

Chapter 2

Game-Based Learning in Economics Education at Upper Secondary Level: The Impact of Game Mechanics and Reflection on Students' Financial Literacy



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2.1 Introduction

Financial education is becoming increasingly important, especially for younger generations (Wuttke et al., 2016). One reason is a growing risk shift, stated from public institutions to private individuals, which is associated with greater personal responsibility for private provision (Hacker, 2019). Additionally, the growing number of atypical forms of employment requires a different form of security (Hermeier et al., 2019). In this regard, financial products offered for this purpose are becoming more complex and meet a lack of consumer sovereignty in financial markets (Kaiser & Lutter, 2015). Preparing young adults in schools for these dynamic challenges is increasingly necessary and therefore becomes an important educational goal at the upper secondary level.

One approach that offers great potential in promoting financial literacy is game-based learning (GBL) (Aprea et al., 2018). However, the wide range of digital and analog games available to promote financial literacy is contrasted by a research gap regarding their actual effectiveness. Although there are empirical indications of the general potential of GBL (Plass et al., 2019), it is unclear how this potential can be used for learning in this domain. The effective use of GBL to promote financial literacy, especially interest in this domain, is not a sure-fire success but depends on many aspects. These are grounded on theoretical considerations of the corresponding domain and the respective target group, in this case, students in upper secondary school who are about to graduate and start the next phase of their life, which for them entails greater economic responsibility (Förster et al., 2018). One approach to

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promoting the aspired educational goals is through the use of a serious game and its instructional framework. Game activities, which are primarily determined by game mechanics as well as reflection, are critical for learning gains (Pawar et al., 2019; Taub et al., 2019).

Against this background, the aims of the chapter are the presentation of a newly developed GBL environment—Moonshot—to promote the financial literacy of upper secondary students, its theoretical framework, and describe the research design of the empirical study in which the game will be implemented to assess the effects of GBL on financial literacy.

2.2 Theoretical Background

This section starts with a short definition of GBL and its essential elements—the game as a learning medium based on Mayer (2014) and instructional guiding through reflection according to Kolb and Kolb (2013), which is then explained and justified in more detail. Based on this, the diversity in the field of games is narrowed to serious games (Graesser, 2017), since one of the aims of this chapter is to present a game for learning purposes alone and one of its main building blocks “game mechanic” following Sicart (2008), which determines the main game activity and therefore is considered important for learning. Subsequently, it is explained how the use of GBL can contribute to fostering financial literacy in the context of financial education. A field with a long tradition of GBL applications but hardly any evidence. Finally, financial literacy as an important learning goal for students is legitimized and how it could be fostered, especially interest in this domain according to Krapp (2005). Interest has an important influence on the extent to which students also deal with the topic of finance in the future (Renninger & Hidi, 2016).

2.2.1 *Game-based Learning and the Meaning of Reflection*

The specific peculiarity of a game as a medium involves the combination of five characteristics: it is a rule-based simulative system that is responsive, cumulative, challenging, and inviting (Loh et al., 2015b; Mayer, 2014). There has been repeated reference to debriefing and instructional support so that GBL can reveal its promising effects as an experiential learning method (Crookall, 2015; Kerres et al., 2009; Kolb & Kolb, 2013; Taub et al., 2019).

To enable a transfer of the player’s world into reality, reflection phases or debriefings are of central importance (Crookall, 2015; Zumbach et al., 2020). Students reflect on the reasons for their playing behavior and their interaction and compare their game experience with their real life. The aim is to avoid misconceptions and to establish a connection with the students’ lives, especially to increase the

value-based valence for the game content as well as their self-efficacy in this domain (Krapp & Ryan, 2002; Ryan & Deci, 2000).

Reflection phases are an essential prerequisite for *deeper interpretative learning* (Kolb & Kolb, 2013). During reflection, students not only become aware of their metacognitive processes but also learn to regulate their cognition (Bräuer, 2016; Taub et al., 2019). This applies even more to GBL. While experiential learning theory (Kolb & Kolb, 2013) refers to general experience-based learning, reflection in GBL is meaningful on two levels. First and foremost, reflection on the game and playing behavior can improve players' success in the game. Beyond that, transfer into the real life of students is an important learning outcome (Ke, 2016). On the one hand, it is important to compare game behavior with behavior in certain real-life situations, especially when a serious game is supposed to model financial decision situations. The determinant bases that can be derived from this can be valuable for young people. On the other hand, it is also about reflecting the opportunities and limits of this complexity-reduced modeling through the game to prevent incorrect concepts with regard to economic relationships and to avoid biases (Büchler & Quarg, 2014; Lusardi & Mitchell, 2014). Although the importance of reflection, e.g., through prompts, is uncontroversial, it is still unclear how this can be used (e.g., in a generic or direct way) to promote learning in a given GBL setting (Taub et al., 2019; Zumbach et al., 2020).

2.2.2 *Serious Games and Game Mechanics*

While it is possible to use an off-the-shelf game for learning purposes, there are so-called serious games with a well-thought-out learning goal (Graesser, 2017), on which the design of game elements such as the design of incentives, identity design, narratives, or the selection and design of game mechanics (Pawar & Tam, 2019) is based. Because the focus in off-the-shelf games is entertainment and engagement, game elements are designed accordingly. In a serious game, entertaining elements can distract from the actual learning goal and therefore have to be avoided when they do not serve a specific learning purpose (Jacob & Teuteberg, 2017). In regard to investigating the effects of serious games, a value-added approach is preferred due to methodological and theoretical reasons (Loh et al., 2015a). In this case, the effects of a basic version of the game are compared with the effects of an extended version. The extended version includes an additional element, e.g., a game mechanic or a narrative (Mayer, 2014).

Game mechanics are the main building blocks of game activities (Plass et al., 2012; Sicart, 2008) and therefore deserve special attention in game development. Nevertheless, there is only a small body of research on this design factor, although it has a major impact on game dynamics and learning effects (Pawar et al., 2019). To ensure the learning effect through a supplementary game mechanic, it must be provided that the corresponding mechanics are congruent with the learning content and are not distracting (Pawar et al., 2019; Zhonggen, 2019). Ideally, game

activities and learning activities align or are even identical (Plass et al., 2012). In this case, they are no longer just game mechanics but so-called *learning mechanics* (Plass et al., 2016). Regarding simulating the effects of dealing with financial decisions, this should be represented by a game mechanic that involves dealing with scarce resources and considering changing (economic) conditions (Kaiser & Menkhoff, 2018). In contrast to game mechanics where the course of the game is predominantly random—as in a game of dice or roulette, for example—there are game mechanics where the success of the game is more directly connected to the strategic decisions of the players, e.g., in chess. To increase perceived learning success, central game mechanics should take this into account, increase the decision-making scope for players, and link the success of the game as closely as possible to game decisions.

2.2.3 *Game-Based Learning and Financial Education*

Meta-analyses in the field of financial education refer to the potential of experiential learning to make one's own actions tangible and, in the upper secondary level, to take future life goals into account (Amagir et al., 2017; Kaiser & Menkhoff, 2016, 2018). Both of these aspects of experiential learning could potentially be supported through GBL. There has also been a plea for “just-in-time” financial education (Fernandes et al., 2014) to ensure that the subjective significance of the content was conveyed to the real life of the students by aligning the content with student motivation and interest and thereby facilitating the transfer of what has been learned (Kaiser & Menkhoff, 2018; Totenhagen et al., 2015).

Numerous digital and analog educational games to promote financial literacy have been developed in recent years. According to our own count, there are more than 70 analog and digital games within the economic or financial domain in either English or German language. In addition to a different content focus and different gaming activities, the providers also vary. However, there is little empirical evidence about the effectiveness of these games in the area of financial literacy in general as well as information regarding the influence of certain design elements (Hainey et al., 2016). There have been some evaluations in this domain, but not all yet meet strict scientific criteria.

Although serious game evidence in the financial literacy area is still very sparse, much is already known about its general potential. Using a media-comparison approach (Mayer, 2014), it was suggested that GBL might be more effective in regard to knowledge acquisition and its retention period (Boyle et al., 2016; Riopel et al., 2019; Wouters et al., 2013) as well as providing higher motivation and interest development during the learning process (Clark et al., 2016; Connolly et al., 2012; Larson, 2020; Wouters & van Oostendorp, 2017; Zhonggen, 2019). In particular, increases in affective activation and learning engagement have been emphasized (Zhonggen, 2019) as important indicators of higher interest (Renninger & Hidi, 2011).

2.2.4 *Interest as Part of Financial Literacy and Its Role in Learning*

In line with several definitions of financial literacy, domain-specific interest can be seen as a substantial component (Koh, 2016; Weinert, 2001). Financial literacy is also defined as a competence incorporating five distinct content dimensions: money and payments, saving, loans, insurance, and monetary policy (Rudeloff, 2019; Schürkmann, 2017). Interest, as a *crucial motivational variable* (Hidi & Renninger, 2006), is an important predictor for attention, goal setting, and knowledge acquisition (Renninger & Hidi, 2016; Rotgans & Schmidt, 2017), since it influences the way and the frequency in which we interact with a certain context (Prenzel, 1986). In regard to interest in financial matters, studies have shown mixed results among young adults. There is evidence of a high level of interest in finance among young people (Greimel-Fuhrmann, 2018), but other studies have shown decreases in interest in finance and economic topics, especially for this age group (Kantar, 2019).

Especially with respect to assumed treatment effects, the distinction between situational (state) and individual interest (trait) has to be kept in mind (Reber et al., 2018; Renninger et al., 2014): While triggered situational interest can be considered simply an affective activation, a more developed situational interest as well as individual interest includes cognitive and emotional components, which are each related to a certain object (Hidi & Renninger, 2006). The cognitive dimension is defined as a high value-related valence, whereas the emotional dimension is defined as a high (positive) emotional experience. Both the cognitive and the emotional dimensions are connected to each other (Hulleman et al., 2010).

Following Krapp (2005), the development of interest can be explained by the basic needs of the theory of self-determination by Deci and Ryan (Deci et al., 2013; Ryan & Deci, 2017) involving social relatedness, perceived competence, and autonomy experience. Krapp (2005) links this concept to the person-object theory of interest (Prenzel, 1986). The role of basic needs with regard to the development of situational and individual interest in the learning process has been supported by several studies (Großmann & Wilde, 2018; Minnaert et al., 2011; Tsai et al., 2008). Regarding this learning process, Ryan and Rigby (2019) have suggested motivational effects of GBL. However, the role of basic needs in the learning process to promote intrinsic motivation, e.g., in GBL, could also be confirmed independent of person-object theory and plays an important role in measuring game experience (Johnson et al., 2018).

2.3 Development, Implementation and Evaluation of the GBL Environment “Moonshot”

Based on the theoretical considerations outlined above, we developed a GBL environment (“Moonshot”, see Fig. 2.1) to promote learners’ interest in the financial domain (see Sect. 2.3.1). As we aim to analyze the effects of this game and its reflective environment, we describe the research design (see Sect. 2.3.2) of an upcoming empirical study.

2.3.1 Game-Based Learning Environment “Moonshot”

The development of the serious game “Moonshot” comprised a two-year process including several pilot phases that involved experts from various disciplines (e.g., domain-specific didactics, educational sciences, game and communication design). It is designed for upper secondary school students (age: 15 years and older) and can be played by groups of 3–5 players. Accompanying reflection tasks were developed. In principle, the game can also be played without these tasks. In the following sections, the game components, game mechanics, and game reflection are briefly described. In addition, challenges in game development are briefly described.



Fig. 2.1 Game “Moonshot”. Photo © Susanna Grimm

2.3.1.1 Game Components of the Serious Game “Moonshot”

To make the game inviting to students, it starts with a so-called “life dream” that can be individually selected by each player at the beginning of the game (e.g., being a social media influencer or living in a self-sufficient manner on a farm). Every “life dream” can be achieved by making personal financial decisions while taking into account (a) changing economic conditions, (b) decisions of others, and (c) scarce resources. These “life dreams” were developed in such a way that they represent different value concepts and life plans and thus offer identification potential for students in different environments (Calmbach et al., 2016) to take into account the value-related valence for the game content by the players right from the beginning (Krapp & Ryan, 2002). All of these goals are comparable in their level of difficulty and allow the players to pursue different or even identical goals within the game, which also means realistic effects on cooperation and competition for existing resources.

The game goal can be achieved through three challenging game levels with increasing difficulty, each of which has different resource requirements. In every round of the game, there is a new economic and political situation that influences opportunities: change in interest rate, change in demand, environmental events, tax cuts, and others. Resources in exemplary areas of life must be taken into account: relationships, education, job and career, regeneration time, and finances. After one level has been completed, the next level can be started. The game is designed in such a way that players in one game can play with each other at the same time, even though they are at different levels, to make it more challenging and provide different opportunities to compete, cooperate, and catch up (Mayer, 2014).

All players have the opportunity to increase their income through gainful employment and financial investments, can take out loans, and insure themselves through different insurance opportunities. The rules are based on real conditions that have been reduced due to their complexity, e.g., changing interest rates are directly offered to the players as consumers and not through different commercial banks.

Thus, the area of finance is the focus of this game, and the game content and goals are aligned with the intended learning goal (Graesser, 2017; Klopfer et al., 2018; Plass et al., 2016). To bring it into connection with other areas of life, different resources (represented by different card stacks) must also be taken into account during the game. In addition to “Jobs” and “Investment,” there are additional categories called “Education,” “Social Affairs,” “Career,” and “Leisure” (see Table 2.1). Focusing on only one aspect of life (e.g., investment) is only successful to the extent that it corresponds to one’s own life dream.

Apart from freely selectable possibilities to get closer to one’s own game goal, card stacks contain the so-called individual “fates” in both positive and negative forms (e.g., (lottery) winnings, illnesses, or family and professional changes).

All options produce “costs” in different forms and amounts regarding time requirements, finances, and opportunity costs. These costs increase with each level of the game. During the game, the players keep track of their income and expenses

Table 2.1 Overview of categories

Category	Possible options
Jobs	Job offers with different salaries, depending on educational qualifications
Investment	More classic forms of investment with different profit and loss expectations, some of which can be anticipated by corresponding key figures
Education	Formal and informal educational opportunities
Career	Exemplary options for career advancement
Social	Exemplary options of civil society and voluntary work as well as individual family and friendship care
Leisure	Different forms of leisure activities and time-saving

as well as their game progress and monitor each other. This allows them to respond potentially early on changing circumstances (Mayer, 2014).

2.3.1.2 Direct and Generic Reflection

In the GBL environment, two reflection phases with two different standardized guidelines were implemented.

The basic version provides for a general, nonteacher-guided reflection (generic reflection): In the first phase, the players talk about their playing experience, and after the second phase of the game, they discuss the relationship to their lives. The first phase was to reflect on game decisions and the overall concept of the game so that in subsequent rounds, what has been learned can be tested directly in the game. Since the developed game has a high number of decision-making possibilities, it is intended to avoid overstraining and to create an experience of success for all participants (Ke, 2016).

In a second version, this objective is implemented by the teacher with the help of standardized instructional guidelines (direct reflection): After a first game phase, students’ insights into promising game decisions were collected, categorized, and discussed. This should make the problem-solving ability within the game more efficient for the players (Kolb, 2015; Pawar et al., 2019) and increase their competence experience (Ryan & Deci, 2000). The topics to be discussed here are not limited to solutions according to the game logic but focus on individual reasons for game decisions to avoid cognitive biases in financial decision-making (Loerwald & Stemann, 2016). The second phase of reflection focuses on the transfer of the playing experience to the reality of the students’ lives. The references to reality, which were limited due to the simulation, are worked out to support the value-related valence for the game content (Krapp & Ryan, 2002). The final step is the design of a personal “(real)life dream” and the necessary budgeting in partial steps. Beyond the intervention, the aim here is to promote further engagement with the topic of finance as an important indicator of individual interest development (Renninger & Hidi, 2016).

2.3.1.3 Varying Game Mechanics to Influence Perceived Basic Needs Experience

Two versions of the game were designed (see Table 2.2): In the first version (treatment I), different opportunities are randomly presented to the players, whereas in the second version (treatment II), limited time resources were added that the players could use at their own discretion to perform an action (e.g., to invest in education) and to achieve their goals. This simulates the use of scarce resources and links individual game decisions more closely to the achievement of the game goal to support the competence experience (Ryan & Deci, 2000). The resulting greater freedom of choice was also intended to promote the autonomous experience (Aprea et al., 2018; Ryan & Deci, 2017). The economic conditions determine the number of limited resources in the category fields for which the players compete.

If categories relevant to the players are currently not available—because other players have already used up the resources in a certain round—there are two additional categories that are available at any time without limit: mini-jobs and advanced training courses. They are not associated with any risk but have a low return. Using only these categories cannot lead to victory, but it does guarantee the players’ ability to act until the next economic scenario begins. Based on the person-object theory of interest, it was assumed that this play experience will be perceived as more relevant to the students’ lives (Krapp, 2005).

2.3.1.4 Challenges During Game Development

Based on the defined game and learning goals, different game versions were tested and discarded. A central challenge was to balance realistic representation and appropriate complexity for the target group. Many pieces of information in text form

Table 2.2 Differences in strategic decisions according to the game mechanic

	Strategic decisions	Random events
<i>Treatment I:</i> Basic game, using dice (random)	<ul style="list-style-type: none">• Taking out a loan• Dealing with an “offer” on playing card: Accept, exchange, or sale	<ul style="list-style-type: none">• Economic situation (e.g., tax increase)• Fate (e.g., illness, winning in the lottery)• Decisions about resource category (e.g., job, leisure)
<i>Treatment II:</i> Advanced game, using an additional strategic game mechanic	<ul style="list-style-type: none">• Taking out a loan• Analysis of available information on open cards• Deciding on a category, depending on the time budget, available resources, and individual game objective• Dealing with an “offer” on playing card: Accept, exchange or sale	<ul style="list-style-type: none">• Economic situation (e.g., tax increase)• Fate (e.g., illness, winning in the lottery)

(e.g., on life goals or investment options) were thus significantly reduced or transferred into symbolic representations. The game mechanics in treatment II should also serve to represent the learning goals more adequately. The decision for an analog variant also brings, in addition to many advantages, such as a haptic gaming experience and a more direct interaction with other players—a few challenges—such as fewer control options for adhering to game rules or correct calculation paths. To counter this, peer control mechanisms were introduced, and it was ensured that minor rule violations did not contradict the intended learning goals. It became clear that not all content dimensions could be considered equally to keep the complexity and clarity appropriate. While money and payment transactions, savings, and loans were considered in a differentiated manner, insurance (through fates and the choice between three different insurance policies) and monetary policy (through changes in key interest rates) are less represented.

2.3.2 Research Design

2.3.2.1 Hypotheses

For the upcoming main study (2020/21), four treatment groups in the GBL environment “Moonshot” will be established and tested within the research design (see Fig. 2.2). The following two questions will be addressed. (1) How do specific game mechanics influence the basic needs experience of the players so that their interest

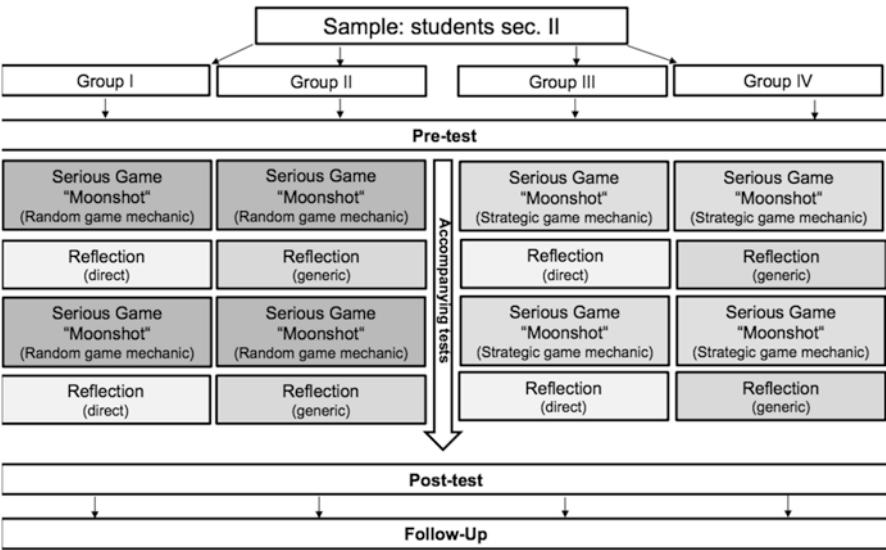


Fig. 2.2 Research design to test the effects of different game mechanics and reflections in the GBL environment “Moonshot”

in the financial domain increases? (2) How can the design of reflection phases support this learning goal? The experiment consists of a 2×2 group design. All four groups will play the game “Moonshot.” Two groups will play the game with a game mechanic that chooses the opportunities on a random basis (I and II), whereas the two other groups (III and IV) will play the game with a strategic game mechanic. Furthermore, two groups with different game mechanics will reflect freely on their game experience as well as on the role of the game experience in their personal life (“generic reflection”; II and IV), whereas the other two groups (“direct reflection”; I and III) will reflect with the help of specific tasks given by the teacher. Thus, the following groups will be compared: group I (random game mechanic; direct reflection), group II (random game mechanic; generic reflection), group III (strategic game mechanic; direct reflection), and group IV (strategic game mechanic; generic reflection).

This group design will allow us to test several hypotheses regarding the effects of different game mechanics as well as reflection phases on the financial literacy of students in the upper secondary level. The following hypotheses will be tested:

- (H1) In groups with strategic game mechanics (groups III and IV), the autonomy experience will be higher than in groups with random game mechanics (groups I and II).
- (H2) In groups with strategic game mechanics (groups III and IV), the competence experience will be higher than in groups with random game mechanics (groups I and II).
- (H3) In groups with strategic game mechanics (groups III and IV), the situational interest (state) will be higher than in groups with random game mechanics (groups I and II).
- (H4) In groups with strategic game mechanics (groups III and IV), the value-related valence will be higher than in groups with random game mechanics (groups I and II).
- (H5) In groups with direct reflections (groups II and IV), the value-related valence will be higher than in groups with generic reflections (groups I and III).
- (H6) In the group with strategic game mechanics and direct reflections (group III), the individual interest (trait) will increase more strongly than in groups with no strategic game mechanics and/or direct reflection phases (groups I, II, and IV).

2.3.2.2 Sample and Procedure

The aim is to conduct a randomized controlled field trial (randomization by class; for an overview, see Fig. 2.2). The entire intervention will take place at schools and last 270 min., including the surveys. The playing time will involve two 60-min. periods, the reflection phases will last 90 min., and completion of the questionnaire will take 60 min. Based on power analyses using the statistic program G*Power (Faul et al., 2007), an optimal sample size of at least 300 students will be aimed at validating small to medium effect sizes for the 2×2 experimental control group

design with repeated measures described above. To achieve this, five school classes for each treatment group will be tested.

One week before each intervention, relevant variables are collected by a pretest, and the program is explained to the students. Due to the different technical resources of the schools, all surveys will be paper-based.

The investigator-in-charge will be involved in all courses and will be supported by research assistants. The entire program during the quasi-experiment will follow a standardized procedure, which is provided by guidelines and standardized materials that accompany the game and reflection.

The intervention starts with a brief introduction explaining the game rules and measurement of emotional states. During the first 60-min. game time, data on emotional activation as a subset of interest (Renninger & Hidi, 2011) will be collected by continuous state sampling (Csikszentmihalyi & Larson, 2014). Basic needs experience and value-based valence will be measured directly after each game phase. After reflection phases, this happens again, but there is no continuous state sampling. After the second period of reflection, a final measurement of the dependent variables will be made, this time including planned changes in behavior. The survey will end with a follow-up two weeks after the intervention. Here, individual interest (trait) and actual engagement with finances will be measured again.

2.3.2.3 Instruments

To measure the development of situational and individual interest as well as basic needs experience, a questionnaire will be used. The questionnaire contains relevant control variables for the assessment of individual condition factors, socioeconomic backgrounds, and institutional framework conditions that are collected with existing and established scales (for an overview, see Table 2.3).

When selecting the dependent variables to be measured, the emphasis was placed on emotional and value-related valence concerning the game content, a general measurement of interest on the five content dimensions of financial literacy as well as the basic needs experience during and after play (for an overview, see Table 2.4). In addition, measurement of intended behavioral change was added as a supplement to have an indicator of change in individuals and not just situational interest (Renninger & Hidi, 2016).

Table 2.3 Extract on control variables measured in the pretest

Variable	Origin	Number of items
Attitudes, perceptions, and intentions toward serious games	Adapted according to Riemer and Schrader (2015)	16
Financial background and socialization	Adapted according to Rudeloff (2019)	5
Personal and socioeconomic factors	Age, gender, mother tongue, school, grades, parental education, and scope of employment	9

Table 2.4 Dependent variables

Variable	Origin	Number of items	Pretest	Accompanying	Posttest ^a	Follow-up
Value-related valence (state)	Adapted according to Prenzel et al. (2001)	6		x	x	
Emotional activation (state)	Adapted according to Schallenberger (2005)	10	x	x		
Competence experience	Adapted according to Prenzel et al. (2001)	5		x	x	
Autonomy experience	Adapted according to Prenzel et al. (2001)	5		x	x	
Interest in the financial domain (trait)	Adapted according to content dimensions of financial literacy and scale for interest used in PISA (2015)	5	x		x	x
(intended) engagement with subject	Self-developed, based on Renninger and Hidi (2016)	9	x		x	x

^aAfter game and reflection phases

To control the quality of each intervention, the teacher rates the quality after the intervention is finished in a class. The dependent variables are also controlled by measuring game engagement in the area of finance by collecting the players’ accounting to count actual game decisions in the finance category; furthermore, the individual game progress is tracked (Klopfer et al., 2018).

2.4 Outlook and Expected Implications

In this chapter, the game “Moonshot” was presented and discussed with regard to its potential as a serious game to foster financial literacy. Furthermore, a research design to analyze the effects of different game mechanics, especially on interest in the financial domain, was introduced.

On the basis of theoretical considerations, it was explained that game mechanics in particular must be taken into account in the development of games, as these form the core of game activity. On this basis, it was argued that in a serious game focusing on financial literacy, the strategic use of scarce resources as well as (economic) real-life conditions should be simulated by game mechanics. By linking the success of the game more closely to individual game decisions and actions, the aim is also to promote upper school students’ experience of competence and autonomy.

Furthermore, reflection phases were included as an essential component of GBL environments (Taub et al., 2019). In the case of the GBL environment presented here, the value-related valence is to be promoted by instructional reflection on the

relationship between the life of the player and the game decisions, since this is where a transfer to the students' own life is initiated.

Testing the hypotheses outlined above will provide needed empirical evidence on the development and implementation of serious games within schools to foster students' financial literacy as well as other learning goals in different school subjects. In this regard, discussing promising methods for teaching and learning as well as advancing the well-founded use of GBL methods could be major implications of this study.

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