Extending DiGaBo with Visual Interactions for Computing Education

Svenja Noichl
Learning Techologies Research Group
RWTH Aachen University
Aachen, Germany
noichl@informatik.rwth-aachen.de

Lingzhi Pähler
RWTH Aachen University
Aachen, Germany
lingzhi.paehler@rwth-aachen.de

Laura Drescher-Manaa
RWTH Aachen University
Aachen, Germany
laura.drescher@rwth-aachen.de

Abstract

DiGaBo is a web-based platform for creating and playing interactive and multimedia digital gamebooks, branching narratives which integrate multimedia content and interactive tasks. We extended DiGaBo with three new interaction types (Hotspot, Image Discovery, and Point-and-Click), enabling learners to engage with content in a more visual and exploratory way. In computing education, these can be used for tasks like identifying bugs in a code snippet. In earlier outreach settings, like Girls' Day and school internships, students have already created narrative and logic-based gamebooks, providing formative feedback for further development. With the newly added visual interactions, we plan to iteratively evaluate their impact on engagement, usability, and conceptual understanding. This poster presents the new interaction types, use cases, and future research plans to investigate how interactive and multimedia digital gamebooks can enrich computing learning experiences.

CCS Concepts

• **Applied computing** → **Interactive learning environments**; • **Social and professional topics** → **K-12 education**.

Keywords

computing education; digital gamebooks; visual interaction types; learner engagement; interactive learning environments

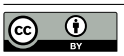
ACM Reference Format:
Svenja Noichl, Lingzhi Pähler, and Laura Drescher-Manaa. 2026. Extending DiGaBo with Visual Interactions for Computing Education. In *The 20th WiPSCE Conference on Primary and Secondary Computing Education Research (WiPSCE 2026), March 11–13, 2026, Aachen, Germany*. ACM, New York, NY, USA, 2 pages. https://doi.org/10.1145/3801749.3801769

1 Introduction and Motivation

Game-based and narrative learning environments have shown potential for engaging students in computing education. Digital gamebooks, interactive stories in which readers make choices that influence the storyline, offer a diverse framework that combines narrative and problem-solving. They can support conceptual understanding and creative exploration, especially when learners are actively designing or adapting their own gamebooks. [4, 8, 10]
However, existing digital gamebook tools, such as Twine, remain largely text-based and rely on simple question-answer formats, which limit the design of rich, multimodal learning experiences. Visual and interactive elements can play a crucial role in supporting comprehension, particularly for younger learners or in contexts where reading skills are still developing [3].
To address these limitations, we introduce DiGaBo, a tool for creating and playing interactive and multimedia digital gamebooks [7]. The newest version of DiGaBo expands the interaction space through three new digital interaction types (Hotspot, Image Discovery, and Point-and-Click), enabling a broader range of image-based and exploratory learning activities in computing classrooms.

2 DiGaBo Platform and New Interaction Types

DiGaBo is a web-based platform designed to support the creation of interactive and multimedia digital gamebooks. It allows teachers and learners to combine narrative text, visuals, audio, and interactive elements into branching storylines that can be used across different subject areas. In the context of computing education, DiGaBo provides opportunities to embed problem-solving tasks, algorithmic reasoning, or debugging challenges directly within a narrative framework. Recent developments of DiGaBo introduce new interaction types that extend the platform's multimodal affordances.
Hotspot tasks allow learners to interact directly with images by identifying or selecting specific visual regions. The selected areas are then compared with predefined hotspots set by the task creator, which remain invisible to the learner. This task type can be applied to simple scenarios, such as identifying specific objects within an image. In a computer science context, this could involve identifying particular computer hardware components. More complex implementations are also possible. For example, a task may require the learner to select errors in a code snippet, which demands an understanding of programming concepts and critical code evaluation (see Figure 1). [9]
Image Discovery tasks enable content to be revealed gradually, stimulating exploration and curiosity. DiGaBo primarily consists of interactive tasks that challenge the learner; however, learners must also receive necessary information to get familiar with the learning content. In Image Discovery tasks, this can be done interactively as the learner clicks on parts of an image to uncover new content. This feature can be used both to present information beforehand and to give feedback by revealing the correct solution with an explanation. For instance, after selecting the errors in the code snippet from the hotspot task, the learner can receive feedback showing the actual errors, with clickable explanations for each one (see Figure 1). [9]
Point-and-Click tasks offer interactive object manipulation within



This work is licensed under a Creative Commons Attribution 4.0 International License.
WiPSCE 2026, Aachen, Germany
© 2026 Copyright held by the owner/author(s).
ACM ISBN 979-8-4007-2502-9/26/03
https://doi.org/10.1145/3801749.3801769

an image context, providing opportunities for logic-based or sequencing activities. They can also be used for simple prototyping tasks, like learners designing mock-ups for a website first and then including them into the gamebook to simulate navigation by linking interactive areas to different scenes. This allows them to explore the concept of hyperlinks and websites without programming and could foster early computational design thinking. [2]

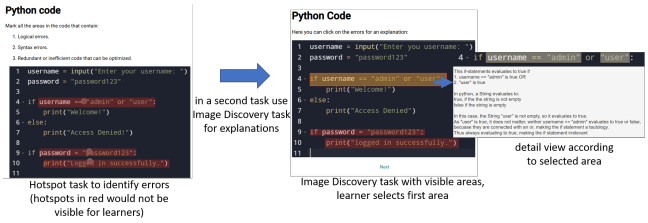


Figure 1: Example use case for integrating Hotspot and Image Discovery tasks in a gamebook.

3 Use Cases in Computing Education

The new interaction types open a range of possibilities for designing engaging and visually rich learning scenarios in computing education. By integrating problem-solving activities within interactive narratives, teachers can address core concepts such as debugging, algorithmic thinking, and user interface design in a playful and structured way. In the following, we will present three different scenarios which demonstrate the potential of DiGaBo as both a teaching and learning platform, supporting teachers in creating meaningful, interactive materials and empowering learners to express computational ideas through narrative and design.

Teacher-created gamebooks. Teachers can design gamebooks that integrate disciplinary content into interactive storylines, as shown. These can serve as guided exercises for practicing computational concepts or as formative assessment tools during lessons.

Student-autored gamebooks. Learners can also act as creators. In previous outreach and extracurricular activities, such as workshops at Girls' Day (grades 6–7) and school internships (grades 9–11), students have created their own digital gamebooks to represent computing concepts [1]. These experiences demonstrated the motivational potential of narrative-based creation tasks and offered insights into how learners conceptualize computational ideas through storytelling. The new interaction types allow learners to design more visually engaging and exploratory experiences. Such activities foster higher-order thinking, agency, and ownership of learning [6].

Support for younger learners. The inclusion of image-based interaction makes DiGaBo particularly suitable for early computing education, where visual cues can reduce linguistic barriers and support pre-readers or emerging readers. This aligns with current efforts to make computing education more inclusive and developmentally appropriate for primary classrooms [5].

4 Discussion and Future Work

Building on our previous implementations of DiGaBo in outreach and extracurricular contexts, future work will focus on systematically exploring the educational potential of the new interaction types. While earlier versions of DiGaBo demonstrated that learners can successfully create their own digital gamebooks to represent computational concepts, the introduction of image-based interaction opens new questions regarding design, engagement, and learning outcomes. Planned studies will investigate how teachers and learners use the new Hotspot, Image Discovery, and Point-and-Click tasks in practice. One research direction focuses on teacher-created gamebooks, examining how educators design interactive and multimedia digital gamebooks and which kinds of computational problems they choose to represent visually. Another line of work explores student-authored gamebooks, analyzing how learners integrate visual interactions into their own gamebooks and how this process supports computational thinking and creativity. Since we regularly host school internships (grades 9–11) and annual Girls' Day workshops (grades 6–7), we have continuous access to one of our key target groups. These recurring activities enable us to iteratively test new features and gather authentic feedback on engagement, learner-established scaffolding, and the influence of narrative and visual elements on motivation. This user-centered approach ensures that DiGaBo's development remains closely aligned with learners' needs and perspectives.

In summary, DiGaBo provides a flexible and creative environment that bridges storytelling, interactivity, and computation. Upcoming evaluations aim to refine both the platform and its didactical use.

References

[1] Miriam Datka and Svenja Noichl. 2025. DiGaBo: Eine Plattform für multimediale und interaktive digitale Gamebooks. In *21. GI-Fachtagung Informatik und Schule (INFOS) 2025*. Gesellschaft für Informatik e.V. (GI). https://doi.org/10.18420/infos2025_pr_2

[2] Laura Drescher-Manaa. 2025. *Implementierung von Point-and-Click-Interaktionselementen in der DiGaBo Plattform.* Masterarbeit. RWTH Aachen University, Aachen.

[3] Jennifer Farrar, Evelyn Arizpe, and Rachel Lees. 2024. Thinking and learning through images: a review of research related to visual literacy, children's reading and children's literature. *Education 3-13* 52, 7 (2024), 993–1005.

[4] Marco Fenici and Ivan Mosca. 2024. Gamebooks and branching narratives in education: Fostering sustainability competences to promote positive social change. In *Frontiers in Education*, Vol. 8. Frontiers Media SA, 1335605.

[5] Gospel Kim, Kathleen Zimmerman, Gregory A Cheatham, and Kelsey Smith. 2024. Visual Cues Using Mobile Technology to Support In-Class Transition for All Children. *Young Exceptional Children* 27, 1 (2024), 42–54.

[6] Silvia Molina Roldán, Roseli Rodrigues De Mello, and Maria Padrós. 2022. Interactive learning environments: Fostering learning, development, and relationships for children with special needs. In *Frontiers in Education*, Vol. 7. Frontiers Media SA, 975142.

[7] Svenja Noichl. 2025. DiGaBo: Eine Plattform für multimediale und interaktive digitale Gamebooks. In *21. GI-Fachtagung Informatik und Schule (INFOS) 2025*. Gesellschaft für Informatik e.V. (GI). https://doi.org/10.18420/infos2025_wd_1

[8] Jan L Plass, Bruce D Homer, and Charles K Kinzer. 2015. Foundations of game-based learning. *Educational psychologist* 50, 4 (2015), 258–283.

[9] Lingzhi Pähler. 2025. *Conception and implementation of new task types for interactive digital gamebooks.* Bachelorarbeit. RWTH Aachen University, Aachen. https://doi.org/10.18154/RWTH-2025-04431

[10] Maja Videnovik, Tone Vold, Linda Kiønig, Ana Madevska Bogdanova, and Vladimir Trajkovik. 2023. Game-based learning in computer science education: a scoping literature review. *International Journal of STEM Education* 10, 1 (2023), 54.