● UI Design<br>● Prototype Testing Feedback | Findings and recommendations document |
| Illustrator | ● Create model sheets for character components | Library of component |
| **Milestone 3–Graphic Novel Prototype:** Aug 25 - Sep. 21, 2024 (28 work days) | | |
| SaaS platform | ● Incorporate developed APIs into graphic novel interface<br>● Parse original texts into text bubble | Weekly demos of progress |
| AI engineers | ● Refinement of AI models and workflow based on feedback<br>● Full integration with SaaS platform<br>● Run models and workflows on several | Weekly demos of progress |
| QA | ● Manual and automated testing to check that the graphics align with content, are culturally and emotionally accurate and layouts accurately relays the story<br>● Manual and automated testing for platform functionality | QA testing plan and findings |
| UX/UI | ● UI Design<br>● Prototype Testing Feedback | Findings and recommendations document |
| Illustrator | ● Create model sheets for character components | Library of component |
| **Milestone 4–Admin Dashboard Prototype:** Sep. 22 - Oct. 19, 2024 (28 work days) | | |

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|---|---|---|
| SaaS platform | ● Analytics dashboard which displays reading comprehension assessments from platform usage<br>● Prototype refinement based on user feedback | Weekly demos of progress |
| AI engineers | ● Refinement of AI models and workflow based on user feedback | Weekly demos of progress |
| QA | ● Manual and automated testing to check that the data is correct and displayed without error<br>● Manual and automated testing for platform functionality | QA testing plan and findings |
| UX/UI | ● UI Design<br>● Prototype Testing Feedback<br>● Accessibility Audit | Findings and Recommendations Document |
| Illustrator | ● Create model sheets for character components | Library of component |
| **Milestone 5–Pilot Program Phase 1:** Oct. 20 - Nov. 16, 2024 (28 work days) | | |
| SaaS platform | ● Prototype refinement based on user feedback | Weekly demos of progress |
| AI engineers | ● Refinement of AI models based on user feedback | Weekly demos of progress |
| QA | ● Continue manual and automated testing for platform functionality | QA testing plan and findings |
| Research | ● Administer Gray Silent Reading Test (GSRT)<br>● Administer pre-pilot survey<br>● Introduction session with study participants<br>● Sessions 1 and 2 (1 hour each and 2 weeks apart): includes surveys, diary studies, and interviews | Study and GSRT results; interview transcripts |
| **Milestone 6–Pilot Program Phase 2:** Nov. 17 - Dec. 14, 2024 (28 work days) | | |
| SaaS platform | ● Prototype refinement based on pilot findings | Weekly demos of progress |
| AI engineers | ● Refinement of AI models based on pilot findings | Weekly demos of progress |
| QA | ● Continue manual and automated testing for platform functionality | QA testing plan and findings |
| Research | ● Sessions 3 and 4 (1 hour each and 2 weeks apart): includes surveys, diary studies, and interviews<br>● Administer post-pilot survey<br>● Analyze session 1 and 2 pilot program data | Study questionnaires and interview transcripts |
| CMS dev | ● Build public site with SaaS application integration | Functioning site |

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| Design/ Marketing | ● Build content for blog and write copy for website launch<br>● Design supplemental pages for website | Text documents |
| **Milestone 7–Data Analysis:** Dec. 15 - Jan.11, 2024 (28 work days) | | |
| SaaS platform | ● Prototype refinement based on pilot findings | Weekly demos of progress |
| AI engineers | ● Refinement of AI models based on pilot findings | Weekly demos of progress |
| QA | ● Continue manual and automated testing for platform functionality | QA testing plan and findings |
| Research | ● Analyze pilot session 3 and 4 program data<br>● Write academic paper summarizing study findings | Text document |
| **Milestone 8–Public Launch of EZ-Read:** Jan. 12 -Feb. 8, 2024 (28 work days) | | |
| SaaS platform | ● Prototype refinement based on pilot findings | Weekly demos of progress |
| AI engineers | ● Refinement of AI models based on pilot findings | Weekly demos of progress |
| QA | ● Continue manual and automated testing for platform functionality | QA testing plan and findings |
| CMS dev | ● Public website refinement based on user feedback | Final site |

**ii. Pilot Research at the End of Phase I**

The research phase will consist of a mixed-methods lab study with middle school students to improve EZ-Read's models and ability to integrate into standard educational practices. This style of study is appropriate at this stage because it can provide rich data to help guide the limited development resources, while also providing some evidence that EZ-Read's core concept is one to pursue.

**Objectives:** 1.) To assess the quality of EZ-Read's text and image generation models; 2.) To evaluate the feasibility of integrating EZ-Read into standard educational practices; 3.) To conduct concept testing to understand user perceptions of the potential for the fully developed EZ-Read product. 4.) To assess the usability of EZ-Read for diverse users, focusing on ease of use, intuitive design, and user satisfaction.

**Research Questions:** Prior to starting the pilot sessions, all student groups will be asked: 1.) Do you enjoy reading in your free time? Why or why not? 2.) Do you enjoy graphic novels (comic books) or text with illustrations? 3.) What kind of books do you like to read the most? 4.) Do you consider yourself a good reader? Why or why not? 5.) Do you feel that you can relate to the characters or stories you read?

After using EZ-Read during the 4 pilot sessions, all student groups will be asked qualitative questions. The following will use a Likert Scale: 1.) How easy/difficult did you find EZ-Read to use? 3.) How would you rate the images created by EZ-Read? 4.) How easy/difficult were the reading comprehension tests in the system? 5.) Did you enjoy the stories in EZ-Read? 6.) How likely are you to share this tool with your friends?

Open-ended questions will also be asked: 1.) What were your favorite features of the platform? 2.) Was there anything you felt was missing or could be improved in the platform? 3.) Any additional comments or suggestions for how we can improve?

After each of the 4 pilot sessions, all student groups will be asked (Likert Scale): 1.) How difficult were the passages to read? 2.) Do you feel you have improved your vocabulary? 3.) Did you enjoy the passages you read? 4.) How difficult were the comprehension tests? 5.) (Open-ended) Were there anything in the passages you read that you did not understand?

After the pilot is complete, all groups will be asked: 1.) Did you enjoy these sessions? 2.) What could we have done to improve our sessions with you?

Administrators and teachers in the pilot will be asked: 1.) How effective were the accessibility features for your students with different needs? 2.) Did you feel the platform was inclusive and catered to a diverse audience? 3.) How beneficial was the platform for your teaching needs? 4.) Do you feel your students' reading comprehension has improved using this platform? 5.) What is your overall, how satisfied are you with the platform? 6.) Are you likely to continue using this platform and are you interested in using this tool in your classrooms?

**Research Design:** Participants: 60 students (15 control using EZ-read with original text only, 15 using EZ-Read text-simplification only, 15 using EZ-Read graphic novel illustrations only, 15 using both EZ-Read text-simplification and graphic novel illustration) from middle schools, 5 educators, and 5 administrators. Demographics: A mix of backgrounds including race/ethnicity and income backgrounds. For research on neurodivergent conditions, where females are often underdiagnosed, a gender-inclusive study design is essential. This requires a balanced gender mix in the research cohort, especially considering the underdiagnosis of conditions like Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD) in females. A diverse gender representation is vital for a thorough understanding of these conditions, as it helps address gender biases in diagnostic criteria and tools (Merikangas, et. al., 2020). The participants recruited will also include a mix of reading levels.

**Instruments:** 1.) EZ-Read Software: The primary tool being evaluated. 2.) Informal Comprehension Tests: Pre- and post-interaction surveys will be built into the tool for users to assess their comprehension, experience and perceived effectiveness of the tool. 3.) Interviews: Semi-structured interviews with educators and student's post-trial. Interviews will be recorded and transcribed. 4.) Formal Comprehension Tests: Gray Silent Reading Test (GSRT) will be used to assess reading comprehension prior to the beginning of the pilot. The test yields raw scores, grade equivalents, age equivalents, percentiles, and a Silent Reading Quotient. 5.) Qualitative Surveys: Pilot participants will be asked about the product and their perception of reading. These surveys will be administered throughout the pilot. 6.) Quantitative Metrics: The system will measure interactions with the tool.

**Procedures:** 1.) Introduction Session: Collect parent/guardian permission letters from students. Administer demographics survey. Introduce participants to EZ-Read, providing a brief training session on its use and gathering initial feedback on user interface and ease of understanding. 2.) Implementation Phase: Students use EZ-Read in a controlled environment for selected reading assignments. The control group receives traditional reading assignments without the aid of EZ-Read, while the experimental groups will receive reading assignments using the features of the EZ-Read platform. 3.) Analysis: Compare the reading comprehension levels and engagement metrics between the four groups. Analyze usage data from the platform, such as time spent on reading, interaction with quizzes, and progress tracking. Note any qualitative

observations from educators and students regarding student engagement and learning improvements.

**Data Analysis:** Quantitative: Compare pre- and post-test scores using statistical methods including simple ANOVA to more complex regression models to determine significant differences. Qualitative: Thematic analysis of interview responses and open-ended survey questions using NVivo, a qualitative analysis software.

**Expected Outcomes:** 1.) User Interface and User Experience Feedback: Insights into how users interact with EZ-Read, including any challenges or particularly appreciated features. 2.) Reading Comprehension Assessment: Quantitative data that illustrates the tool's impact on reading comprehension. 3.) Feasibility Assessment: Determination of how well EZ-Read integrates into regular educational practices and its impact on learning environments. 5.) Concept Validation: Understanding of the perceived potential of EZ-Read and suggestions for improvement or additional features.

**Potential Challenges and Mitigation Strategies:** 1.) Low Engagement: The attrition rate is expected to be about 20%. Incentives such as gift cards, snacks, extra credit (at the school's discretion), and a letter of participation will be used to mitigate this risk. 2.) Technical Issues: The tool will be thoroughly tested before exposing it to students. However, to mitigate any technical issues, developer and IT support will be ready to ensure all participants have access to necessary technology and their experience is not disrupted by technical difficulty. 3.) Bias in Feedback: To mitigate bias, surveys will be administered anonymously, and users will be encouraged to give honest feedback through a supportive environment.

**Foundations for Phase II:** The findings from Phase I will be used to refine the EZ-Read tool, focusing on enhancing user-friendly features and addressing any identified barriers. Additionally, research will be continued in a larger-scale study to further validate findings and explore long-term impacts.

By the end of Phase I, the EZ-Read prototype will be a functioning tool capable of simplifying text and providing accompanying graphic novel illustrations, a novel, AI-driven approach. It will have undergone several rounds of testing and refinement based on comprehensive data analysis and user feedback. The effectiveness of the combined text and graphics approach in enhancing reading comprehension will be preliminarily assessed, setting the stage for further development and more extensive testing in subsequent phases. The end product of this phase will be a viable, web-based prototype, accessible to the public for beta-testing in preparation for commercialization, which would further demonstrate the potential of the EZ-Read concept to enhance reading comprehension. After completing Phase I, the tool's commercialization opportunities will be explored to include: 1) a platform for publishers or authors; 2.) An integrated tool for LMS systems; 3) a resource for individuals learning a second language.

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