

## Article

# Peer Coaching to Reflect on Digital Games in Geography Lessons During the Debriefing

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**Abstract:** The present study investigates the influence of peer coaching on the depth of reflection on the content of digital games in geography education. The results show that the combination of a reflection diary and reflection coaching in the debriefing session significantly increases the depth of reflection at different levels. In particular, students were able to formulate more precise and critical statements at the level of comparison between the game world and reality, as well as at the level of self-reflection. Working in tandem and targeted questions from the trainers proved to be key success factors in promoting depth of reflection. The study shows the importance of combining written and oral reflection after using digital games and provides impetus for integrating digital games and reflection methods into the classroom.

**Keywords:** digital game-based learning; peer coaching; geography education; reflection diary; debriefing; reflection; debriefing

## 1. Introduction

The use of everyday media in the classroom could increase student engagement and motivation and promote meaningful learning (cf. Nascimento et al., 2023, p. 1). Today's generation, the so-called "digital natives", are particularly attracted to activities related to digital media, such as playing video games (cf. *ibid.*). The results of the JIM Study 2023 also show that German young people (12–19 years) are growing up in a mediated environment. Most of the households in which the young people were surveyed have smartphones (99%) and computers/laptops (99%) (cf. JIM, 2023, p. 5). Young people spend an average of 224 min a day online in their free time every day, and playing digital games is one of the most popular leisure activities (cf. *ibid.*, p. 23). The Bitkom study on children and young people (Bitkom Research, 2024, p. 5) found that 81% of the surveyed German children and young people between the ages of 10 and 18 use their smartphones to play games. The study of *Health Behaviour in School-Aged Children* (2024, p. 9), which is a large-scale school-based survey that collaborates with WHO-Europe at the national and international level, also shows that a third (34%) of young people play digital games every day, with more than one in five (22%) playing for at least four hours on gaming days. The three studies show that children and young people are very interested in digital games and that this could potentially be used for educational purposes. The "game-based learning" approach uses games in a school context to enhance learning. In this context, digital games are particularly suitable for geography education as they often deal with geographical issues such as climate change, resource use, urban planning or conflicts (cf. Lux & Budke, 2020). The use of digital games in the classroom can increase students' motivation to learn and teach complex skills and knowledge (cf. Reinders, 2017). Another study by Özhan and



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Kocadere (2020, p 1ff.), aimed to investigate the factors that influence academic success in a gamified online learning environment. The study shows that both flow state and emotional involvement play a crucial role in increasing motivation in a gamified online learning environment. Emotional involvement, which is characterised by attention, enjoyment and interest in the learning process, also had a positive effect on motivation. Other studies also show that the use of digital games has a positive effect on students' learning performance (cf. Su & Cheng, 2015; Mekler et al., 2013).

In addition, game-based learning also promotes strategic thinking and problem-solving (cf. Prensky, 2003). The study by Nascimento et al. (2023) shows positive learning effects. In the study, seventh-grade students in São Paulo were asked to build a sustainable city in a digital game, and the students showed a positive learning gain.

Whether the learning content of digital games is actually successful depends crucially on whether the game content is reflected upon by the players in the debriefing phase (cf. Garris et al., 2002, p. 454f.). In this context, a reflective debriefing of the game phase is indispensable (cf. e.g., Crookall, 2010, p. 90ff.; Kriz, 2010, p. 6ff.). In an earlier study we conducted (cf. Baßeng & Budke, 2023), we first examined students' reflection on digital games with geographical content without instructed debriefing.

It was found that students made only limited comparisons between game content and reality outside the game and that the potential of games for building content understanding was limited without guided reflection (cf. Baßeng & Budke, 2023). Based on these findings, a further study was developed in which game reflection was guided by a reflection diary (cf. Baßeng & Budke, 2024). In the third study presented below, the effects on students' game reflection are examined in combination with a reflection diary completed by students individually and interactive peer reflection coaching in pairs.

In recent years, the field of research on the use of digital games in education has intensively explored their potential as a learning medium. Numerous studies show the positive effects of digital games on learning motivation and knowledge acquisition (cf. Wouters et al., 2013; Papastergiou, 2009). Particularly in geography education, games such as SimCity or Cities: Skylines have proven to be valuable tools for making complex spatial processes tangible in a playful way and for promoting understanding of urban development, resource management and ecological contexts (cf. Gaber, 2007; Adams, 1998; Khan & Zhao, 2021).

A central research focus is on reflection as a key process in the learning process. The scientific discussion emphasises that the mere use of digital games is not enough to achieve sustainable learning outcomes. Rather, it is necessary to reflect on game content in a targeted way in order to transfer knowledge to real-life contexts. Crookall (2010) and Kriz (2010) emphasise that debriefing—the structured discussion of game experiences—plays an essential role in deepening learning processes. Without this focused reflection, there is a risk that learners will absorb only superficial content or adopt game mechanics uncritically (cf. Garris et al., 2002, p. 454 f.).

One of the major challenges in this area of research is the didactic integration of digital games in the classroom.

Therefore, a didactic method (reflection peer coaching) was developed and empirically tested for its effect on students' reflections on game content in geography classes. The study thus contributes to the further development of didactic methods for geography teaching and the use of digital learning tools.

The following research questions will be investigated:

- What influence does reflection coaching by students have on the depth of reflection on game content?

- Which interaction processes positively influence the reflection outcomes in relation to the content of digital games?
- How do students evaluate the method of peer reflection coaching?

In the following, the theoretical background is presented, followed by a detailed explanation of the methodology and research design. Finally, the results are presented and discussed, and an outlook is given.

## 2. Theoretical Basics

This chapter presents the state of research on the learning potential of digital games for reflection on digital games in the classroom, as well as on reflection-supportive teaching methods.

### 2.1. *The Potential of Digital Games in the Classroom*

Gee (2003, p. 1) emphasises that schools could learn a lot about effective learning from video games, as these games contain many proven learning principles that can be applied in the classroom, e.g., in science subjects. Digital games offer an effective way to engage students in broader learning processes. Children and young people today are accustomed to taking an active part in the media production process, which changes their role from passive consumers to active participants in the information and knowledge society (cf. Mitgutsch & Wagner, 2009, p. 3). The pilot project “Didactic Scenarios of Digital Games Based Learning” showed that teachers have a positive attitude towards the use of computer games in the classroom because they motivate students. In addition, the teachers interviewed who had previously used computer games in the classroom emphasised the enormous achievements of the learners in terms of their creative and independent handling of knowledge (cf. *ibid.*, p. 28; see also Gee, 2008, p. 34). Furthermore, the pilot project showed that the use of digital games in combination with didactic concepts and instructions is important to achieve a learning effect (cf. *ibid.*, p. 29).

It is high time to focus on computer games in terms of their educational value and the associated gain in knowledge and skills (cf. Zielinski et al., 2017, p. 7). The focus should be on process- and outcome-oriented, critical and creative learning (cf. KMK, 2016, p. 13). The practical research project “Learning by Playing—Computer Games as a Vehicle for Knowledge Transfer in School Education” investigated why digital games are rarely used in the classroom despite their proven added value. In workshops with experts, teachers and students, success factors and limitations of the use of entertainment-oriented computer games for knowledge transfer in the school context were analysed, and challenges were identified (cf. Zielinski et al., 2017, p. 12). The research project showed that the use of games in schools contributed to the development of students’ self-competence, e.g., by increasing their frustration tolerance and self-reflection. It also promoted social skills such as communication and teamwork, as well as methodological skills such as spatial, tactical, and logical thinking (cf. *ibid.*). In addition to these skills, subject knowledge, for example, in geography, was also taught intensively (cf. *ibid.*). Gee (2008) emphasises that students can fail in games, but there is the possibility of repeating game sequences. Pupils thus learn from their actions in the game and can derive new action strategies from them (cf. Gee, 2008, p. 34).

Gee also emphasises that deeper learning is inextricably linked to a sense of ownership and agency. Equally important is the ability to produce, rather than passively consume, as is often the case in everyday school life (cf. *ibid.* p. 35). A study by Kebritchi et al. (2010), which investigated the effects of computer games on students’ performance and motivation in mathematics classes, also showed that playing mathematics computer games improved students’ understanding of the subject. In addition, the teachers who conducted the study

stated that games are effective teaching and learning tools because they are experiential in nature, combining learning with fun, and because they offer an alternative to everyday teaching (see p. 436). Digital games are, therefore, suitable for combining emotions with problem-solving (cf. [Gee, 2008](#), p. 35).

Video games are valuable tools for teaching geography, but it is particularly important that their content is critically reflected upon before they are used in the classroom ([Morawski & Wolff-Seidel, 2023](#)). Before games are used in a school context, they need to be critically evaluated in terms of quality, pedagogical value and appropriateness ([Derevensky et al., 2019](#)). [Jolly and Budke \(2023\)](#) also investigated the extent to which players can build sustainable cities in the urban planning simulation game 'Cities: Skylines'. They examined which sustainability principles were incorporated into the game mechanics.

The study shows that the game offers the potential for an action-oriented approach to sustainable urban development in geography education. While [Lux and Budke \(2022\)](#) highlight the potential of commercial digital games for teaching urban structures and processes as well as promoting media literacy, it remains unclear how exactly these games can be integrated into the classroom to ensure a sustained and reflective engagement with urban issues. While games can provide exciting and interactive learning experiences, the question arises as to how the skills acquired can be transferred to real-life situations (cf. [All et al., 2021](#)). It is, therefore, all the more important to create explicit links so that learners adapt their gaming experiences to reality (cf. *ibid*). This is precisely where our study comes in, as there is a lack of concrete empirical studies that investigate which methods and didactic approaches are most effective in embedding digital games in the classroom in a meaningful way, in optimising students' learning outcomes, and in reflecting on the learning content in the game in debriefing.

## 2.2. Reflection on Digital Games

As already mentioned, reflection after using a digital game in class is essential during debriefing in order to deepen the learning effect.

According to [Dewey \(2015\)](#), the concept of reflection can be divided into reflection on content and learning experiences and, according to [Schön \(1984\)](#), into reflection on one's own actions and the development of alternative actions. Furthermore, there is a distinction between the concepts of reflection and reflexivity ([Gryl, 2012](#)). This distinction is that reflection is at the level of the object, whereas reflexivity is at the level of one's own perspective and self-reflection. [Flavell \(1979\)](#) emphasises that reflection also promotes metacognitive awareness, i.e., the ability to reflect on one's own thinking, which is crucial for the further development of learning strategies and self-directed learning. [Moon \(1999\)](#) in her theoretical study states that reflection is a key component of learning, especially in the transformation of experience into knowledge. She clarifies that reflective learning enables learners to make connections between existing knowledge and new information, leading to a deeper understanding (p. 23f.). In their study, [Hatton and Smith \(1995\)](#) examined how reflection can be encouraged in pre-service teachers by analysing the written and oral reflections of pre-service teachers. The study emphasises the need for targeted support to guide teachers to higher levels of reflection (p. 33f.). By support, we mean targeted guidance to develop deeper reflection processes, e.g., feedback from mentors or lecturers, as well as exchanges with fellow students to promote higher levels of reflection. In general, it should be noted that most studies on reflection relate to teacher education (p. 33ff.).

However, it should be noted that reflection is essential to learning as it enables learners to analyse and draw conclusions from their experiences, leading to deeper understanding and sustained knowledge acquisition. [Dewey \(1933\)](#) emphasises that reflection is not just the processing of experiences, but an active process of thinking through which learners can

construct meaningful knowledge (p. 78). Reflection also makes connections between old and new knowledge, significantly improving the transfer of learning (Moon, 1999, p. 23ff.).

When it comes to digital games, learners need to reflect on the games. In the context of using digital games in geography education, the central importance of reflective debriefing is repeatedly emphasised (cf. Crookall, 2010, p. 90ff.; Kriz, 2010, p. 6ff.). Debriefing plays a crucial role in initiating learning processes and in analysing and questioning the digital game on different levels (cf. Van Eck, 2006, p. 24).

Debriefing is an essential part of experiential learning and plays a central role in the context of simulations and digital games. It enables learners to systematically reflect on their experiences, critically question them and transform them into deeper knowledge. Crookall (2010, p. 907) defines debriefing as a structured reflection process in which participants exchange and analyse their experiences in a discursive setting and derive further learning processes from them. Debriefing serves not only as a tool for reflection, but also as a crucial mechanism for learning transfer. By linking the insights gained in the game to real-life contexts, it supports a deeper engagement with the topics covered.

The methodological design of this process is particularly important to ensure that new content is sustainably integrated into existing knowledge structures. Scientific literature emphasises the importance of structured debriefing for learning success. So far, however, there is a lack of comprehensive empirical studies on which specific methods and approaches are most effective in promoting the learning process (cf. Reed, 2015, p. 543ff.). In a study on the importance of debriefing, Shinnick et al. (2011) found that while debriefing contributes to knowledge accumulation, further research is needed to make informed statements about the optimal design of such reflection phases.

Although debriefing plays a crucial role in simulation-based teaching and learning contexts, there is still a lack of clear concepts and standardised guidelines for optimal implementation. There is a risk that valuable learning opportunities will be missed. It is therefore necessary to develop tools that allow both objective feedback and effective collaboration between facilitators—such as teachers—and learners. Such tools should be based on empirical evidence and closely linked to the desired learning objectives in order to systematically improve the quality of debriefing (cf. Şahin & Başak, 2021, p. 346).

Structured debriefing not only promotes understanding and application of the knowledge acquired, but also helps to increase student motivation. Lux and Budke (2023) developed a “model of levels of reflection of digital games” (see Figure 1), which takes into account four central levels of reflection that should be addressed during debriefing.



**Figure 1.** Model of the levels of reflection on digital games that should be addressed during the debriefing (Lux & Budke, 2023, p. 194).

The following levels are considered: 1. Reflection of the system in the context of the game, 2. Reflection of the system in the context of the world outside the game 3. self-reflection and 4. reflection of the medium. With the help of the model (Figure 1), questions were developed for the method of peer reflection coaching, which was developed for the present study. The reflection diary was already used successfully in the previous study by [Baßeng and Budke \(2024\)](#). Implementing the reflection diary in the classroom yielded significantly better results in terms of reflection at all model levels than spontaneous reflection by students without instruction in the classroom ([Baßeng & Budke, 2024](#)).

### 2.3. Teaching Methods to Promote Reflection Skills: Reflection Diary and Peer Reflection Coaching

There are various methodological approaches to promoting reflection in the classroom, two of which we would like to present as examples. On the one hand there is the support of self-reflection through learning diaries, in which learning progress as well as thoughts and challenges are regularly recorded in a diary (cf. [Ziegler & Stoeger, 2010](#), p. 183ff), and on the other hand there is peer feedback, in which learners give each other feedback on tasks or projects (cf. [Nicol & Macfarlane-Dick, 2006](#), p. 199ff).

[Morawski and Budke \(2023\)](#) also mention the benefits of peer feedback. In general, it can be said that the peer tutoring/peer learning approach promotes not only learning but also social and communicative skills (see e.g., [Topping, 2005](#); [Goodlad & Hirst, 1989](#)). [Topping \(2005\)](#) emphasises that peer learning has positive effects on motivation, self-confidence and achievement, especially when pupils are actively involved in the learning process.

As the literature shows, there are some teaching methods that have been shown to support learning. So far, however, these methods have not been investigated in terms of promoting students' reflective skills in the context of debriefing digital games. In the latest study by [Baßeng and Budke \(2024\)](#), the method of reflection diaries was found to be particularly effective. Promoting reflection and reflexivity in geography classes is a central didactic challenge that requires specific methodological approaches. The aim is not only to enable students to engage with geographical topics in terms of content, but also to encourage them to critically question their own cognitive processes and decision-making strategies. An established tool to support this process is the use of learning diaries. By continuously documenting thoughts, insights and learning progress in writing, they provide a structured opportunity for in-depth reflection, which can be used to specifically promote metacognitive skills (cf. [Schäfer et al., 2012](#)).

Promoting reflection and reflexivity in geography education is a key didactic challenge that requires specific methodological approaches. The aim is not only to enable students to engage with geographical topics, but also to encourage them to critically question their own cognitive processes and decision-making strategies. An established tool to support this process is the use of learning diaries. By continuously documenting thoughts, insights and learning progress in writing, they provide a structured opportunity for in-depth reflection that can be used to specifically promote metacognitive skills (cf. [Schäfer et al., 2012](#)).

The reflection diary is based on the learning diary method known from higher education (cf. e.g., [Borsch & Imhof, 2006](#); [Berthold et al., 2007](#); [Schäfer et al., 2012](#)). The questions that guided the students' reflections in the reflection diary were derived from the model of [Lux and Budke \(2023\)](#). With the help of the reflection diary, students should be able to reflect on the game used in class. The results show that the use of a reflection diary improves students' reflection scores compared to unguided reflection ([Baßeng & Budke, 2024](#)).

The combination of teaching, game phases and the reflection diary created a learning arrangement that enabled in-depth reflection at different levels. The reflection diary method takes students out of their role as players and creates a critical distance to the game. At the same time, it helps them to analyse the game experience in a targeted way (see p. 1ff). In

the current study, we combined the individually completed reflection diary with the new cooperative method of peer reflection coaching in order to achieve even deeper reflection on the part of the learners.

We combined peer feedback approaches with aspects of coaching. The term ‘coaching’ is very broad and can be understood in different ways. In this paper we refer to the following assumption of the definition: that coaching is a consultative and supportive process (cf. Greif, 2008, p. 4). König and Volmer (2019) also present expert coaching. The aim is for the coach to provide suggestions for problem solving as an expert (see p. 13). It is important to note that the term coaching comes from the world of work and that employees can be coached to optimise their working methods. We have adapted the term from the world of work to the world of education.

In the present study, we developed and empirically tested the teaching method of peer reflection coaching. The term “reflection coach” refers to a person who helps his tandem partner to reflect on game decisions, for example, by asking targeted questions. Using an interview guide (see Table 1), the reflection coach ensures that the partner explains and justifies his or her actions and decisions in detail. Both participants alternate between the roles of coach and partner, so that each has the opportunity to reflect on the game and their own actions, and to benefit from the coach’s questions.

**Table 1.** Selected questions from the interview guide for peer coaching on the basis of the reflection model (Lux & Budke, 2023)—(own representation, 2024).

Model Level	Selected Questions from the Interview Guide for Peer Coaching
Reflection of the system in the context of the game	<i>Tell me how the game works. What do you have to watch out for?</i>
Reflection of the system in the context of the world outside the game	<i>Are there any (structural) limitations in reality? Which ones?</i>
Self reflection	<i>Describe your qualities as a player and as a student. How do they differ?</i>
reflection on the medium	<i>How did the game contribute to a better understanding of urban planning?</i>

### 3. Methods

#### 3.1. Design-Based Research

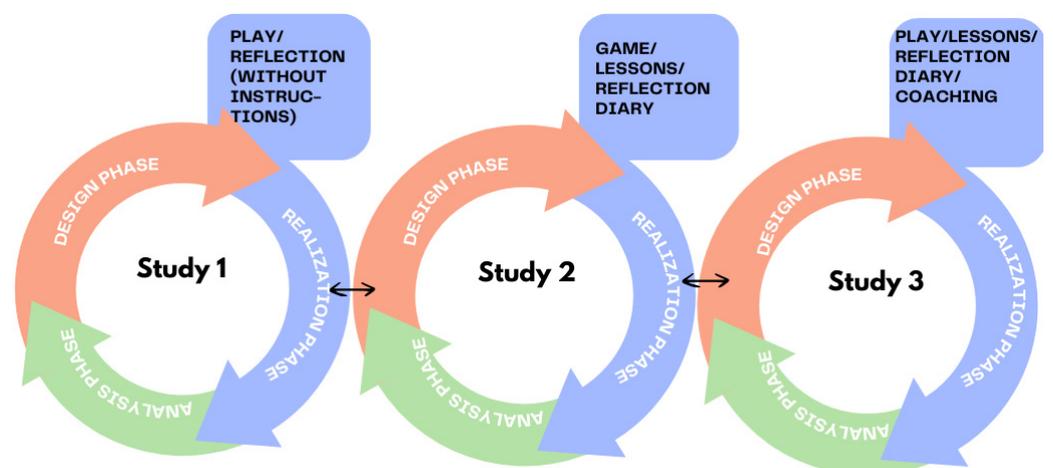
The study presented here was conducted using the design-based research (DBR) approach. The focus of this article is on the third design cycle. In education, design-based research is a research approach that uses iterative designs to generate knowledge and improve educational practice (cf. Armstrong et al., n.d., p. 37). Proponents of DBR (see The Design-Based Research Collective, 2003, p. 6) emphasise that educational research is often seen as too detached from practice. It is therefore important that theory and practice are not developed separately but in combination. There is a need for new research approaches that specifically address practical problems (see National Research Council, 2002). The aim of the DBR approach is to provide solutions to problems in educational practice and to develop theories that are useful for practice, while at the same time increasing scientific knowledge about learning and teaching (cf. Reinmann, 2005, p. 62).

Studying both the design of an intervention and its specific implementation as a research object can provide comprehensive explanations of innovative practices and fundamental principles (see The Design-Based Research Collective, 2003, p. 12). Knowledge is developed through collaborative and iterative research processes. Knowledge is thus

divided into two categories: tangible and practical outcomes on the one hand, and theoretical outcomes on the other (cf. [Armstrong et al., n.d.](#), p. 39). With each cycle, the researchers revise and deepen their intervention, thus creating an iterative process and developing knowledge (cf. *ibid.*, p. 39 ff.). This methodological framework is particularly suitable for didactic research to bridge the gap between theory and practice (cf. [Feulner et al., 2021](#)). DBR studies address problems in school practice and the lack of guidelines for teaching and learning processes (cf. [Kelly, 2013](#), p. 137). According to [Euler \(2014\)](#), the problem specification (specification—precise and detailed definition of requirements, objectives and frameworks in the educational process) has to be considered from two perspectives: from an academic point of view, the central contribution lies in identifying relevant theories and integrating them into the research process. From a practical point of view, this involves understanding the framework conditions for the development of innovative solutions and making use of existing experiential knowledge (see p. 24). In summary, the design-based research (DBR) approach combines theoretical research with practical intervention studies to improve educational processes in real-world settings. DBR is based on the development, implementation, and evaluation of learning environments to link theory and practice in education (cf. [Anderson & Shattuck, 2012](#), p. 16). It involves multiple cycles of design, analysis and adaptation to achieve continuous improvement (cf. [Barab & Squire, 2004](#), p. 3).

[Feulner et al. \(2021\)](#) refer to three steps in linking theory and classroom practice (p. 22): 1. Explication of the initial problem (problem analysis in both practical and theoretical terms), 2. Design cycles (design, implementation, and analysis phases), 3. Transfer of project results into practice (findings in relation to practice and theory).

Figure 2 below shows how our studies relate to each other. Study 1 ([Baßeng & Budke, 2023](#)), in which students' reflection on a digital game was investigated without teacher guidance and classroom discussion, Study 2 ([Baßeng & Budke, 2024](#)), in which game reflection was supported by a reflection diary, and the study described here, in which game reflection was supported by the method of reflection coaching in addition to the reflection diary. In the design phase, the intervention is developed on the basis of theoretical knowledge and practical requirements (see Figure 2). The intervention is then implemented in the school, i.e., it is used in a real educational environment during the implementation phase. In the analysis phase, data are collected and analysed, and the design is critically evaluated and subsequently adapted. These phases have been repeated in our three studies, so that with the help of the DBR we have now obtained practical and theoretical results that can be applied in a school context.



**Figure 2.** Research design of the studies—(own presentation, 2024).

### 3.2. Research Design in the Third Research Cycle

The research design of the third research cycle extends the research methodology used in the two previous cycles (cf. Baßeng & Budke, 2023, 2024) (see Figure 3). It can be seen that the studies have been continuously developed using the BDR approach. In the present study, cooperative peer coaching was implemented as a new method.

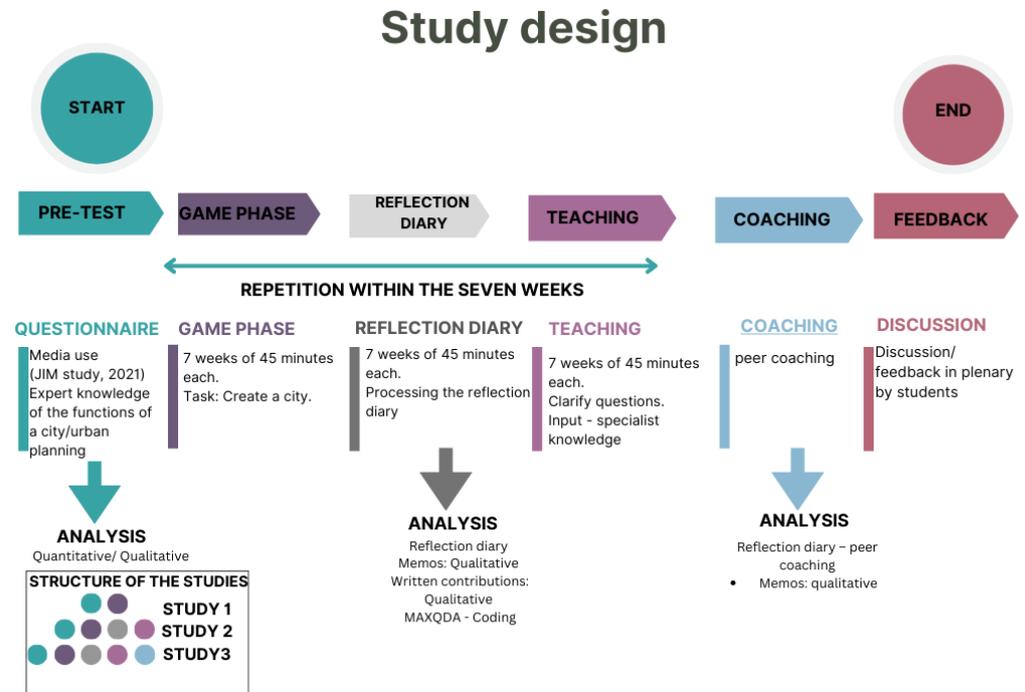


Figure 3. Study design 3 (own illustration).

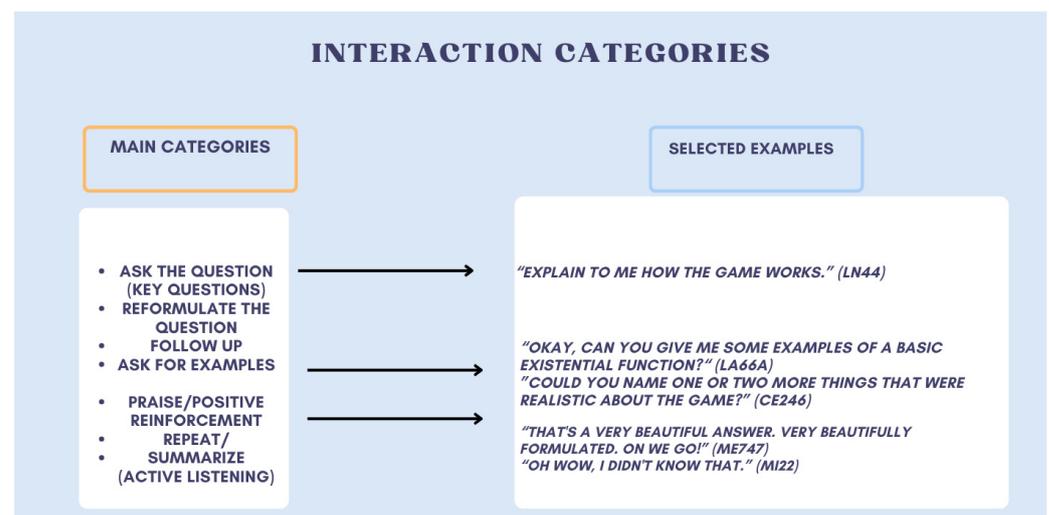
In the first step, the students completed a pre-test to determine their media device equipment and to assess their knowledge and experience with games. This was followed by a 45-min gaming phase. The students were given the task of building a city using the commercial city-building game PocketCity. This was followed by a 45-min teaching phase to clarify questions and ambiguities and to impart specialist knowledge. Students also had time to complete the reflection diary in detail. Again, students had the opportunity to ask questions and clarify uncertainties. These teaching phases were alternated over a period of seven weeks. The new method of reflection coaching was then implemented. The tandem task was carried out with one student taking the role of reflection coach and the other taking the role of tandem partner. These roles alternated so that each student was a reflection coach and was coached once. The reflection coaches were given a set of interview questions to ask during the coaching session (see Table 1). The students had already completed these questions individually while working on the reflection diary, which should allow for a comparison between the two methods. The questions ensured that each tandem asked the same questions and that the results were comparable. The coaching served to enable the tandem partner to reflect more deeply on the game or the questions/game mechanics and to justify his/her answers. For example, the coach helped to explain the answers given in more detail. At the end of the study there was a plenary reflection on the study project.

### 3.3. Participants and Selection of the Game

A total of 28 students, 14 female and 14 male, participated in this study. All 28 students were in the 9th grade of a public secondary school in North Rhine-Westphalia (Germany) and formed a natural class. The students were between 14 and 17 years old. We conducted a pre-test to assess their prior knowledge, their experience with digital games and their

digital equipment, but also to examine the comparability of the subjects' prerequisites with those of previous studies (cf. Baßeng & Budke, 2023, 2024). Based on the evaluation of the pre-test, it can be seen that the students have similar characteristics in terms of socio-demographics, device equipment and media activity as the German participants in the JIM study (JIM = Jugend, Information, Medien, 2023) and the studies by Baßeng and Budke (2023, 2024), and thus represent an optimal comparison group. In the present study, care was also taken to ensure that the topic of the research project (urban development) was appropriate for the selected grade level. Based on the curriculum of the German state of North Rhine-Westphalia (see Ministry for Schools & Further Education of the State of North Rhine-Westphalia, 2011), the topics of mixed use, functional separation and basic functions were defined as the main subject areas.

The students played the commercial city-building game "PocketCity" (developed by Codebrew Games). The decision to play the commercial city-building game PocketCity was based on the fact that it is an easy to understand and less complex game. It was also the game chosen in the studies mentioned above. Changing the game does not therefore make sense, as this would make it impossible to compare and draw accurate conclusions. The city-building game is available as an app and can be easily installed on mobile phones and tablets. In PocketCity, students have to build a city and take on the role of the mayor. For example, they have to take care of the satisfaction of the population and the different zones of a city. If the students meet the requirements, they can move on to the next level of the game and unlock additional features. The game was played over a period of seven weeks, with each week lasting 90 min (two class periods). After each phase of the game, students completed a reflection diary (see Figure 4). This was followed by peer reflection coaching. This new method is the focus of the present study.



**Figure 4.** Interaction categories during coaching with selected student responses—(own figure, 2024).

### 3.4. Evaluation

The pretest data were analysed using descriptive statistical methods. The analysis was carried out using the spreadsheet programme Excel. The voice recordings of the tandem work were transcribed. Subsequently, the transcripts and the written contributions from the reflection diaries were evaluated according to Mayring's (2010) qualitative content analysis. The evaluation categories of the reflection diary and the coaching were deductively derived using the model (see Figure 1). To ensure that no important information was lost, further inductive subcategories were created based on the empirical data. Finally, the data were screened again for relevant information, the individual and important information was assigned to the categories (coding) and all the collected data were summarised. To answer

the first question of the present study, we compare the results of the collaborative peer reflection coaching with the individually completed reflection diary. On the basis of this comparison, we would like to find out whether cooperative reflection coaching has a positive influence on the depth of reflection on the game content. The categories 'similar reflection aspects', 'less in coaching' and 'more in coaching' refer to the comparison between the reflection diary and the coaching. The category 'similar reflection aspects' means that there is no difference in the reflection aspects mentioned by the students between the two methods. This category includes statements that were identical/similar in coaching and in the reflection diary. "Less in coaching than in reflection diary" means that statements were recorded that were only made in the reflection diary and not in the coaching, and 'more in coaching than in reflection diary' means that responses were recorded that were only made in the coaching process and not in the reflection diary.

The second research question is "Which interaction processes have a positive influence on the reflection results regarding the content of digital games?" In order to answer this question, the interaction categories that were first deductively and then inductively derived from the data will be used in order not to lose any important information. The interaction categories are shown in Figure 4. Examples were chosen to illustrate how the coach approached his task and interacted with the person being coached.

To answer the final question of the study, "How do students evaluate the peer reflection coaching method", inductive categories were formed. Questions such as "Can digital games support the learning of subject knowledge? Justify your opinion"; "Do you find the tandem work helpful?"

## 4. Results

The results of the study are presented below, structured according to the research questions of this study. The results show that there was an overlap between the reflections in the reflection diary and during the coaching, with peer coaching producing significantly more aspects of reflection overall. It can therefore be assumed that peer coaching is a successful method.

### 4.1. What Influence Does Reflection Coaching of Students Have on the Depth of Reflection of the Game Content?

To answer this question, we compare the students' answers in the reflection diary with those given during the peer coaching. We evaluate this according to the categories described above.

#### 4.1.1. More Aspects of Reflection During Peer Coaching Than in the Reflection Diary

The evaluation shows that the majority of the subjects mentioned and evaluated more aspects of reflection during the cooperative peer coaching than in the written reflection diary. The following example shows that the answer given during the coaching was more reflective than the one in the reflection diary. During the coaching, the student mentions the advantages and disadvantages of segregating and mixing functions. He also justifies his decision in favour of functional separation by explaining how it contributes to the satisfaction of the citizens and to the creation of an idyllic living environment.

In contrast, in the reflective diary, the student gives only a superficial description of what he did in the city and what effects it had, e.g., how the separation of functions improved the satisfaction of the inhabitants. However, there is no further explanation of why these decisions were made or what negative effects were associated with them.

Question: Write down how you have implemented the mixing and separation of functions in your own city or in parts of your city. Justify your decision.

Answer from the reflection diary:

*“In my city, both are present. In some parts of the map, everything is separated from each other because it has increased the satisfaction of the inhabitants. But in the beginning I had all areas in one place. But as traffic became a big problem, I decided to rebuild everything. Although there was still some mixing, I always made sure there was enough green space and that the streets were separated. As a result, the satisfaction of the citizens is impeccable and more are coming” (ME474)*

Response during coaching:

Coach: *“And what other difficulties arise from a mix of functions, for example when you look at the environment?” (PI25)*

Coachee: *“Oh yes, of course. Actually, there aren’t that many difficulties because the distances are shorter. That means less CO<sub>2</sub>. But it is also possible that less attention is paid to green areas because there is less space. In fact, air pollution can also be a small problem, because industrial areas naturally produce a lot of CO<sub>2</sub>, which cars do not produce on short journeys. But of course that can also lead to air pollution. You also have to make sure that all houses are still connected to roads and motorways, so that you can still get into the city. A disadvantage of functional separation would be that you would have longer distances to go to leisure activities, for example to go to the cinema, to go out for dinner, etc.” (ME474)*

Coach: *“Okay, what function did you choose for your city? Explain.” (PI25)*

Coachee: *“I deliberately chose the separation of functions because I believe that this can promote a sense of idyll for the citizens. I have also made sure that there are enough green spaces and I have also put a very large lake in the middle of a residential area, so that people can of course go fishing or just enjoy it for the satisfaction of the citizens. However, there are still a few mixed functions in some corners. Unfortunately, this was unavoidable because the space available in the city was very limited. Still, I think the separation of functions is a better option for the game.” (ME474)*

During coaching, most students’ answers are much more reflective than in the reflection diary, because not only actions and results are described but also background, context and consequences are well thought out.

#### 4.1.2. Similar Aspects of Reflection in the Reflection Diary and During Coaching

In general it can be said that from time to time students’ answers/reflections could be found that were mentioned in a similar way both in the reflection diary and in the coaching. Similar answers were often found in response to the first questions in the reflection coaching. It can be assumed that the students first had to build trust and familiarise themselves with the coaching process.

The following example shows that the learner chose the same aspects for reflection as in the reflection diary and during the conversation with his reflection coach. In the reflection diary, the learner mentions that one obstacle is that in the game you can only build farms on earth. He also mentions this aspect during the coaching:

Coaching:

Coach’s question: *“Okay, great, next question. Were you restricted in your construction project in the game and how were you restricted?” (VA7)*

Coached answer: *“Yes, exactly. In fact, I was restricted a lot more than that. For example, a farm. We unlocked a farm by leveling up. I wanted to build it. Only then did I notice that it said that you absolutely needed soil. But I didn’t find any soil, and it took me a long time to find that soil” (AL342)*

This example shows that the learner was able to verbally express and explain his key points in the reflection diary. It is interesting to see that the person has understood the moderation of the player's possible choices in the game and the limitations in this respect.

#### 4.1.3. Fewer Aspects for Reflection in Coaching Than in Reflection Diary

There are only a few answers that were more detailed in the reflection diary than during the peer coaching.

The following example (see Table 2) shows that some answers in the reflection diary were still more detailed than during the peer coaching. During the coaching, the answers in the reflection diary are rather short and concise, in contrast to the spreadsheet completed by the student. She does not give specific examples or detailed descriptions of the basic functions of being. Instead, she simply states that she has considered these aspects, but does not explain them in more detail.

**Table 2.** Example answers from the reflection diary in table form (GO189).

What Have You Built?	Why?	What Basic Function?
Business parks Industrial area	So that every resident has a job and can earn money	Work Care for yourself
Hospitals Police Fire department	For the safety of the residents	Safety
Leisure facilities Beach, water park, park	pastime for the locals	Leisure Relax

Coaching Response:

Coach: *Okay, did you pay attention to your basic function when you built your city?* (LJ25)

Partner: *Yes, I did. I did, yeah, I actually paid attention.* (GO189)

#### 4.2. Which Interaction Processes Positively Influence the Reflection Results with Regard to the Content of Digital Games?

It is interesting to see how students interact with each other during reflection coaching. It should be noted that some students follow the guidelines very closely and read the questions from the interview guide. However, most of the learners have also specifically formulated questions. In the following example, the reflection coach refers specifically to the student's own experiences between the real and the digital world: "For example, what have you experienced yourself here in the real world?". The students who took on the role of reflection coach often adapted the given questions to their interaction partners:

Question from the interview guide: *"Can you tell me the differences between the digital game and the real world and explain them?"*

Question rephrased by the student during coaching: *"So, for example, what have you already experienced here in the real world that was easier in the game? Can you tell me something about that?"* (LJ25)

In another example, the reflection coach rephrases the question because the partner has difficulty understanding it.

The following example illustrates that the coach has understood the question, as he was not only able to reformulate it independently, but also adapted it for the tandem partner by simplifying the question, showing that he is responsive to his partner. In addition, the

reflection coach asks again specifically for self-reflection, as the partner only mentioned the characteristics as a player.

Extract from peer coaching interaction:

Coach: *"Name your characteristics as a player and as a student. How do they differ?"* (LJ25)

Coachee: *"I would say that I am very ambitious in the game, because for example I want to achieve something in my city. I want my citizens to be happy. So I'm very ambitious and I'm very motivated, I would say, to build things and to continue to build the city."* (GO189)

Coach: *"And as a student?"* (LJ25)

Coachee: *"As a student, I don't build a city."* (GO189)

Coach: *"But what is your motivation as a student?"* (LJ25)

Coachee: *"Oh yeah, I guess I'm a bit uninterested because I'm not really interested in games."* (LJ189)

Coach: *You're not much of a gamer.* (LJ25)

Coachee: *"Exactly. And when I'm in the middle of the game, when I'm playing it, then, as I said, I tend to be quite ambitious and want to achieve everything."* (GO189)

During each reflection coaching session, the coach asked specific follow-up/in-depth questions. This indicates that the coach understood the question well and had a certain expectation of the answer. The follow-up questions make it clear that the coach was not satisfied with the depth or reasoning of the answer received. The follow-up questions were always aimed at stimulating the tandem partner's reflection, which led to more specific answers. This can be seen in the following example:

Coachee: *"So a mix of functions is when you have commercial areas, residential areas and industrial areas all next to each other, close to each other."* (LN44)

Coach: *"I wouldn't say it like that.. try to explain a little bit more what you mean by 'next to each other.'"* (AG99)

Another example makes it clear that the coach expects an even more detailed answer. The coachee should respond in a more targeted way to an emergency call from the police or fire brigade. The coachee engages with the question and is able to give a more focused, in-depth and reflective answer about the game events and game mechanism:

Coach: *"Okay. When you built your city, did you pay attention to the basic functions of existence?"* (LA317)

Coachee: *"Yes, I paid attention to that. So I made sure that we had enough space to live and work. I also planted some small trees from time to time because I thought it was important for nature too. I have leisure activities for children, young and old. Which was a bit stupid. I think I was only able to build schools at level 30, universities were even later, and I was only able to "educate" myself at a later stage. But I also built farms, because that way you could support yourself. I also built some with pastures, and yes, I provided for the police. I provided for the fire brigade because the town I lived in always felt like it was on fire. I always have to make sure that I have enough firemen."* (LA66A)

Coach: *"Okay, was there ever a police or fire emergency where the fire brigade really had to come into the game?"* (LA317)

Coachee: *"Yes, I had a lot of emergencies. The police had to come a lot because of robberies. But they weren't that bad, I can tell you. Once there was a fire and the fire*

*brigade was too far away, in another corner, and then the fire spread a bit and a bigger part burned down. Now I have fire engines all over the place and they are quick because I have upgraded them all". (LA66A)*

It was rare for the coachee to ask questions of the coach. This suggests that the questions asked were clear and understandable. In general, learners only asked questions to make sure they had understood the question or to check the correctness of their answers, e.g., *"Was that right?" (GO189)*

In general, it can be said that the students who took on the role of coach were able to assess the quality of the answers and, if something was unclear, to ask for further examples in order to clarify the answers. All the coaches asked their tandem partners to give specific examples to support their reflections, e.g., *"Could you give one or two more things that were realistic about the game?" (CE246)*. In addition, some coaches use their own examples to make the question clearer and more comprehensible for their tandem partner, e.g., *"I've mentioned some with the nuclear power station, and now you just have to name something."* (LA68)

In some tandems it was clear that the coach was very good at supporting and motivating their partner. Many coaches encouraged their partner with short, positive feedback such as 'OK' or 'Very good', 'Oh wow, I didn't know that'. (MI22).

In many tandems, it was clear that coaches were actively listening to their partners by briefly summarising their responses. This promotes successful interaction between the coach and the tandem partner and trains cooperative skills. As a result, tandem partners become more confident in their answers and motivated to reflect more deeply, e.g., *"That's a very nice answer. Very well put. Let's move on."* (ME747) and *"OK, these are quite detailed answers. But that's very good."* (MV28).

The following example shows that the coach summarises everything:

*"Let's come to the end. Yes, just repeat everything briefly. Now, you have mentioned that you have a mix of functions in your city. You paid a lot of attention to the basic functions of existence. Then you described your role in the game and the differences and similarities between the digital and real world."* (LA68)

The coach evaluates the attention to the basic functions of existence with "you paid great attention to that" and also praises his tandem partner. The reflection coach can only come to this conclusion because he has actively listened to his partner. Through active listening he also shows interest in his partner, which is very motivating to continue working/talking. The results of reflection in relation to digital games are positively influenced by various interaction processes between coach and coachee. Coaches ask targeted questions, either taken from a guide or adapted to increase comprehensibility. Reflection is encouraged through follow-up questions and targeted exploration, leading to deeper answers and a better understanding of the game mechanics. Mutual exchange and active listening allow for a deeper exploration of the content and actions in the game. A higher motivation to learn can also be observed because the coach gives praise to the coachee, which encourages him to continue talking. In addition, two tandems stood out because of the formal use of the second person, which made it clear how seriously they took the teaching project and how much they identified with their assigned role. This formality was not imposed by the teacher. The formal address allowed the students to take on a new role and create a special setting for the conversation.

#### 4.3. How Do Students Rate the Reflection Coach Method?

In response to the question "Evaluation of the learning unit (game, lesson, reflection diary and reflection coach)—rate on a scale of 1–10 (1—not at all, 10—very good): How much did you enjoy the unit? All learners gave a score of 10. The learners gave the following reasons for the increased motivation during the unit *"Just learning with games is*

*much, much more motivating and you can learn much, much better with them” (AG99); “Well, I found the combination of the lessons and the game phase definitely very good because I was always motivated to attend the lessons. So I always had fun when I was playing and when I also, well, generally had these lessons because I was also really interested in this topic (CS40)”. In addition, many students praised the reflective coaching method. Students felt more confident with their partner because they had the opportunity to ask questions. Students also emphasised the added value of the reflection coaching method, in particular, the improved interaction fostered by discussions and the opportunity to ask specific questions. They also repeatedly emphasised that the exchange with their partners helped to consolidate their knowledge, e.g., “In my opinion the tandem work was very, very helpful because you can deepen all your opinions and knowledge with a partner and clarify problems again (FN26)”.*

In addition, partner work during the lesson using the reflective coach method provided a more lively and dynamic design, e.g., “Yes, I think that’s great. I’m a big fan of partner work because you can interact with a person and not just look at your sheet. It’s also more fun and you learn from each other (PI25)”.

It was also repeatedly emphasised that students were allowed to choose their own tandem partners in order to support each other and because they felt more comfortable with friends, e.g.,

*“It’s a good point to add to these game phases and group phases. Just because you have interaction with other players and probably also if you have a good friend that you spend a lot of time with. A shot like this makes you feel a lot safer and just interacting with other people is good for you. Yes, so I’d say that this tandem work was definitely helpful.” (NR155)*

In addition, the students mentioned the appropriate combination of game phase and teaching units. With the help of the game, the students were able to try out the knowledge they had acquired in the game. This helped to consolidate the knowledge as the game also helped to visualise the knowledge. In addition, the two examples below show that the learners can identify exactly what contributed to their learning success. They mention that the combination of teaching and playing contributed to the acquisition of knowledge and that the combination of theory (teaching) and playing is suitable for building subject knowledge. Time and again ‘trying things out’ is praised as a way of understanding theory.

*“My knowledge has definitely increased a lot. I know the basic functions of being, I know the separation and mixing of functions. That’s definitely a big step forward, I’d say, and we also played that on the tablet. That helped me to visualise it again. If we had just done it on the board, I might not have known exactly what it was. But because you could build it yourself and make your own decisions, it was presented even better and I think it is better stored in my head.” (CE246)*

All students in the study rated the reflection coach method very positively. The tandem work during the method was found to be helpful as it allowed the students to feel more confident in asking questions and to consolidate their knowledge through sharing. They also appreciated the choice of their tandem partner and emphasised that the combination of play, teaching and debriefing significantly supported their learning progress.

## 5. Discussion

The present study investigates the effect of the teaching method of reflection coaching on students’ reflective outcomes when debriefing digital games in the classroom. Debriefing is part of a process in which participants reflect on their experiences and share them with others in order to learn from them (cf. Crookall, 2023, p. 118). This means that students reflect on the content, challenges and learning aspects (cf. Schwägele et al., 2021, p. 3). The

results show that the combination of teaching phases, game phases, reflection diary and reflection coaching improved learners' ability to reflect at several levels. A key finding is the significant increase in the depth of reflection achieved through reflective coaching. Coaching, in general, aims to support individuals in developing their personal skills [...] by promoting reflection and personal responsibility (cf. Greif, 2008, p. 24 f.). As a result of the structured guidance provided by the coaches and the targeted questions based on the guiding questions provided, most students were able to provide more complex and precise answers than in the individually completed reflection diary. Especially at the second level of the model (see Figure 1). In particular, at the second level of the model (see Figure 1) (reflection on the system in the context of the world outside the game) and self-reflection (model level 3), well-founded statements were formulated, suggesting a critical examination of the game content and its transferability to the real world. At model level 2, the students analysed differences and similarities between the game world and reality in a very detailed and reflective way. They also reflected on the limitations of the game, such as unrealistic construction times or a lack of democratic processes. At model level 3 (self-reflection), learners were able to distinguish between their roles as players and as learners. If we compare the results of Baßeng and Budke (2024) on the reflection diary with the new results on the combined use of reflection diary and reflection coaching, it is clear that the depth of reflection could be increased, especially at model levels 2 and 3. The study by Baßeng and Budke (2024) already showed a significant increase in the depth of reflection through the use of the reflection diary, but the combination of teaching phases, game phases, reflection diary and the new method of reflection coaching helped to achieve a better depth of reflection.

The results suggest that a combination of both methods is ideal for addressing different learning and reflection styles and for promoting engagement with complex issues.

In addition, the interaction between students is highlighted as a positive influencing factor. The reflection coach had a very motivating influence on the coachee, for example by praising him or asking interested questions. This made the work in pairs even more intensive and familiar. The tandem work during the reflection coaching promoted not only the exchange of ideas, but also social skills such as communication and teamwork (cf. Traub, 2004).

The mutual interaction and collaborative nature of the reflection coaching created a supportive learning environment that promoted not only the depth of reflection but also the social and communication skills of the students. Key factors included adapting and flexing questions, asking targeted follow-up questions to deepen understanding, providing motivational feedback, active listening, and consciously shaping conversational roles. These processes led to students reflecting more deeply on the game content, providing more differentiated responses and making connections between the digital and real worlds. Thus, reflection coaching proved to be an effective method for strengthening critical engagement with complex content and enabling intensive reflection on game mechanisms.

The opportunity to choose their own tandem partner was perceived by learners as particularly motivating and confidence-building. This reinforces the cooperative learning method, which is recognised in the literature as an effective approach for promoting reflection processes (cf. Souvignier, 2007).

At the same time, the reflection diary provided a basis for reflection coaching, so that written and oral reflection could be effectively combined. The results show that the combination of a reflection diary and coaching is an effective methodological approach to promote depth of reflection and, thus, content learning among students. While the diary allows for a structured, written, personal engagement with the game content, cooperative peer coaching through targeted interaction ensures a dynamic and often deeper reflection.

The different results between the two methods suggest that different students benefit from different reflection formats. Some learners prefer the structured, written reflection in the reflection diary, while others are more activated by oral exchanges. Overall, the study provides important insights into the use of digital games in the classroom. Again, the design-based research approach is evident, as the studies we have conducted (cf. [Baßeng & Budke, 2023, 2024](#)) build on each other, and both practical and theory-based findings have been collected.

Despite the methodological strengths and positive study results, there are also limitations in the power of the results. Firstly, the sample size of this cycle is relatively small, at 28 students, which limits the generalisability of the results. Secondly, all participants were studied at a single school in North Rhine-Westphalia, which means that regional and socio-cultural influences could not be fully taken into account. A larger and more diverse sample would be needed to make well-founded statements for different educational settings, possibly also in an international context.

Another point concerns the method used: only one commercial digital city-building game was used in the classroom. Therefore, it remains unclear to what extent the results obtained are transferable to other types of games. Nevertheless, we assume that the methods developed are also applicable to other games, as they stimulate general reflection processes.

It should also be noted that this study has no explicit control groups to prove that reflection coaching and reflection diaries are more effective than other debriefing methods. However, we do compare our data with an earlier study (cf. [Baßeng & Budke, 2023](#)) that did not use either guided debriefing or guided instruction. In this first study, the focus was on learners' uninfluenced reflection based solely on their gaming experience during the gaming phase. However, by comparing the results of the two studies (cf. [Baßeng & Budke, 2023](#)), conclusions can be drawn about the effectiveness of the methods used, so that the available results can be related.

The categorisation of levels of reflection on game mechanics, content reflection, self-reflection and media reflection (cf. [Lux & Budke, 2023](#)) provides a differentiated view of reflection and is useful for analysing reflection processes during game debriefing.

However, we don't know exactly how these levels affect students' knowledge acquisition. We believe that the comparison of reality and the game at the second level of reflection during debriefing has a particularly strong influence on the learning effect, but this needs to be analysed further. Reflection is primarily seen as a cognitive process, while affective and motivational aspects, which could also have a significant influence on the depth of reflection, are less explored. The positive effects of peer coaching could be partly due to the social dynamics: the study shows that learners feel more comfortable and are more motivated to reflect when working in tandem. This is in line with findings from cooperative learning research (cf. [Topping, 2005](#)), according to which peer learning approaches are particularly effective through social support and mutual feedback. However, it remains unclear to what extent these effects depend on individual factors such as group dynamics, trust and language skills. Just as [Vergara et al. \(2023\)](#) analysed teacher player types, future studies could focus on learners to explore the influence of individual player profiles on digital game learning.

The study provides valuable insights into a debriefing method (peer coaching) that has been used successfully in geography classes and could be used effectively in other subjects.

The recommendation for school practice is to use reflective methods in debriefing that stimulate reflection at different levels, thus enabling personal development, strengthening media skills and deepening understanding of content. In addition, the increasing use of digital devices and the associated longer play times should be taken into account. However, in addition to the goal of using games to motivate understanding of classroom content, there

is also the possibility that the reflective skills developed through our methodology will be used by students when playing digital games in their free time. However, this needs to be investigated in further studies. In summary, the study shows that the methodological design has strengths, particularly through the design-based research approach, the systematic modelling of levels of reflection and the differentiated evaluation. However, the limited sample size and possible bias due to social dynamics should be critically noted. There are valuable insights for practitioners, while further research could focus on investigating the long-term effects of this method and developing further approaches to integrating reflection processes into debriefing.

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