DOI: https://doi.org/10.56198/5M1RHB4XK

Building Background Knowledge to Support Literacy through Immersive Learning

Sara C. Heintzelman[1] and Julie B. Fogt[1]

[1]Centennial School of Lehigh University, Bethlehem, USA
sch309@lehigh.edu
juf2@lehigh.edu

Abstract. Students with emotional behavioral disorders (EDB) and autism spectrum disorder (ASD) often present with deficient literacy skills, sometimes as severe as being several grade levels below their expected achievement. Reading comprehension is particularly challenging as many students with EBD and ASD struggle to understand vocabulary encountered in the text and make connections to previous learning. The Science of Reading is grounded in empirical evidence to support systematic instruction of vocabulary and reading comprehension. The purpose of this iLEAD practitioner contribution is to describe an instructional approach using shared immersive technology to build background knowledge to support literacy development in the areas of vocabulary and reading comprehension. An Immersive Learning Center (ILC), a 360-degree classroom, was developed to create a collaborative, immersive learning experience where students engage in content exploration through 360 photos and videos. This shared immersive learning environment scaffolds opportunities to build background knowledge and has the potential to improve motivation to increase engagement in the learning process. This practitioner contribution highlights specific examples of how to use shared immersive technology to design highly engaging instruction aimed at improving literacy skills.

Keywords: Immersive Learning, Science of Reading, Special Education.

1 Introduction

Students with emotional behavioral disorders and autism spectrum disorders often have comorbid deficits in reading. Some of their disability-related barriers (e.g., sensory sensitivities, emotional dysregulation, executive functioning deficits, interpersonal challenges) make accessing the general curriculum difficult and hinder their participation in activities and experiences designed to build background information. Background information acknowledges all of the world knowledge and experiences a reader brings to the task of reading and includes events, facts, procedural knowledge, and knowledge related to vocabulary [9]. The impact of background knowledge on reading comprehension extends beyond a reader's ability to make inferences and build upon existing mental schemas. Possessing sufficient background knowledge also reduces the burden on a reader's cognitive load thereby freeing up their working memory to integrate new information more effectively. Students who read with ease are more likely to have motivation to sustain engagement in the learning process and make connections from previous knowledge to new information.

Shared immersive technology is a promising solution for providing students access to activities and experiences to facilitate the acquisition and application of background knowledge aimed at supporting literacy development. At one school, an Immersive Learning Center (ILC), a 360-degree classroom, was developed to create a shared learning experience where students can engage in content exploration through 360 photos and videos. Students who have difficulty accessing content using traditional teaching methods can benefit from shared immersive technology to acquire background knowledge and attach these experiences to existing schemas.

2 Science of Reading and Immersive Learning

When students have limited background knowledge, they may struggle to participate in rigorous reading curricula. To assist students with limited worldly experiences, immersive learning can provide students with the background they need to comprehend and interact with texts. Given that background knowledge impacts vocabulary acquisition [2], it is critical to address how to support student vocabulary development through building background knowledge [5]. Effective vocabulary strategies to support students include: having students collaborate to create a drawing that is labeled and represents their previous knowledge of the topic [6], conducting repeated readings of texts with toys and props to extend the students' understanding of the book [6], and using graphic organizers [10]. These strategies can be implemented through a shared immersive learning environment and may lead to higher levels of student engagement.

Although a reader may be fluent, comprehension requires a broader set of skills [4]. While there is evidence to support that background knowledge supports a reader's ability to comprehend new materials, there is a dearth of research to support how to build background knowledge [2]. Strategies to support comprehension include: teaching self-questioning by stopping to ask questions throughout reading a text [7], using visual representations in instruction such as graphic organizer, videos, photos or illustrations [5], and giving students multiple opportunities to respond [5]. There is research to support the importance of building content knowledge to support comprehension development [1]. Through immersive learning, teachers can implement these strategies to support learners in a highly engaging environment. Table 1 provides examples of how to support the Vocabulary and Reading Comprehension strategies through designing shared immersive learning experiences. Figure 1 shows a group of elementary students building background knowledge in an Immersive Learning Center.

Table 1. Vocabulary and comprehension examples of immersive learning.

	Elementary	Middle	High
Vocabulary	Teachers will display a 360 image or video that represents the vocabulary word in the 360 immersive room. For example, if a student reads a sentence with the word "bleak" in it to describe the room where a character spends their time, the teacher may project a 360 image of a room that is dark with a single desk and chair in the corner. The teacher would say the definition of the word and explain that the word bleak in the context of a room or building means that it is dreary, not a desirable space to be in and lacks entertainment. This would help the students to make a connection to their own experience of their home, what they have access to in their own room and how they feel in those spaces.	Students will create shared drawings using a web-based platform that represent their previous knowledge of the vocabulary word. The teacher will project a web-browser for each student in the small group to project their drawing representing their previous knowledge around the room. After these drawings are projected, the teacher will talk through the previous knowledge displayed in the drawings to connect to the vocabulary word in the content of the current reading.	Using the Frayer model [3], students will complete the graphic organizer through a web-based platform. To represent the word and/or the context of the word, the students will use an AI 360 image generator to input keywords that will help the AI generator to create a realistic visual representation of the word. These 360 images will be projected around the three walls of the immersive classroom to assist students with acquiring new vocabulary.
Reading Comprehension	To help support young learners in an immersive environment and to give all students an opportunity to represent their understanding of a	To support the self-questioning strategy, teachers will use the walls of the immersive room to display various pieces of content. On the	Students will listen to the audio version of a text while sitting in the 360 immersive room

	text visually, students will be given a set of digital assets through a web-based immersive authoring tool. With these assets, students will re-create the story with a 360 setting. These visuals will be projected around the three walls of the immersive room as demonstrated in Fig.1.	left wall of the immersive room, the teacher will project a list of the characters in the text and other relevant information. On the center wall, the teacher will display the text that will be annotated as the teacher presents the new content. On the right wall, the teacher will display a list of questions to prompt students to use the self-questioning techniques. While students are reading the text, the left and right walls of the room will transform into the setting of the text to assist with the comprehension.	where the setting of the story is projected and wrapped around the three walls of the room. As students listen to the audio, they can follow along with a PDF version of the text projected onto a portion of the immersive room.

Fig. 1. Elementary students experience a taxi ride throughout New York City to build background knowledge on the busy streets of a city and different forms of transportation.

3 Conclusion

Shared immersive learning is one way to build background knowledge in a highly engaging setting. Through planned instructional design, teachers can design lessons where students engage with immersive content while building schemas to support literacy development. This project highlights specific examples of how to use shared immersive learning to connect with the vocabulary and reading comprehension components of the Science of Reading [8].

References

1. Cabell, S. & Hwang, H.: Building content knowledge to boost comprehension in the primary grades 55(S1), S99-S107 (2020).
2. Ceretti, G., Wright, T., & Hwang, H.: Conceptual coherence, comprehension, and vocabulary acquisition: A knowledge effect? Read Writ 29, 761-779 (2016).
3. Dazzeo, R. & Rao, K.: Digital Frayer model: Supporting vocabulary acquisition with technology and UDL 53(1), 34-42 (2020).
4. Duke, N., Ward, A., & Pearson, P.: The science of reading comprehension instruction 74(6), 663-672 (2021).
5. Hovey, K., Miller, R. Kiru, E., Gerzel-Short, L, Wei, Y., & Kelly, J.: What's a middle school teacher to do? Five evidence-based practices to support English learners and students with learning disabilities. Preventing School Failure 63(3), 220-226 (2019).

6. Jalongo, M. & Sobolak, M.: Supporting young children's vocabulary growth: The challenges, the benefits, and evidence-based strategies. Early Childhood Education Journal 38, 421-429 (2011).
7. Joseph, L., Alber-Morgan, S., Cullen, J., & Rouse, C.: The effects of self-questioning on reading comprehension: A literature review 32(2), 152-173 (2016).
8. Shanahan, T.: What constitutes a science of reading instruction? Reading Research Quarterly 55(S1), S235-S247 (2020).
9. Smith, R., Snow, P., Serry, T., & Hammond. L.: The Role of Background Knowledge in Reading Comprehension: A Critical Review. Reading Psychology 42(3), 214-240 (2021).
10. Taylor, D., Mraz, M., Nichols, W., Rickelman, R., & Wood, K.: Using explicit instruction to promote vocabulary learning for struggling readers 25(2-3), 205-220 (2009).