












Children as Creators of Augmented Reality Stories

A Constructionist Approach to Language Learning

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Abstract

This paper investigates an Erasmus+ project entitled Children as Creators of Augmented Reality Stories (CARS), focusing on how children aged 10–12 create augmented reality stories for language learning, grounded in constructionist principles. We apply a SWOT analysis from teacher perspectives to highlight strengths, weaknesses, opportunities, and threats. The literature review underscores the gap in child-driven augmented reality narrative creation, linking it to collaborative, hands-on learning processes. The proposed research design outlines iterative methods for capturing students' experiences, language gains, and the practical demands of augmented reality implementation. Results aim to inform educators on best practices, emphasizing resource availability, assessment frameworks, and sustainability considerations. By offering a constructionist lens, the study addresses both theoretical and applied implications, contributing to the broader discourse on augmented reality-based educational innovation while ensuring practical feasibility in diverse contexts.

Keywords and Phrases: Constructionism, Augmented Reality, Language Learning, Storytelling



1. Introduction

Augmented Reality (AR) has emerged as a promising educational tool, offering immersive experiences that can enhance both motivation and engagement. While many studies focus on the benefits of AR from a consumer perspective, there has been limited exploration of how children themselves can construct AR narratives to advance their language skills. Grounded in a constructionist approach, this paper investigates a work-in-progress of an Erasmus+ project titled Children as Creators of Augmented Reality Stories (CARS). The project empowers students aged 10–12 to create AR stories, thereby integrating hands-on learning with innovative digital practices. By emphasizing children's active role in developing and refining their own narratives, the project highlights opportunities for deeper language comprehension and creative expression. Through teacher perspectives gathered via a SWOT (strengths, weaknesses, opportunities, and threats) analysis, this work also reveals the practical advantages, challenges, potential opportunities and risks of integrating AR into real classrooms. The following sections outline the relevant literature, identify the research gap, and present a plan for future empirical work aimed at refining AR-based language instruction within a constructionist paradigm.

2. Literature Review

The rapid development of technology has continuously shaped education, with AR emerging as a transformative tool for enhancing student engagement and learning outcomes. As educators increasingly adopt AR, its potential to revolutionize storytelling and language education gains attention, particularly when framed within the constructionist paradigm. This review investigates the integration of AR into language learning, examining its alignment with constructionist principles and its implications for the evolution of educational practices.

2.1 Theoretical Underpinnings: Constructionism and AR

Constructionism, rooted in Seymour Papert's (1980) seminal work (Kafai, 2005), emphasizes learning through making and doing. This theory builds on Piaget's constructivism by asserting that learners construct knowledge more effectively when actively creating meaningful artifacts. Scholars have extended this framework to digital environments. For example, Kafai and Burke (2014) highlight the potential of digital tools to enhance constructionist learning by fostering creativity and critical thinking. AR aligns well with constructionist principles, enabling learners to merge physical and digital worlds, promoting active engagement and contextualized learning (Dunleavy and Dede, 2014). By designing AR narratives, students can practice language skills and also engage in problem-solving and innovation, which are core tenets of constructionism.

2.2 AR Applications in Language Education

Research reveals a growing interest in AR as a medium for storytelling and language acquisition. Several studies demonstrate its benefits in enhancing learner engagement, comprehension, and the development of multimodal literacy. Wu et al. (2013) highlight the immersive nature of AR, which enhances student motivation and active participation. When students design AR-based narratives, they interact with language in a dynamic, context-rich environment, which supports deeper comprehension (Wu et al., 2013). AR storytelling fosters vocabulary acquisition, syntax comprehension, and narrative structure. Saja et al. (2022) illustrate that AR's multimodal approach of combining visual, auditory, and textual elements enhances both written and oral language skills. AR also supports collaboration, as students work

in teams to develop and refine stories (Saja et al., 2022). This aspect aligns with Vygotsky's emphasis on the social nature of learning and reinforces constructionist ideals (Cole et al., 1978).

Despite these benefits, challenges persist. Researchers such as Bower et al. (2014) caution that the integration of AR often requires significant technical expertise and resources, which can create barriers for educators. Moreover, the risk of cognitive overload in young learners is a concern (Cheng and Tsai, 2013), emphasizing the need for carefully designed interventions. The scholarly discourse on AR in language education reflects both enthusiasm and caution. Proponents such as Billinghurst and Duenser (2012) praise AR's ability to make abstract concepts tangible, while critics like Koutromanos et al. (2015) argue that its effectiveness is contingent on teacher training and infrastructure.

A comparative analysis of studies highlights several key themes related to the integration of AR in language education. One significant strength is AR's interactive and multimodal nature, which aligns with diverse learning styles and enhances both student engagement and knowledge retention (Parmaxi and Demetriou, 2020). Nevertheless, its adoption is not without challenges. Logistical and financial barriers, coupled with a steep learning curve for educators, present significant obstacles (Khan et al., 2018). However, emerging technologies such as artificial intelligence (AI) integrated AR offer exciting potential for personalized and adaptive learning experiences, paving the way for more tailored and effective educational interventions (Okolo et al., 2024).

2.3 A Framework for Innovations, Assessment, and Sustainability

The integration of AR into constructionist practices exemplifies the theory's evolution in response to contemporary educational needs. Historically, constructionism emphasized physical artifacts such as LEGO robotics (Resnick, 1995). Today, digital storytelling through AR extends this tradition, offering new opportunities for creativity and learning. Alshammary and Alhalafawy (2023) argue that AR bridges the gap between traditional and digital constructionist tools, enhancing accessibility and scalability.

Innovative assessment approaches are vital for evaluating AR's impact on language education (Zacharis, 2010). Traditional tests may fail to capture the dynamic and interactive nature of AR storytelling. Scholars propose alternative frameworks, such as performance-based assessments and digital portfolios, to measure learning outcomes effectively (Vlachopoulos & Makri, 2024). These methods align with constructionist principles by emphasizing creativity, collaboration, and problem-solving. To ensure the sustainable integration of AR, researchers advocate for environmentally conscious practices and equitable access. Sustainable AR tools that minimize resource consumption are gaining traction (ManiMekalai et al., 2024). Moreover, incorporating "making" into AR storytelling – where students design physical and digital artifacts – deepens engagement and fosters innovation (Radu & Schneider, 2023).

The current study in progress aligns seamlessly with the themes outlined in the literature review, building on the integration of AR within constructionist practices, innovative assessment methods, and sustainable educational approaches. By focusing on children as creators of their own stories through AR, the research represents a state-of-the-art approach that bridges traditional constructionist principles with digital

innovations, as highlighted by Alshammary and Alhalafawy (2023). This emphasis on learner agency and creativity positions the study at the forefront of contemporary educational practices. Furthermore, the research incorporates performance-based and collaborative assessment strategies, addressing the limitations of traditional evaluation methods, as Vlachopoulos and Makri (2024) discussed. The project underscores the importance of sustainable and equitable use of AR technology, resonating with the emphasis on environmentally conscious practices (ManiMekalai et al., 2024) and fostering creativity amongst students through the “making” of digital and physical narratives (Radu and Schneider, 2023). This comprehensive approach ensures the research is both theoretically grounded and practically relevant, offering actionable insights for educators and researchers alike.

3. Enabling Child-Driven AR Storytelling for Language Learning

Despite the growing body of literature exploring AR in educational settings, there is a notable absence of studies that focus explicitly on children creating AR stories within a constructionist framework. Much of the existing research highlights AR’s potential to boost engagement and foster language learning, but the primary emphasis remains on how students consume or interact with pre-designed AR content rather than on how they construct their own artifacts. This gap is particularly relevant to constructionist principles, which stress learning through active creation and reflection (Papert, 1980; Kafai & Burke, 2014).

In light of these considerations, the present Erasmus+ project seeks to fill this gap by empowering children aged 10–12 to develop their own AR-based narratives. By centering instruction around the iterative process of designing and refining AR stories, the project directly aligns with core constructionist ideals of learning by making. As part of their language learning experience (whether in their native or second language), students will first create their own stories on paper. Then, they will transfer the main scenes to a storyboard. Finally, they will bring their stories to life on an AR platform to make them more interactive. The teachers will mainly act as facilitators to support students throughout the learning experience. Through hands-on experimentation, collaboration with peers, and continuous feedback from teachers, students experience language acquisition in an authentic, creative context. Consequently, this study aims not only to reinforce the utility of AR in the classroom but also to extend the discourse on constructionism by highlighting its applicability in technologically rich environments. In doing so, it aspires to offer actionable insights into how child-driven AR storytelling can advance both language learning and the broader goals of student-centered, constructionist pedagogy.

4. Teacher Perspectives on Using Augmented Reality for Language Learning: A SWOT Analysis

This project aims to support students aged 10-12 years to undertake language learning by creating their own stories through the medium of AR. In this project, teachers play a pivotal role as they serve to facilitate students’ process of creating their AR stories. Given their important role, the researchers in this project conducted a focus group with 8 teachers from the 3 schools located in Cyprus, Malta and Spain who were recruited from the schools participating in this project and expressed interest in participating in the AR-based learning experience; for this reason, a SWOT analysis was used as a basis for the discussion. The focus group took place towards the end of a three-day teacher training programme organised as part of the project, during which the participants received training on the technical use of AR authoring tools,

as well as pedagogical training on how to effectively implement these tools. During this workshop, participating teachers had the opportunity to use this knowledge to create and share their own AR story. This hands-on experience provided valuable insights to the teachers attending the programme. In addition, during this workshop teachers visited a school participating in this project, where they observed children working individually or in pairs to develop their own AR stories using laptop computers. Considering the four components of the SWOT analysis, namely strengths, weaknesses, opportunities, and threats, the following two subsections describe how these elements were applied in the context of this research.

4.1 Strengths and Weaknesses

Teachers identified both strengths and weaknesses in using AR authoring tools for language learning. Among the strengths, AR was praised for fostering creativity by allowing students to create stories in an engaging audio-visual format. It also encouraged collaboration, even when students worked on individual stories, they often cooperated in gathering necessary assets (e.g., pictures, 3D models, audio) for their AR stories as well as explaining to other peers how to incorporate the elements into their stories. That way, students also became peer learning guides and were actively involved in the teaching-learning process. This collaborative process generated enthusiasm, particularly when sharing their completed stories. Additionally, teachers suggested that using storyboards could help guide students by limiting the number of elements in each scene, making their stories clearer and more shareable. However, several weaknesses were highlighted. The creation of AR stories requires multiple assets to represent story elements, making the process highly iterative. Students often struggled to find suitable assets for key story elements, such as main characters, leading to delays and revisions. During the training program, many teachers had to adjust their storyboards to address these limitations, particularly the scarcity of 3D models. To mitigate these challenges, teachers proposed having students write scenes instead of drawing them, which could streamline the iterative process between storyboarding and AR scene creation.

4.2 Opportunities and Threats

Teachers identified several opportunities and threats in using AR for language learning. Opportunities include AR's potential to enhance students' communication and problem-solving skills. This arises from the need for students to organize their stories into scenes, collaborate with peers, and make decisions about story elements and assets to integrate into their AR projects. Additionally, making storyboards more flexible – allowing for drawing, edits, and text – could accommodate diverse learning styles, benefiting both visual and non-visual learners. Conversely, several threats were noted. Storyboarding might impede the iterative storytelling process if students struggle to find suitable resources. Technical challenges, such as unreliable internet connectivity and limited device availability, can also pose significant barriers. Device limitations are particularly critical as they determine whether students can work individually or must share devices. Furthermore, the limited range of free resources for acquiring necessary assets (e.g., images, 3D models) can constrain creativity. As a result, careful planning during story creation is required, which may dampen the creative potential of AR-based storytelling.

5. Future Research

The findings from the literature review and SWOT analysis of focus group discussions informed the development of a plan for further research to be undertaken as part of the project outlined in Figure 1. The target groups for this empirical research are students aged 10-12 years and teachers directly involved in the implementation of AR in language learning. The data collection tools employed throughout these five phases are consistent across all languages and countries, with all data being collected or translated into English to facilitate a unified analysis.

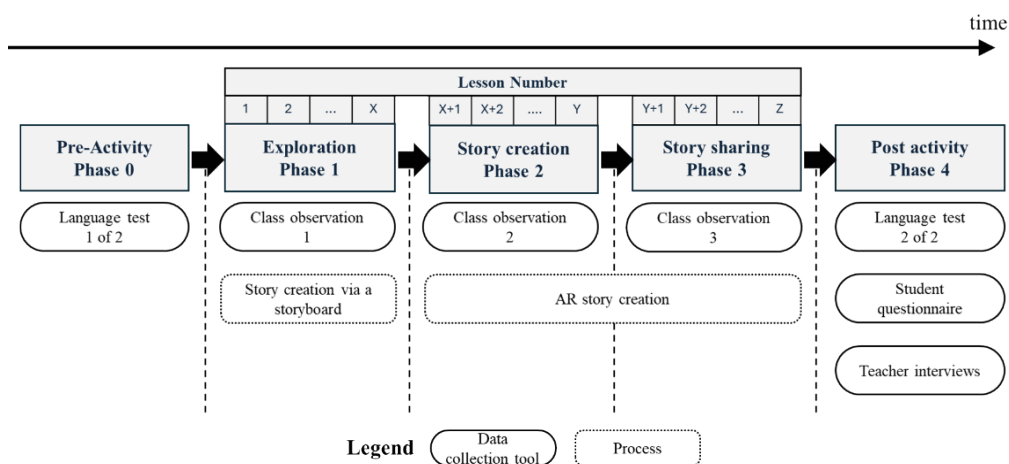


Figure 1: Outline of planned research work.

The planned research entails 5 phases, with phase 0 consisting of a language test intended to gauge student language skills and competencies at the beginning of the interventions. Students in phase 1 will identify and develop their story through the use of a storyboard. The storyboard serves to help students identify key scenes, their sequence and story elements such as main characters, key objects and the context where the story takes place. The main data collection instrument to be used in phase 1 will be classroom observations. Phase 2 entails the translation of the story, documented via the storyboard, into AR using a web-based authoring toolkit. During this phase, students will be required to identify digital assets necessary to create the AR version of the story, such as 3D models, images, sound clips and videos. Data will be collected via class observations, paying particular attention to any changes between the AR version of the story and the story as documented via the storyboard. Based on first-hand experiences, this phase may be highly iterative as students may be required to revise their original story based on the availability of digital assets. Students will share the AR story created by them with their teachers and peers in phase 3, where data will be collected via class observations. An emphasis here is to collect the AR version of each story created by children. Technical challenges identified through literature review and teacher focus groups informed the development of the observation protocol used in phases 1 to 3. This protocol assesses technical issues, student recovery, and their engagement with AR-based concepts. In phase 4, a questionnaire will evaluate students' emotions and learning experiences using AR to create and narrate their own stories in language learning classes. Pre- and post-tests will be analyzed to measure AR's impact on language learning. The plan disclosed in Figure 1 also entails interviews with teachers, which are intended to gather insights on the affordances and limitations of AR from a teaching perspective. All the data

generated and analysed throughout the study will be utilised to develop best practice guidelines for implementing AR in language learning using a constructionist approach.

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