Lego Level Up

Game Literacy and Playful Materialities

HANNS CHRISTIAN SCHMIDT

INTRODUCTION: HOW TO READ A GAME?

Computer games constantly generate texts for us. A game like TUNIC (2022) draws its appeal from the exploration of the unknown. This exploration also includes the interpretation of a language that should give us clues about the world but ultimately cannot be deciphered. In BABA IS YOU (2019), we play with in-game text as if it were a programming language. Here, the goal is to move blocks of text within 'if-then' chains of commands in order to solve logic puzzles. In UNPACKING (2021), we interact with objects we clear out of moving boxes. Many of these objects have a narrative meaning attached—when placing these fragments in chronological order, a story unfolds in our minds.

When we speak of texts in computer games, we are not only referring to the numerous literal text passages—dialogs and descriptions— that can be found in many contemporary computer games (and sometimes fill entire in-game-libraries in the form of diegetic artifacts). We are also not necessarily talking about the hundreds to millions of lines of code hidden at the 'bottom' of the digital image[1] of contemporary games, concealed from us by a graphical interface.

On a more fundamental level, the concept of text in computer games is both much more general and, at the same time, much more complex: just like literary works and the paintings of fine art, the audiovisual moving images of film and computer games produce a semiotic fabric that must be sensually perceived and cognitively 'understood.'

1 Nake, Frieder: "Das doppelte Bild," in: *Digitale Form: Bildwelten des Wissens. Kunsthistorisches Jahrbuch für Bildkritik* 3, no. 2 (2005), pp. 40-50, here p. 46.

Figures 1-3: TUNIC (Finji 2022, O: Finji); BABA IS YOU (Hempuli 2019, O: Hempuli); UNPACKING (Witch Beam 2021, O: Witch Beam)

Sources: Screenshots by Ethan Webb, https://screenrant.com/tunic-unlock-magic-dagger-location-guide/Screenshot; James Sheppard, https://www.indiegamewebsite.com/2019/03/20/baba-is-you-review/; HC Schmidt

Only when we have learned to 'read' the text of the computer game—as a sequence of images, sounds, and language signs—and have internalized the conventions of its rules and input devices, we can interact with the medium in an effective way, thus becoming able to actually *play* the game. These interactions, in turn, enable us to perceive games as artifacts that 'have something to say'—and therefore not only to read them but to interpret them in a way that, just a few decades ago, was largely reserved for the nobilitized genres of our cultural canon.

According to such an understanding, the computer game is a medium of textuality and carries cultural meanings. Games are mediators through which statements are made, messages are expressed, and content is communicated in aesthetic, narrative, or procedural ways. As such, they demand a certain literacy from us. Such an ability to read digital games—a game literacy—is, therefore, a crucial condition for a productive, meaningful, and competent engagement with computer games. The media scholar and game designer Ian Bogost sums up the importance of such reading competence in the following way:

"The kind of technology literacy that procedural rhetoric offers is becoming increasingly necessary for kids and adults alike. As more of our cultural attention moves from linear media like books and film to procedural, random-access media like software and video games, we need to become better critics of the latter kind."[2]

Although Bogost's appeal to a technology literacy was made almost exactly 15 years ago, it is no less suitable today. On the contrary: The need for a literacy in procedural software and games clearly deserves our attention at a time when morally questionable design decisions, so-called dark (design) patterns,[3] of browser, social, and mobile games encourage countless players to engage in problematic consumption behaviors that are difficult to manage; when blockchain technologies and NFTs break open the distinction between voluntary play and rigorous exploitative employment;[4] and radicalized online communities of

2 Bogost, Ian: "The Rhetoric of Video Games," in: Salen, Katie (ed.): *The Ecology of Games: Connecting Youth, Games, and Learning*, Cambridge, MA: The MIT Press 2008, pp.117-140, here p. 136.

3 Zagal, José P./Björk, Staffan/Lewis, Chris: "Dark Patterns in the Design of Games," paper presented at the *Proceedings of the 8th International Conference on the Foundations of Digital Games* (FDG 2013), Chania, Greece, 2013.

4 Winkie, Luke: "Play-to-Earn Gaming Sounds too Good to be True. It probably is," *Vox* (2022), https://www.vox.com/the-goods/23074931/play-to-earn-video-games-blockchain-web-3 w

gaming servers impact the everyday life of the social space.[5] Thus, the unfolding of the meaning of the text 'in itself' also expands to the meaning of the cultural context in which it is read.

If we follow this four-step approach to a developing game literacy—from (1) the sensual perception of the game's audiovisual repertoire of signs, to a (2) functional readability in order to be able to interact with the game, to a (3) textual interpretation that exposes the explicit and implicit levels of meaning and can (4) unfold its significance within a cultural context and have a social impact—finally, one important question arises: How can such a literacy be mediated or taught successfully? This contribution tries to collect some approaches to a possible answer. After a brief theoretical underpinning that will lead us from a model to learn how to read computer game images to a short digression of two practical school projects, our own approach will show how children can become 'brickcoleurs' of their own computer game worlds by incorporating a playful materiality—literally brick by brick. After that, the prototype we developed in our research project—the editor game software A MAZE IN TILES and our augmented reality game literacy arcade cabinet DARIO'S BOX will be discussed. At the end of this contribution, I will outline some perspectives which seem to be important for the further development of the game literacy approach.

PANOFSKY IN THE POST-APOCALYPSE: GAME LITERACY MODELS IN FORMAL LEARNING ENVIRONMENTS

If we ask how games unfold their effects, which reading competencies they require, and how the teaching of such literacies can take place, we can draw on several models that have been developed for didactic and pedagogical use in formal and informal educational settings. Not surprisingly, nearly all publications dealing with the topic of game literacy begin by attempting a kind of ontological definition: If games are readable artifacts, then what are the properties that define the text? Which elements make a game readable in what regard? Again, it comes as no surprise that different scholars from different fields suggest different approaches. Let us have a look at three examples from German academia:

5 Romano, Aja: "What e Still Haven't Learned from Gamergate," *Vox* (2021), https://www.vox.com/culture/2020/1/20/20808875/gamergate-lessons-cultural-impact-changes-harassment-laws

The educational scholars Johannes Fromme and Christopher Könitz transfer the classical image analysis model of the art historian Erwin Panofsky[6] to computer games.[7] According to Panofsky's well-known three-step model, images can be effectively interpreted by first making a pre-iconographic description: What can we recognize in the depiction on a phenomenological level? Do we see a bearded man with a hammer, for example? Afterward, in an iconographic analysis, we will assign the contents of the picture according to the conventions of the depicted subject and the identifications of the persons: Can the bearded man read as Thor, the Norse god of thunder, identified by his attribute, the hammer Mjölnir? Finally, Panofsky proposes to engage in an act of iconological interpretation and uncover the so-called "document sense of a representation, the actual meaning or content" of the work, which finally lets the viewers become the educated exegetes of the "'unknowable[s]'—today we would say unconscious[s] attitudes," which "have entered the picture, which are hidden behind the superficial level of interpretation of the represented, which the iconologist can make visible again."[8] This would raise the question, for example, of whether the iconographic representation of a character like Thor in the computer game GOD OF WAR: RAGNARÖK (2022) was deliberately designed to create a counter-image to the contemporary representation of the character in the immensely popular motion pictures of the Marvel Cinematic Universe. In terms of the required literacy gained from these steps, Kopp-Schmidt summarizes as follows:

"the iconologist generally assumes that an image is 'readable' like a text. If it cannot be understood spontaneously, then it must be interpreted with the help of [other] texts. What Warburg, Panofsky, and other art historians of the iconological school do, then, is to try to interpret images that prove resistant to conventional iconography-tested sources and remain unintelligible, with the help of new, previously unconsidered material."[9]

6 Panofsky, Erwin: "Ikonographie und Ikonologie," in: Kaemmerling, Ekkehard (ed.), *Bildende Kunst als Zeichensystem. Ikonographie und Ikonologie. Band 1: Theorien—Entwicklung—Probleme*, Cologne: DuMont 1994, p. 207-225.

7 Fromme, Johannes/Könitz, Christopher: "Bildungspotenziale von Computerspielen—Überlegungen zur Analyse und bildungstheoretischen Einschätzung eines hybriden Medienphänomens," in: Marotzki, Winfried/Meder, Norbert (eds.), *Perspektiven der Medienbildung*, Wiesbaden: Springer 2014, p. 235-286.

8 Kopp-Schmidt, Gabriele: *Ikonographie und Ikonologie: eine Einführung*, Cologne: Deubner 2004, p. 57, my translation.

9 Ibid, p. 58, my translation.

Fromme and Könitz apply this model to games in a very similar way. However, they make the attempt to include not only the depiction of the pictural qualities of digital games but almost *all* conceivable game characteristics for the question of its educational potential. In addition to naming the game's characters, classifying the "typical or basic objects," and the "tasks and objectives,"[10] the two authors show how games can draw on an "extensive repertoire of culturally shaped signs and conventions that points beyond pre-iconographic understanding"[11]—from image content as well as gameplay mechanics, to sound design, to interface design, and so-called "interaction indicators,"[12] which direct us to possible points of action in the game world. Although Fromme and Könitz, in this extraordinarily broad taxonomy, are quite explicitly "not concerned with embedding [game images] in art-historical contexts [through which] Panofsky elaborates the actual content of a picture,"[13] Panofksy's model is already quite suitable for representing certain levels of meaning in relation to a game's readability and interpretability.

An example: With the help of the context of American art history, the epilogue from the enormously popular (and by many critics scolded)[14] THE LAST OF US PART II (2020) could no longer be read as an additional depressing moment in an almost endless sequence of depressing events, but (also) as an artistic reference that holds a key to the interpretation of the game. By comparing the depiction of the game to the one of a popular painting—a female back figure within a strikingly similar farm landscape—we are prompted to read the game scene as a reference to artist Andrew Wyeth's painting CHRISTINA'S WORLD (1948).

10 J. Fromme/C. Könitz: "Bildungspotenziale von Computerspielen," p. 255, my translation.

11 Ibid, p. 257, my translation.

12 Ibid, p. 268, my translation.

13 Ibid, p. 273, my translation.

14 "THE LAST OF US PART 2 depicts individual people who are instead ruthless, capable, yet self-absorbed, and whose perception of violence is limited to how it affects them and their chosen family members. They are almost unbelievably unable to see the bigger picture. PART 2 ends up feeling needlessly bleak, at a time when a nihilistic worldview has perhaps never been less attractive. Its characters are surviving, but they're not learning, and they're certainly not making anything better. Maybe the most surprising thing that THE LAST OF US PART 2 offered me was the certainty that, while the game was made with great skill and craft, we are actually much, much better than Naughty Dog thinks we are." Myers, Maddy: "The Last of Us Part 2 Review," *Polygon* (2020), https://www.polygon.com/reviews/2020/6/12/21288535/the-last-of-us-part-2-review-ps4-naughty-dog-ellie-joel-violence

Figures 4 and 5: CHRISTINA'S WORLD (Andrew Wyeth, 1948) and THE LAST OF US PART II (Naughty Dog 2020, O: Sony Computer Entertainment)

Sources: Museum of Modern Art, https://www.moma.org/collection/works/78455; Screenshot by HC Schmidt

According to the Museum of Modern Art, Wyeth was concerned with depicting the autonomy of the painting's polio-stricken protagonist—Christina, "do[ing] justice to her extraordinary conquest of a life which most people would consider hopeless."[15]

The composition of the image and the choice of subject matter suggest a pictorial line of tradition that supports an intertextual reading of the game in terms of self-determination, the attainment of autonomy under one's own, self-chosen conditions in the face of the sheer overwhelming forces of illness, trauma, and death. Panofsky's model thus unfolds a relevance for understanding digital games not only as media with playable action (both narrative and interactive) but also for analyzing them as visual media and interpreting them for their expressive power.

Such a readability, which sharpens the eye for intertextual and intermedial levels of meaning, could unquestionably be taught within formal educational settings. This has been shown by several publications: Instead of borrowing a model from art history, Danny Kringiel, for example, suggests in this context applying a kind of 'toolbox' of different perspectival lenses that would enable close readings of computer games in the school classroom.[16] In addition to a ludological perspective, which decidedly examines questions about the effects of game mechanics, Kringiel considers (1) a perspective of film analysis, (2) a 'cyberdramatic' perspective of theatrical character representation, (3) a narrative perspective as well as (4) an architectural perspective of the game world and level design as useful to analyze games—in his case the third-person shooter MAX PAYNE 2: THE FALL OF MAX PAYNE (2003)—as highly stylized and intermedially strongly overformed artifacts in the classroom and to examine them for their own means of expression. It must be noted that a case study such as MAX PAYNE 2, in particular, demonstrates the extent to which games are not closed individual works but rather 'living' works that are often updated on the software side and prepared for new playful contexts and technologies. For example, the first MAX PAYNE (2001) has been playable as a mobile game adaptation on smartphones and tablets for several years now, which required a fundamental rethinking of the access requirements (for example, with regard to control via touchscreen).

In addition to such a breakdown of the readable features of games that make them analyzable, linguistically accessible, and interpretable as texts, another promising approach lies in designing games themselves and thus providing

15 "Andrew Wyeth: Christina's World," https://www.moma.org/collection/works/78455

16 Kringiel, Danny: "Learning to Play: Video Game Literacy in the Classroom," in: Fromme, Johannes/Unger, Alexander (eds.), *Computer Games and New Media Cultures*, Dordrecht: Springer 2012, p. 633-646.

learners with a deeper understanding of the language of games—their formal design and the resulting aesthetic effects. The ability to read games would thus be complemented by the ability to express oneself with and through the media-specific means of games. This corresponds with James Paul Gee's definition of an active learning process: "The learner needs to learn [...] how to think about the domain at a 'meta' level as a complex system of interrelated parts [...]—how to produce meanings that, while recognizable, are seen as somehow novel or unpredictable."[17] Being able to use game design to express meanings might be considered a more advanced form of game literacy. Teaching such an ability might, at first glance, seem way too ambitious for regular classroom use; however, Kristina Jonas and Marten Fütterer did exactly that with their 2012 research project *My Video Game. Constructionist Experiential Learning in School*.[18] In their studies, they describe how a constructionist approach to education based on Seymour Papert's learning philosophy[19] and Herbert Gudjon's project method[20] can be used fruitfully in several subjects. Using comparatively simple editing and authoring tools such as GAME MAKER or the adventure editor software VISIONAIRE, schoolchildren become game designers themselves, with individual building blocks of the game being developed in subjects such as German (narration and character development), art (asset design), or music (sound design).

Of particular interest for this approach is a footnote in Jonas and Fütterer's text, in which the authors elaborate on Papert's philosophical approach to education. They quote Papert as follows:

"Here I use the concept of bricolage to serve as a source of ideas and models for improving the skill of making and fixing and improving mental constructions. I maintain that it is possible to work systematically toward becoming a better bricoleur. [...] The basic tenets of bricolage as a methodology for intellectual activity are: Use what you've got, improvise, make do."[21]

17 Gee, James Paul: *What Video Games Have to Teach Us About Learning and Literacy*, New York: Palgrave Macmillan 2007, p. 23.

18 My translation.

19 Papert, Seymour: *The Children's Machine: Rethinking School in the Age ot the Computer*, New York: Basic Books 1993.

20 Gudjons, Herbert: *Handlungsorientiert lehren und lernen*, Bad Heilbrunn: Klinkhardt 2008.

21 S. Papert: *The Children's Machine*, p. 144, quoted in: Jonas, Kristina/Jonas, Marten: "My Video Game—Erstellung Digitaler Spiele in der Schule unter Berücksichtigung partizipativer Produktionsströmungen," in: Biermann, Ralf/ Fromme,

Transferred to their project *My Video Game,* this means for the two authors:

"to fall back on precisely that knowledge one has so far, and to deal with it so freely that new insights and/or horizons of meaning can be opened up from it. These then count in turn to the stock of knowledge [Verfügungswissen], so that this constantly grows (but is also corrected, revised, and transformed) and thus always enables new views of the world and self [Orientierungswissen], as well as a fundamental ability to act in the world."[22]

However, Seymour Papert is not 'only' considered the authoritative founder of the constructionist approach to education but was also responsible at the time for the conception of a popular Lego model series that was intended to teach children robotics and programming skills through the use of a playful materiality: Lego MINDSTORMS. Thus, there are various intersections between the concept of bricolage and Lego bricks, not only in the sense of a play on words but also in a conceptual way in the context of newer media literacy models. In this sense, the interlocking plastic bricks represent a material analog of mental construction processes—a kind of constructionist building substance. The metaphor of mental models, which can be built up, modularized, expanded, recombined, and iteratively repaired again and again through constructionist processes, transforms into a playful, tangible equivalent, a physical manifestation. Mental models and actual models come together here—and enable children to acquire knowledge about processes through their own experiential learning, which is normally shielded from the outside world as black boxes and takes place in secret.

This was also an initial starting idea for the *Game Literacy* project of the Cologne Game Lab (TH Köln) and the Institute for Media Culture and Theater (University of Cologne), funded by the RheinEnergie Foundation in 2018-2021. The goal of the project was to develop a workshop that complements the approaches described above by incorporating an even lower-threshold tool away from the operation of software, coding, and authoring tools, thus taking advantage of the playful materiality of the interlocking brick system. At the same time, we experimented with new technologies that opened up a transition between analog and digital processes—resulting in a hybrid, post-digital approach. In the following,

---

Johannes/Verständig, Dan (eds.): *Partizipative Medienkulturen*, Wiesbaden: Springer 2014, pp. 233-259, here p. 239.

22 Jonas, Kristina/Fütterer, Marten: *My Video Game: konstruktionistisches Erfahrungslernen in der Schule; die Entwicklung von Computerspielen als Projektpraxis*, Magdeburger Schriftenreihe zur Medienbildung, Stuttgart: Ibidem 2012, p. 239; my translation.

we will introduce both the workshop concept and our tool, the editor game software A MAZE IN TILES, as well as the accompanying AR hardware that later became DARIO'S BOX.

THE LEGO LEVEL UP WORKSHOPS

The workshop *Lego Level Up!* is the practical part of the research project *Literacy of Games/Literacy of Play: Playful Mediation of Media Literacy in the Field of Analog, Digital, and Hybrid Games* (*Literalität des Spiel(en)s*). As outlined above, the project aimed to identify central theoretical foundations of a literacy of digital as well as analog and hybrid game(s) and to design a workshop series that could be carried out with a different number of participants and different age groups. Also, this was intended to take into account the frequently articulated public desire for media competence in the sense of games competence.

The core of the workshop concept was a material two-step process that led from analog to digital game design and was framed by several rounds of reflection and feedback with our participants. The workshops, which were designed for a period of one or two days of four hours each, began with a moderated "get-to-know-you" phase in which the participants exchanged their own gaming experiences and shared their knowledge about games with others. This initial phase led to a first practical part, in which the participants were asked to record their expectations of a 'typical' game with pen and paper. This step served, on the one hand, as a warm-up exercise and to map the current status quo of interests and preferences within the group. On the other hand, it established a connection to the children's imaginative worlds—by which we hoped to gain insight into the children's cognitive concepts and the 'dispositional knowledge' mentioned above via a means of expression that was not purely linguistic. In response to the open-ended request "Draw what you like to play!" we got very different results—besides the expected answers about current games like FORNITE (2017) and MINECRAFT (2009), we also got pictures of sports activities (from soccer to judo), musical instruments like piano, and games that actually belong exclusively to the adult world—like poker. This grounded, open-ended approach showed that studies investigating game and play literacy needs to be much broader than we had originally assumed.

Focus 1: Storytelling, Games, Game Mechanics

The first focus within our workshop was on the relationship between storytelling and rule-based play. In keeping with our low-threshold approach, however, our workshops were not about academic or design theory arguments about the infamous "debate that never took place"[23] or the alleged "blood feud" between narratologists and ludologists, respectively.[24] Nor was it about conveying certain preconceived answers to predefined questions. Instead, the children were to be sensitized to the different effects of narration and gameplay. The anchor point was the mythical figure of the Minotaur: The question of whether and from where the children knew the famous hybrid creature from Greek mythology was aimed at finding out how mental models and processes of understanding manifest themselves in our minds across generations via transmedially mediated figures that have been an integral part of Western culture for several thousand years—whether as a literary figure or ornament on an ancient artifact, as a book illustration, feature film or cartoon character, or as a character in a computer game.

The question of transmedial (game) figures like the Minotaur finally led to questions about how to adapt the narrative text into a game text and, thus, into spatial concepts of playing—a topic that we treated with the motif of the labyrinth. As "media of decision making,"[25] labyrinths are particularly well suited for investigating the effects of designing readable game spaces—which in turn provided the link to the construction toy Lego. In this way, the children were able to experience how brick constructions can be transformed into spatial options for action and play architectures. The extent to which a narrative leitmotif and plot element—escape from a labyrinth against the backdrop of the threat of a mythical

23 Frasca, Gonzalo: "Ludologists Love Stories, too: Notes from a Debate That Never Took Place," in: *DiGRA 03—Proceedings of the 2003 DiGRA International Conference: Level Up*, http://www.digra.org/digital-library/publications/ludologists-love-stories-too-notes-from-a-debate-that-never-took-place/

24 Jenkins, Henry: "Game Design as Narrative Architecture," in: Wardrip-Fruin, Noah/Harrigan Pat/Crumpton, Michael (eds.), *First person: New media as story, performance, and game,* Cambridge: Mass, The MIT Press, 2004, pp.118-130, here p. 118.

25 Nohr, Rolf F.: "The Labyrinth. Digital Games as Media of Decision-Making," in: Bonner, Marc (ed.), Game | World | Architectonics: Transdisciplinary Approaches on Structures and Mechanics, Levels and Spaces, Aesthetics and Perception, Heidelberg: Heidelberg University Publishing 2021, pp. 133-149.

monster—can be translated into a game mechanic is demonstrated by the board game LEGO MINOTAUR.

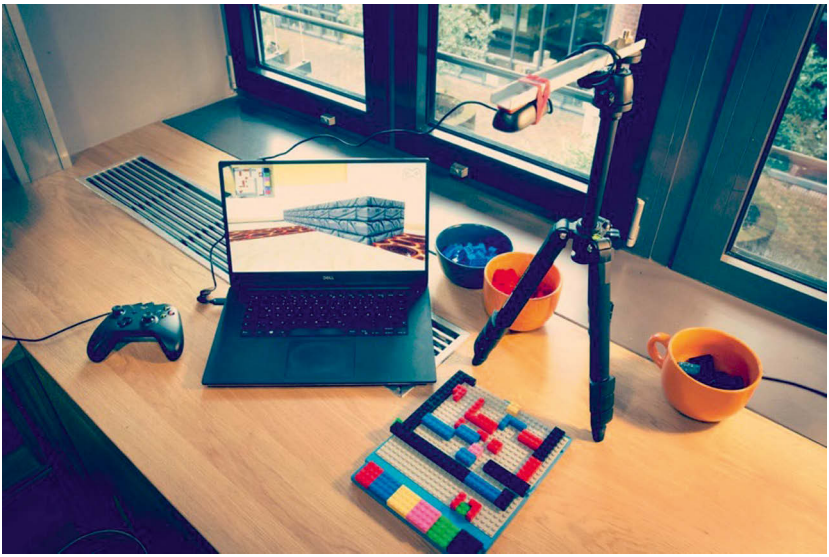
Officially licensed by the Danish toy company, LEGO MINOTAUR is reminiscent of the classic German board game MENSCH, ÄRGERE DICH NICHT. Here, players must try to reach the exit of the labyrinth without getting caught by the creature. The special feature of the board game: the labyrinth, the figures, and the dice can be easily modified to suit the children's own wishes, as the entire game is made of interlocking bricks. Hence, the children were given a separate work assignment: They were to come up with a new rule for the board if they got a certain result on the dice. Such modifications could represent, for example, doubling the number value per dice roll, which sped up the game enormously, or collecting power-ups to gain the ability to jump over certain structures. By applying these changes and inventing new rules, the children themselves became (analog) game designers, which fostered their understanding of the effects and meanings of their creations and helped them acquire a sensitivity for 'producing meaning in the semiotic domain of games.' Such prototyping is a popular exercise among professional game designers (mostly done with paper and cardboard) because it trains to balance the mechanics with varying degrees of influence on the game experience; here, in addition to the interplay of board architecture and the game rules. This exercise also focuses attention on components of social interaction (articulation skills to explain abstract rules, agreement on a 'good' rule change, renegotiation when game rules are not clearly defined, and so on).

Focus 2: From the Analog to the Digital Labyrinth

With this knowledge of the textual, game-mechanical translation of a narrative leitmotif through a free construction toy, we moved from the analog board game labyrinth to the digital labyrinth in the third workshop unit. Here we used our own software and hardware prototype.

The prototype initially developed by Dario D'Ambra (and later improved by Cordula Heithausen) was intended to enable players to build their own level architecture and to define their own game objectives by choosing the corresponding brick color. When a brick of a certain color is placed on a tile of the base plate and recognized by the webcam, certain objects with specific functions are created in the game world: Black bricks build walls, blue bricks create water, red bricks create lava, and the gray tiles represent the walkable base area. In addition, start and finish portals can be applied. The constructions were scanned with a simple, self-made device for image recognition via webcam and the Unity plug-in Open CV and then transferred in real-time to the game world based on the Unity game engine.

Figure 6: the augmented reality prototype A MAZE IN TILES (Dario D'Ambra)



Source: Photo by H. Fischer/TH Köln

Here, the children were put in teams to play the roles of the Greek master architect Daidalos and his son, Ikaros, to build a new labyrinth using the AR Editor Game and try out how fast to find the exit. This was preceded by a brief explanation: What exactly does Augmented Reality mean? What's the deal with the Lego plate made by the 3D printer? How does the image recognition via webcam and the color-coded bricks work? Can the bricks be understood as a visualized 'code'?

At this point, we talked about the similarities and differences between the board game and the digital game. The digital game space generated by our prototype is no longer explored from the allocentric map view from above—as in the MINOTAUR board game—but from the egocentric view, the first-person perspective, which requires a much more complex need for orientation and a cognitive readaptation to the controls. The level could also be changed dynamically during the course of the game: New elements could be added spontaneously, and children were able to repeatedly twist the nine tiles to be built. This not only created a strong physical involvement through the haptic experience of the Lego bricks but also an additional dynamic in the gameplay as well as the need for social agreements beyond the code of the digital game.

After completing the construction, the teams rotated to the other stations set up in the workshop to face the challenges of the other participants. Afterward, they

reflected on the characteristics of each level in a short feedback session: What worked particularly well? What didn't work well? Where was potential for frustration?

Although the prototype worked relatively well 'under laboratory conditions,' it proved to be highly susceptible to interference and errors 'in the field.' Since image processing takes place in real-time and relies on good, uniform lighting conditions as well as precise alignment with the Lego base plate/tripod-webcam-construction, it was very sensitive to vibrations and disturbances. This was especially notable during our 'rehearsal' before the first workshop with children, at the visit to the A MAZE festival in Berlin 2019: At the game festival, we were given the opportunity to present the prototype to the walk-in audience in a casual atmosphere—unaware that we would be dealing with light from pink fluorescent tubes as the only light source. Since our webcam could not use manual white balancing for color correction, we had to make do with additional light sources at short notice. The fact that the presentation took place next to a DJ booth with stroboscopic lighting (as well as various dancing feet that shook the tripod) also made a flawless presentation visibly more difficult.

In order to solve the problem of vibration and light sensitivity, we had to include software-side improvements in addition to more stable hardware; for example, an auto-warping feature developed by Cordula Heithausen that automatically brings an image of the Lego board back into the correct position. But even after some short-term improvements to the prototype were added, it became clear in the first workshops shortly after the A MAZE festival that the children were much more exploratory than we had originally anticipated. Instead of relying on our instructions and designing game worlds within the given framework, they were much more likely to play with the technology itself—which in places led to involuntary mistakes. For example, the vibration-sensitive tripod and the webcam, which was responsible for the image recognition of the Lego board, were repeatedly moved during the construction process. Also, in response to our efforts to calibrate and readjust the image recognition software, the children quickly got into the backend of the software application on their own. Here, they tried out changing certain input values (such as color and light sensitivity) and 'hacking' them, so to speak. Playing with the technology was enormously appealing to the children but did not lead to a smoother process—neither within the application nor during the workshop phases. In this way, it became clear to us that, despite the improvements made, there was still much to be done.

After the third workshop phase, in which all teams were able to try out the respective levels and compare and improve them in free collaboration with each other, the supervisors and the participants met for a final feedback discussion to

exchange ideas about the workshop process. The material differences between physical and virtual construction were pointed out again, and the quality of the experience with the different tools was evaluated. Finally, the participants received a certificate and, as a small gift, some Lego tape that converts any surface to a Lego board. The certificate emphasized that they had done a great service to science with their participation in the workshop.

Findings from the Workshop I: Gender

The workshops that took place before the outbreak of the Covid-19 pandemic revealed several interesting findings. However, a first observation can be described even before the workshops took place. This concerns a gender aspect: Media psychological research already suggests that a larger proportion of gamers are male (as it is described as the so-called "gender gap" in media psychological game research)[26] , and media-critical studies show that Lego as a construction toy was marketed primarily to boys in recent past.[27] However, we were surprised to find that there was not a single girl among the registered participants of the first workshop. This aspect can possibly be attributed to gender stereotyping in education. However, we were also able to determine that this circumstance could be counteracted by opening up the program and waiving prior registration. Not only did we discover a passionate A MAZE IN TILES player in a six-year-old girl who was accompanied to the event by her father, who motivated her in a supportive way. The effect of building something physically and seeing it turned digital via augmented reality also exerts a considerable appeal beyond stereotypical, possibly uninviting gaming situations for the 'un-initiated,' arguably breaking down barriers and arousing curiosity to engage with new technologies in a playful, more welcoming way.

Findings from the Workshop II: Game Diversity and Media Literacy

Secondly, a closer look at the answers collected in the preliminary interviews and the pictures taken suggests that a culturally critical assumption about the supposed

26 Reineke, Leonard/Klein, Sina A.: "Game Studies und Medienpsychologie," in: Thon, Jan-Noël/Sachs-Hombach; Klaus (eds.): *Game Studies: Aktuelle Ansätze der Computerspielforschung*, Cologne: Herbert von Halem Verlag 2015, pp. 210-251.

27 Sarkeesian, Anita: "LEGO & Gender Part 1: Lego Friends/Lego & Gender Part 2: The Boys Club, " 2012, https://feministfrequency.com/tag/lego-friends/

dominance of digital games in children's rooms cannot be confirmed. On the contrary: Although computer games were mentioned, again and again, not only numerous board and card games were found alongside them, but also various types of sports. Furthermore, some children displayed a differentiated pattern of argumentation, which already suggests a very distinctive game literacy: When one participant was asked about the violent content of the game FORTNITE, he spoke placatingly about the fact that there was no killing at all in the game, but that the virtual avatar was "only shot back into the lobby" to wait for a new game round. This observation shows the extent to which ludic framing and diegetic in-game narration colors one's own gaming experience (as a competitive play between avatarial substitutes), and also demonstrates that a form of media criticism can already be pronounced at the age of 12—legitimizing one's own media use in front of supposed authority figures.

Findings from the Workshop III: The Role of the Game Material

In our feedback round, the children often reflected on the fact that building with your "hands, not with mouse and keyboard" presents direct haptic feedback, as opposed to "something digital that always works." Thus, a form of tacit knowledge about construction processes inscribes itself into the material experience, an implicit literacy for the possibility of the materials. In addition, we repeatedly observed the children experimenting with the hardware setup itself, trying to readjust the webcam as well as pushing the limits of image recognition. Interlocking bricks, as a constructionist building substance, provide a promising material foundation on which to build further, both literally and theoretically: Not only are the bricks intuitively graspable and immediately invite constructive play, but their geometric form and simple colorfulness make them quite suitable for prototyping game spaces as well as digital image recognition procedures. The interplay of material affordances, the intuitive invitation to play (something that, with Fromme and Könitz above, can also be understood as 'interaction-indicating potential' that only needs to be activated), as well as their possibility to merge with digital play worlds—all this points in many different promising directions that can be further explored both theoretically and empirically.

DARIO'S BOX

Since the Covid-19 virus outbreak prevented workshops from taking place during the project's 2020 run, we focused on implementing the idea of a protective casing

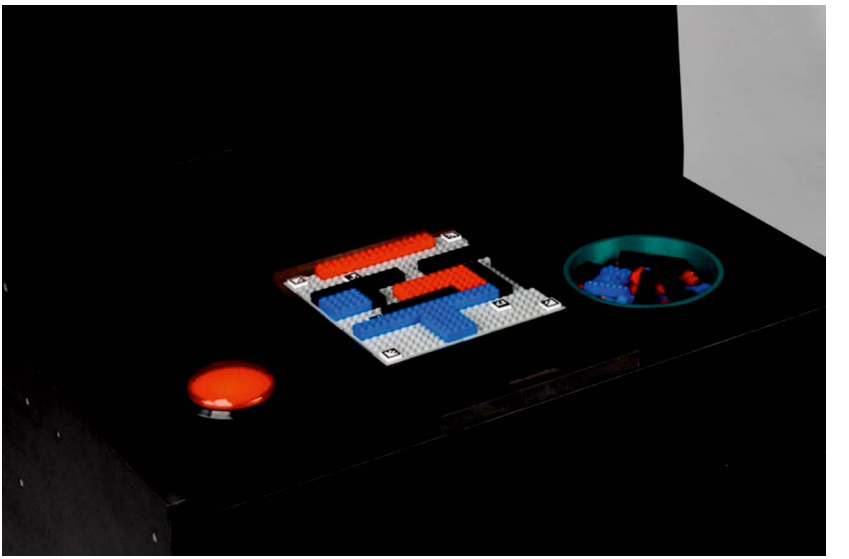
for our prototype during the initial stages of the pandemic, which always guaranteed consistent lighting conditions. It was designed by Kjell Wistoff and named DARIO'S BOX—in memory of our project collaborator, game designer, and programmer Dario D'Ambra, who passed away in 2020. Kjell Wistoff designed two boxes for us that echo the iconic design of classic arcade game cabinets—a reference to the formative early period of computer game culture.

Besides the design, two special features of the box are worth highlighting. Whereas conventional arcade cabinets only consist of a computing unit, a screen, a control unit, and a housing, DARIO'S BOX uses two screens. This makes it possible to bring two players into the game at the same time in two different roles: As a level architect and as a challenged player who has to find the exit of the maze (and, if agreed upon, achieve the highest possible high score by collecting collectibles). A child stands behind the box, constructs the maze on a Lego board, and then slides it into the box on a kind of 'disk' that resembles the module of an old game console.

Through the webcam inside the box, the software recognizes the building blocks and the arUco markers added by our programmer Cordula Heithausen. These markers made it possible to generate further power-ups in the game world. Again, this resembles the semiotic 'code' of the game, making the game space a readable artifact, a physical space manifesting itself in digital space on a materially assignable disk in the hands of the playing child. The textuality of the game is thus both on the level of architecture and the level of game mechanics, prompting the participants to learn to articulate themselves with the means of the game. Pressing the red button on the front of the box switches from building to playing mode, and the exploration of the labyrinth can begin.

It must be added, however, that at this point, the approach of using DARIO'S BOX, on the one hand, represents a considerable gain for the success of the workshops, but on the other hand, also entails a curtailment of another potential of the prototype. DARIO'S BOX is also a black box in the literal sense—and as such, it also prevents access to the configuration menu that the children had found by themselves in the previous version of the setup. While we can aim at a playful mediation of certain aspects of game literacy and are now able to ensure a more seamless course of the program, the application of the box, however, eliminates a dimension of meaning that can be brought to the notion of "gaming literacy" by Eric Zimmerman.

Figures 7 and 8: Front and back of DARIO'S BOX. Design: Kjell Wistoff; DARIO'S BOX (detail)



Source: Photos by H. Freres

Here, Zimmerman is already playing a game on the level of the terminology itself: He uses the two notions to denote a view behind systemic processes and their appropriation through play. By focusing not on game literacy but on gaming the particular systemic literacies that shape our modern lives, he describes gaming literacy as the act of

"exploiting or taking clever advantage of something. Gaming a system, means finding hidden shortcuts and cheats, and bending and modifying rules in order to move through the system more efficiently—perhaps to misbehave, perhaps to change that system for the better."[28]

In order to maintain this experimental, open dimension of playing with systemic processes in the game itself, it would be conceivable to use two hardware setups in future workshops—the tripod design described above as well as the closed solution with DARIO'S BOX.

OUTLOOK: POSTDIGITAL BUILDING BLOCKS OF GAME LITERACIES—IN THE DISTORTION MIRROR OF PARTICIPATORY CULTURE

Felix Cramer describes the term "postdigital" ("a term that sucks but is useful")[29] as:

"either a contemporary disenchantment with digital information systems and media gadgets, or [as] a period in which our fascination with these systems and gadgets has become historical—just like the dot-com age ultimately became historical in the 2013 novels of Thomas Pynchon and Dave Eggers."[30]

Cramer's diagnosis that a post-digital mindset fundamentally rejects the idea of digital technologies as an "all-purpose form of information processing"[31] finds

28 Zimmerman, Eric: "Gaming Literacy. Game Design as a Model for Literacy in the Twenty-First Century," in: Bernard; Wolf Perron, Mark J. P. (eds.): *The Video Game Theory Reader 2*, New York: Routledge 2008, pp. 23-31; here p. 25.

29 Cramer, Florian: "What Is 'Post-Digital'?" *APRJA* 3, no. 1 (2014), pp. 10-24, here p. 12.

30 Ibid.

31 Ibid, p. 16.

articulation in our workshop concept and our AR prototype: It is not exclusively about digital game design but also about how analog building blocks of a playful, haptic construction activity merge with digital building blocks to reveal tangible insights.

However, with the results brought to light here, we are admittedly only scratching the surface of a project that needs to be much broader and more broadly defined to bring together the dense interlockings of materiality, literacy, text, and context in a transdisciplinary investigation. For example, contexts mentioned in the introduction, which have a particular impact on the readability of (Dark) Design Patterns, could not (yet) be considered within the duration of our project. Further follow-up questions also refer to aspects of performativity—after all, computer games are not static artifacts that, like literary works on bookshelves, patiently wait for the knowledgeable exegete to reveal their meaning in an eloquent hermeneutic act but are rather 'living' texts—not only on the level of interpretation and interpretative context but also on the level of playful access and constantly updated software, which is often continued and monetized by DLCs or within serial seasons as a prolonged service.[32]

Last but not least, the aspect of game literacy as the key competence described by Bogost must be emphasized once again. This concerns, above all, the ability to recognize ludic patterns and ludic structures in areas that are not labeled as games per se. Different game literacies are, once again, important building blocks in media education not only because the complexity and diversity of the subject matter present us with interpretive challenges and raise aesthetic and theoretical questions but also because a form of hyperliteracy on the part of certain actors enables forms

32 The three examples from the beginning of the text could be supplemented here: A game like ELDEN RING (2022) develops its own design language within the game text itself, which must be painfully learned to read in order to successfully advance. Within its particular context, it has formed an elitist, rather non-inclusionary culture of veteran players. However, a look at the career of the enormously popular online player "Let Me Solo Her," who has made it his task to support other players in defeating a particularly difficult boss enemy (while only being dressed in nothing but a jug on his head), shows that it would be too short-sighted to consider only the 'readability' of a plain textual level of a game as the sole and universal key to the unfolding of a game's meaning. Winslow, Jeremy: "True Elden Ring Lord Let Me Solo Her Kills Malenia 1,000 Times," Kotaku (2022), https://kotaku.com/elden-ring-let-me-solo-her-klein-tsuboi-1000-malenia-yo-1848911945. For other important preconditions about player's performability and the interplay of accessibility and disability, see Markus Spöhrer's contribution within this volume.

of participation that can have (sometimes serious) consequences for less literate individuals and populations. Thus, specialized literacies of games (and types of play, for that matter) can also be read as catalysts for certain forms of participatory culture that encourage and drive perplexing, sometimes questionable, and even toxic behaviors. This is reflected not only in (playful) conspiracies to manipulate stock market trades on Reddit (WallstreetBets)[33] and to drive the prices within cryptocurrency trades but also in communities that engage in political play with anti-democratic tendencies (such as the mentioned GamerGate movement, which is often interpreted as a petri dish for fascist movements.)

These developments undoubtedly have ludic structures but have long since moved beyond the semi-permeable—if not porous—confines of the metaphorical magic circle of game spaces into other areas of our culture. Game literacy is also a form of cultural participation—and sometimes unfolds in a distortion mirror, which will continue to confront us not only with playful phenomena but also with social challenges.

LITERATURE

Bogost, Ian: "The Rhetoric of Video Games," in: Salen, Katie (ed.), *The Ecology of Games: Connecting Youth, Games, and Learning*, Cambridge, MA: The MIT Press 2008, pp. 117-140.

Cramer, Florian: "What Is 'Post-Digital'?" *APRJA 3*, no. 1 (2014), pp. 10-24.

Frasca, Gonzalo. "Ludologists Love Stories, too: Notes from a Debate That Never Took Place," in: *DiGRA 03—Proceedings of the 2003 DiGRA International Conference: Level Up*, http://www.digra.org/digital-library/publications/ludologists-love-stories-too-notes-from-a-debate-that-never-took-place/

Fromme, Johannes/Könitz, Christopher: "Bildungspotenziale von Computerspielen—Überlegungen zur Analyse und bildungstheoretischen Einschätzung eines hybriden Medienphänomens," in: Marotzki, Winfried/Meder, Norbert (eds.), *Perspektiven der Medienbildung*, Wiesbaden: Springer 2014, pp. 235-286.

Gee, James Paul: *What Video Games Have to Teach Us about Learning and Literacy*, New York: Palgrave Macmillan 2007.

33 Sarlin, Jon: "Inside the Reddit Army That's Crushing Wall Street," in: CNN Business (2021), https://edition.cnn.com/2021/01/29/investing/wallstreetbets-reddit-culture/index.html

Gudjons, Herbert: *Handlungsorientiert lehren und lernen*, Bad Heilbrunn: Klinkhardt 2008.

Jenkins, Henry: "Game Design as Narrative Architecture," in: Wardrip-Fruin, Noah/Harrigan, Pat/Crumpton, Michael (eds.), *First person: New media as story, performance, and game*, Cambridge; Mass: The MIT Press 2004, pp. 118-130.

Jonas, Kristina/Fütterer, Marten: *My Video Game: konstruktionistisches Erfahrungslernen in der Schule; die Entwicklung von Computerspielen als Projektpraxis*, Stuttgart: Ibidem 2012.

Jonas, Kristina/Jonas, Marten: "My Video Game—Erstellung Digitaler Spiele in der Schule unter Berücksichtigung partizipativer Produktionsströmungen," in: Biermann, Ralf/Fromme, Johannes/Verständig Dan (eds.), *Partizipative Medienkulturen* Wiesbaden: Springer 2014, pp. 233-259.

Kopp-Schmidt, Gabriele: *Ikonographie und Ikonologie: eine Einführung*, Köln: Deubner 2004.

Kringiel, Danny: "Learning to Play: Video Game Literacy in the Classroom," in: Fromme, Johannes/Unger, Alexsander (eds.), *Computer Games and New Media Cultures*, Dordrecht: Springer 2012, pp. 633-646.

Museum of Modern Art: "Andrew Wyeth: Christina's World," in: *Museum of Modern Art*, https://www.moma.org/collection/works/78455

Myers, Maddy. "The Last of Us Part 2 Review," in: *Polygon* (2020), https://www.polygon.com/reviews/2020/6/12/21288535/the-last-of-us-part-2-review-ps4-naughty-dog-ellie-joel-violence

Nake, Frieder: "Das doppelte Bild," in: *Digitale Form: Bildwelten des Wissens. Kunsthistorisches Jahrbuch für Bildkritik 3*, no. 2 (2005), pp. 40-50.

Nohr, Rolf F.: "The Labyrinth. Digital Games as Media of Decision-Making," in: Bonner, Marc (ed.), *Game | World | Architectonics: Transdisciplinary Approaches on Structures and Mechanics, Levels and Spaces, Aesthetics and Perception*, Heidelberg: Heidelberg University Publishing 2021, pp. 133-149.

Panofsky, Erwin: "Ikonographie und Ikonologie," in: Kaemmerling, Ekkehard (ed.), *Bildende Kunst als Zeichensystem. Ikonographie und Ikonologie. Band 1: Theorien—Entwicklung—Probleme*, Köln: DuMont 1994, pp. 207-225.

Papert, Seymour: *The Children's Machine: Rethinking School in the Age of the Computer*, New York: Basic Books 1993.

Reineke, Leonard/Klein, Sina A.: "Game Studies und Medienpsychologie," in: Thon, Jan-Noël/Sachs-Hombach, Klaus (eds.), *Game Studies: Aktuelle Ansätze der Computerspielforschung*, Köln: Herbert von Halem Verlag 2015, pp. 210-251.

Romano, Aja. "What we still haven't learned from Gamergate," *Vox* (2021), https://www.vox.com/culture/2020/1/20/20808875/gamergate-lessons-cultural-impact-changes-harassment-laws

Sarkeesian, Anita: "LEGO & Gender Part 1: Lego Friends/Lego & Gender Part 2: The Boys Club," *Feminist Frequency* (2012), https://feministfrequency.com/tag/lego-friends/

Sarlin, Jon: "Inside the Reddit army that's crushing Wall Street," in: CNN Business (2021); https://edition.cnn.com/2021/01/29/investing/wallstreetbets-reddit-culture/index.html

Winslow, Jeremy: "True Elden Ring Lord Let Me Solo Her Kills Malenia 1,000 Times," *Kotaku* (2022), https://kotaku.com/elden-ring-let-me-solo-her-klein-tsuboi-1000-malenia-yo-1848911945

Zagal, José P./Björk, Staffan; Lewis, Chris: "Dark Patterns in the Design of Games," paper presented at the *Proceedings of the 8th International Conference on the Foundations of Digital Games* (FDG 2013), Chania, Crete, Greece, 2013.

Zimmerman, Eric: "Gaming Literacy. Game Design as a Model for Literacy in the Twenty-First Century," in: Perron, Bernard/Wolf, Mark J.P. (eds.), *The Video Game Theory Reader 2*, New York: Routledge 2008, pp. 23-31.

GAMEOGRAPHY

A MAZE IN TILES (Cologne Game Lab 2000, O: Cologne Game Labb)

BABA IS YOU (Hempuli 2019, O: Hempuli)

ELDEN RING (From Software 2022, O: From Software)

GOD OF WAR: RAGNARÖK (Sony Santa Monica Studio 2022, O: Sony Computer Entertainment)

MAX PAYNE (Remedy Entertainment 2001/2018, O: Rockstar Games)

MAX PAYNE 2: THE FALL OF MAX PAYNE (Remedy Entertainment 2003, O: Rockstar Games)

THE LAST OF US PART II (Naughty Dog 2020, O: Sony Computer Entertainment)

TUNIC (Finji 2022, O: Finji)

UNPACKING (Witch Beam 2021, O: Witch Beam)