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Abstract:
There is a growing interest in harnessing the motivational and engaging power of games for learning purposes. Motivation and engagement are frequently used interchangeable. In this article, we suggest that engagement is theoretically a volitional process and discuss the value of such distinction for research and design of educational games. We further argue that educational games research needs to move its focus beyond intrinsic motivation and explore others important motivational processes. The article ends by proposing a conceptual framework based on a multidimensional perspective on engagement (cognitive, behavioral, and emotional). The hope is that this framework can organize and accumulate the findings of future research so that in the near future the field can produce empirically tested guidelines and principles that respond the central questions of for whom and under what circumstances a designed educational game works.

Keywords: engagement, game-based learning, instructional design, learning, motivation, theory building, volition.

Engagement has been proposed to be the central mechanism behind the success of educational games (e.g., Dickey, 2005; Egenfeldt-Nielsen, 2005; Garris, Ahlers, & Driskell, 2002; Kiili, 2005), capturing the attention of instructional designers decades ago (e.g., Malone, 1981).Nineteen articles published in the *Simulation & Gaming: An Interdisciplinary Journal of Theory, Practice and Research* since 1992 have mentioned the term "engagement" as part of their abstract. However, engagement has often been equated to intrinsic motivation, flow, and immersion among others. Although these previous conceptualizations of the term may have produced fertile ideas, is engagement different from motivation? Does engagement represent a volitional process? Can engagement be differentiated in terms of quantifiable dimensions? And, does engagement mediate the effects of educational games on learning outcomes?

Addressing these questions may have several advantages to the field of educational games. First, differentiating engagement from motivation may guide the design of appropriate instructional support for fostering engagement. Second, differentiating types of engagement inform which one is being elicited in an educational game. Third, proposing engagement as a mediator variable my help understand how, for whom and under what circumstances a game works. Finally, these theoretical considerations can support a new conceptual framework for future research on games effectiveness, as will be illustrated later.

The Motivation-Volition Distinction

Research on human motivation has been conducted within two different traditions (Heckhausen & Gollwitzer, 1987). The first tradition is concerned with the mechanisms underlying goal[1] setting processes in which the role of self-efficacy, task value and expectancies are central to understand individual decision to pursue a goal. These processes

[1] Along this article, when referring to "goals" we mean "learning goals"

occur in the so called pre-decisional phase. The other tradition is concerned with the mechanisms underlying goal striving processes in which the role of self-regulation to protect and implement a chosen goal are central to understand how the intention to pursue a goal is actually enacted. These processes occur in the so called post-decisional phase.

This distinction is based on the observation that current motivational research usually predicted individuals' effort investment and performance during a task based on the same principles that predicted the choice of doing the task in the first place. Heckhausen and Gollwitzer (1987) reported that, contrary to the risk-taking model of Atkinson (1957), individuals induced to set goals with higher level of difficulty outperformed individuals who chose intermediate level goal – as predicted by Atkinson (1975) – by investing a higher amount of effort. This result suggested that the risk-taking model of Atkinson (1957) and arguably the later expectancy-value model of motivation (see Eccles & Wigfeld, 2002) can predict better the formation (predecisional) of intentions, but not their actual enactment (postdecisional). In light of these considerations, the motivational processes correspond to two successive psychological states, in which motivation reflects a predecisional state and volition reflects a postdecisional state.

However, not all researchers make an explicit distinction between these two psychological states. For example, influential scholars on motivational research defined motivation as "the process whereby goal-directed activity is instigated and sustained" (Pintrich & Schunk, 2002, p. 405). Goals represent individuals' being conscious of something they are trying to achieve. Activity refers to physical (e.g., effort, persistence and other overt actions) and mental activities (e.g., planning, organizing, monitoring, making decisions and assessing progress). Instigation refers to the fact that individuals make a commitment and the first step towards achieving the goal. Finally, sustainability has to do with the motivational processes behind the "sustained" action (e.g., expectations, attributions, emotions). It can be argued that the instigation of goal-directed activity corresponds to the motivational state and the sustainability corresponds to the volitional state.

The motivational state. Concerning motivational states, the field of games has researched motivation mainly from the perspective of *intrinsic motivation*, i.e., doing an activity "for its own sake". This definition, however, has reduced the explanatory power of motivational states and has seemed to present some conceptual issues concerning the intrinsic-extrinsic distinction (Lepper, Corpus, & Iyengar; Ryan & Deci, 2000; Sansone & Morgan, 1992). Ryan & Deci suggested that intrinsic motivation usually coexists with extrinsic sources of motivation and therefore it is more about a continuum from a-motivation, going through different extrinsic motivations, to intrinsic motivation. Among the extrinsic motivations, the authors further distinguished between external regulation (e.g., struggling for a reward), introjected regulation (e.g., perform an act to protect our self-esteem), identification (e.g., memorizing grammar rules to talk better a second language which can be considered crucial), and integrated regulation (e.g., behavior with instrumental value such as never being late). Similarly, Sansone and Morgan suggested that intrinsic motivation is created through an ongoing temporal process which links an activity with its final culmination. They further suggested that what can be at first perceived as intrinsic, can later be regarded as extrinsic.

Fortunately, intrinsic motivation is but one type of motivational state. A more comprehensive model considers motivation as a psychological process emerging from the interaction of the person and the situation. For Lewin (1926), motivation was a psychological force that depended on the valence of the goal to be pursued and the distance between the person and the goal. In formal terms:

$$F(p,g) = f[Va(G)]/ep,g = f(t, G)/ep,g$$

The strength of the psychological force (F) to achieve a goal (g) by an individual (p) is directly proportional to the valence of the goal Va(G) and indirectly proportional to the distance between the person and the goal (ep,g). Furthermore, the value of a goal Va(G) depended also on the need/tension of the person (t) and the perceived nature of the goal object G. Therefore, the greater the individual need for the goal object and/or the greater the quality of that goal, the greater the motivational force. Examples in the educational context show that how students perceive their teacher or the classroom environment (G), for example as mastery or performance oriented, may have an influence on their behavior, and hence, on the underlying motivational process. This basic model was the foundation for the expectancy-value theories of motivated behavior (Eccles & Wigfeld, 2002). In the case of games, if we consider the triad of challenge, curiosity and fantasy, as the core attributes of games, it is simply to see how fantasy and curiosity may well support individuals' perception of the value of the game (e.g., to get money, to save the princess, or to advance to the next level). Meanwhile, the challenges posed by the game – which, by definition, are within individuals' skills – may well produce a high expectancy of achieving the challenge. In Lewin's (1926) terms, the game attributes produce a tension in the player for reaching a goal, so that the distance between the player and the goal is minimal and at the same time the goal is highly valued. Although this model may overcome the theoretical difficulties suggested concerning the notion of intrinsic motivation, the model does not say anything about how individuals go about enacting and implementing a goal once they have perceived it as close and valuable. We suggest that this is the role of volitional processes, as we describe them next.

The volitional state. Volition refers to a system of psychological control processes that protect individuals' concentration on a certain goal and direct their efforts towards it despite personal or environmental distractions. Volition both depends on a person's motivational decision to achieve a certain goal and helps the person to perform the necessary steps to reach the goal. Once the individual engages in a certain action to achieve a goal, volitional control processes become relevant and influence whether the goal will eventually be reached (Kuhl, 1987). This protective function is what makes volition an important variable for understanding learning processes and learning outcomes (Corno, 1993). A strategic volitional control entails the formation of an elaborated representation of how to enact one's intentions, and the comprehension of how this will affect the consequent set of actions. Volition is related to the task management, rather than planning or appraisals such as self-efficacy for a particular task. In this context, volitional processes support the maintenance of an intentional state, facilitate decision making among alternative courses of action, and control the amount of information processing. Therefore, the primary role of volition is the *management* and *implementation* of goals, and is defined by three groups of constructs: action control, goal related cognition, and volitional styles (Corno, 1993).

Action control refers to the strategies and knowledge used to manage cognitive and non-cognitive processes to achieve a particular goal. For example, how individuals allocate and control their attention, and how they use self-motivation techniques and handle intrusive emotions, such as anxiety, belong to this group. Goal-related cognition refers to the adaptive use of learning strategies and to the investment of mindful effort. Volitional styles refer to dispositional tendencies that affect goal implementation and action control processes. For example, action oriented versus state oriented individuals may differ in terms of the effort they invest, the strategies they employ and the resulting performance on a particular task. These volitional processes suggest activities for which individuals may well need support (Economides, 2009; Kim & Keller, 2011). For example, Economides found that feedback messages aimed at supporting volitional processes had a positive impact on individuals' test scores. Similarly, Kim and Keller showed how volitional email messages can influence pre-service teachers' implementation of technology in classrooms.

The motivation-volition distinction set the stage to consider motivational processes from a broader perspective and to differentiate two distinct psychological states that have different roles on performance and learning and may need different instructional support strategies. It can be argued that in light of the above discussion, motivation can explain why an individual chooses, among other activities, to play a game. However, this motivational explanation may fall short in explaining the persistence and sustain effort typical of gamers. This latter characteristic may well be understood in terms of games as supporting volitional processes. Furthermore, we argue that games research has been examining this issue under the concept of engagement.

Engagement

Engagement seems to provide with a way to address the important issue of *active* learning (cf. Chi, 2009; Renkl, 2011). In the literature the term "engagement" is used in different ways. It is possible to find expressions such as "cognitive engagement" (Corno & Mandinach, 1983; Hannafin, 1989), "engaged learning" (Jones, Valdez, Norakowski, & Rasmussen, 1994), "engaging work" (Schlechty, 1997), "productive disciplinary engagement" (Engle & Conant, 2002), "persistent reengagement" (Garris et al., 2002), "engaged participation" (Hickey, 2003), "emotional/behavioral engagement" Fredricks et al.(2004), "engaging by design" (Dickey, 2005), "procedural, conceptual and consequential engagement" (Gresalfi, Barab, Siyahhan, & Christensen, 2009), and "levels of engagement" among others (Filsecker & Hickey, 2013). Outlined next are the aforementioned authors' definitions of these terms. Each of the terms is reviewed in the broad context of school, classroom and educational games. Regardless of any particular conceptualization, engagement represents an effortful on-going process, a deployment of "energy in action", which we argue, reflects its volitional and active nature.

School engagement. From the school engagement literature, several dimensions have been proposed (Appleton, Christenson, Kim, & Reschly, 2006; Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003; Bohnert, Fredricks, & Randall, 2010). In these models of engagement: (1) emotional engagement is similar across researchers and refers to feelings and emotional reactions towards a situation (e.g., a subject matter); (2) behavioral engagement is also similar across researchers and entails the core idea of "participation" (e.g., in extracurricular activities, etc.); (3) Appelton et al. (2006) academic (e.g., time on task) and psychological (e.g., feelings of belonging) engagement can be considered to reflect behavioral and emotional engagement, respectively; (4) some dimensions seem to represent motivational states (e.g., self-efficacy, autonomy, value), instead of volitional states; and, finally, (5) cognitive engagement is the most consistent dimension across researchers, entailing thoughtfulness, investment and self-regulation. Therefore, for the remaining discussion of engagement, only three dimensions seem enough: behavioral, cognitive and emotional.

As suggested above behavioral engagement refers to active participation and includes effort, concentration, and attendance, obeying social rules, and avoiding trouble. Emotional engagement refers to the emotional experiences of students while interacting with teachers, peers, and tasks in general. It includes emotions such as interest, enjoyment, enthusiasm, feelings of belonging and valuing of learning. Cognitive engagement is defined as investment in learning and includes self-regulation, thoughtfulness, and willingness to go beyond the basic requirements to master difficult skills. In this line of reasoning, high engagement involves heightened attention, interest, enjoyment, and effort to master new skills. Meanwhile, low engagement involves boredom, inattentiveness, and passivity (Bohnert et al., 2010). Corno and Mandinach (1983) referred to cognitive engagement as the highest level of self-regulation, which involves effortful transformation processing strategies such as connecting incoming information with information in long-term memory, selecting the

relevant information for a particular task and developing plans to achieve task-related goals. Hannafin (1989) defined the same term as "the intentional and purposeful processing of lesson content" (p.170). Cognitive engagement has been proposed as a notion to integrate motivational and cognitive aspects of human functioning, representing a construct that possesses quantitative (i.e., the amount of mental effort), and qualitative (i.e., the type of strategy used) properties. So defined, the central role of engagement on learning seems intuitively comprehensible.

Engagement in the classroom. On the other hand, Jones et al. (1994) characterized an individual engaged in learning if s/he was (1) responsible for their own learning (i.e., self-regulated), (2) energized by learning (i.e., feelings of pleasure related to intrinsic motivation), (3) strategic (i.e., knowing how to learn by developing learning strategies), and (4) able to collaborate (i.e., skills to work with others). Another set of criteria has been proposed by Schlechty (1997) with the concept of engaging tasks. Such tasks should evoke students' 1) attention, 2) persistence, 3) commitment, 4) meaning and value. If students pay attention, persist in the face of difficulties, allocate more time to the work beyond the requirements because they find it meaningful and valuable, then the task is engaging.

Engle and Conant (2002) proposed several indicators of engagement in the classroom: (1) more students making substantive contributions, (2) few students involved in "off-task" activities, (3) students making emotional displays, and (4) students spontaneously become re-engaged over long periods of time, among others. Furthermore, they differentiated between the various types of engagement; asking whether the engagement was (1) disciplinary (i.e., the extent to which students activities are corresponding to practices typical for a specific discipline), or (2) whether the engagement was productive, (the extent to which students' make "intellectual progress" or "get somewhere" during a lesson) (Engle & Conant, 2002, p. 404). In a similar vein, Hickey's (2003) emphasized the context of learning as represented by a set of knowledgeable practices within a specific community. Participating in these practices involves the creation of interpersonal relations and satisfying interactions with the environment. From this perspective, engagement is mainly a function of the extent at which participants' knowledgeable activity is "attuned" to the constraints and affordances of the social context in which they occur. The author further suggested that engaged participation requires the active negotiation of one's identity with potentially conflicting communities. This means that if a classroom community does not value the knowledge practices of a curriculum, the *engaged participation* of individuals is unlikely to occur. These two meanings of engagement go in line with Azevedo's (2006) notion of engagement as a term referring to the quality of the relationship between a person and an activity within the broader context of material and socio-cultural environments. For the author high engagement entails an individual choosing an activity, persisting in it, investing personal resources such as effort, and showing positive affect toward the activity.

Engagement and educational games. Engagement is a central concept in the field of educational games (cf. Dickey, 2005; Filsecker & Hickey, 2013; Garris et al., 2002; Gresalfi et al., 2009). Garris et al. (2002) proposed a model of gaming as a cycle that entails users' judgments and behaviors, and the systems (i.e., game), feedback. For the authors, persistent re-engagement of a player refers to the cyclic behavior in terms of involvement with the task, more time on task, pursue of challenges and commitment to continue with the task. First of all, this continuous engagement, coveted by instructional designers, simply is saying that individuals that form positive judgment will engage actively in gameplay, "…exert more effort and concentration and return to game play unprompted" (Garries et al., 2002, p. 454). Likewise, from the user's perspective, engagement is equated with flow and it is assumed to represent a particular feeling or emotion that gamers experience. Filsecker and Hickey (2013) addressed engagement from a multilevel model of assessment developed for assessing learning outcomes at different time scales. The multi-level assessment model has evolved in

design studies from the ecology game Taiga in Quest Atlantis (Barab, Gresalfi, & Ingram-Goble, 2010). As applied to engagement, the model distinguishes different levels of engagement: immediate, close, proximal and distal engagement. Immediate level corresponds to actions such as "live" discourse and social interaction together with in-game actions as captured by log-files data and whose timescale is in minutes. Close engagement is the extent to which students participate knowledgeably in the discourse of the respective discipline as reflected in the content of the tasks (quests) students submit during games and can have a timescale of hours or days. Proximal engagement correspond to the students motivational orientation while engaged in solving the quests and distal engagement corresponds to students' reported interest in doing these quests in the future. Another line of research also steaming from Quest Atlantis has distinguished among procedural, conceptual and consequential engagement (Gresalfi et al., 2009). Procedural engagement involves using procedures accurately, but not necessarily without an understanding of why on performs the procedure (e.g., using correctly a formula to calculate the mean of a set of data). Conceptual engagement captures the idea of "sense-making" or understanding (e.g., asking why a formula might be useful to solve a problem). Consequential engagement requires "interrogating the usefulness and impact of the selection of particular tools on outcomes" (p. 22). For example, an individual should be able to explain how her choice of a particular statistical method supports her conclusions. They further suggested consequential engagement to be the highest level and to involve the interplay between the intentional choice of a tool in a particular situation, and the reflection on the consequences of that choice in terms of its impact on that situation.

From these different perspectives, engagement is definitively a multidimensional construct that cannot be routed in one single theory (e.g., intrinsic motivation), and that has different aspects and indicators depending on the context (i.e., school, classroom, computer application) engagement is being studied. Below a conceptual framework is proposed for studying engagement in the context of educational games.

A Conceptual Framework for Research on Engagement

In this article, we use the term conceptual framework as an *argument* of what concepts (i.e., variables) are important and why they are needed in order to explain the empirical results obtained when attempting to understand a phenomenon (Eisenhart, 1991). The present conceptual framework (Figure 1) is based on two assumptions: (1) the factors involved in the process of learning can be organized as an input-process-output (IPO) model (Garris et al., 2002), and (2) engagement represents a mediator variable between an educational game and its learning outcomes. The main contributions of this framework is its explicit distinction of motivational and volitional processes usually presented as interchangeable (see Garris et al., 2002) together with a set of specific dimensions to examine and measure, its focus on examining processes independent of any particular theory, and its incorporation of the mediational analysis perspective so that it can be possible to examine empirically any suggested IPO chains.

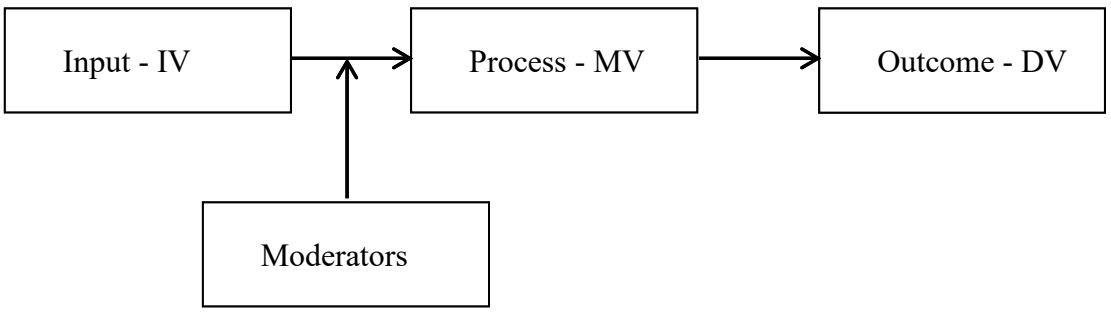
Input–Process–Outcome (IPO). Garris et al. (2002) organized the variables related to learning from games in terms of an IPO model. The inputs were game characteristics (e.g., fantasy) and the instructional content. The process considered a cycle of "re-engagement" including users' judgments and behaviors, and game's feedback, followed by a debriefing (i.e., instructional support) and a learning outcomes. The present framework overcomes a few limitations of Garris et al. (2002) gaming model. First, the authors overlapped categories first presented as exhaustive. For instance, both user judgments and behaviors are described in terms of "concentration". Second, the concept of "task involvement" seems rather fuzzy, although central for the model. A third drawback is that the gaming model incorporates variables, such as self-efficacy, that seem to factors affecting engagement, but not

engagement itself. In our framework, the fuzzy category of "task involvement" would correspond to the dimension of cognitive engagement (described below), which as we suggest corresponds to the volitional process of goal-directed cognition. Likewise, the attentional aspect is considered to belong to the dimension of emotional engagement, which would correspond to the volitional process of action control, mainly related to its resource allocation component. Our framework by differentiating between motivational and volitional states, it does not include – as Garris et al. do– motivational concepts such as self-efficacy to describe engagement in games. In summary, from Garris et al. fuzzy concept of task involvement, our framework differentiates two distinct dimensions of engagement (cognitive and behavioral) corresponding to two distinct volitional processes.

Mediational perspective. The present conceptual framework proposed the use of the mediational perspective in order to develop an empirically based theory of learning from games. This perspective is important if the interest is to understand how something works, for whom and under what conditions. Ennemoser (2009) suggested that mediation and moderation could help understand how interactive processes – central to games – produce particular effects. A mediational analysis attempts to determine the extent to which a third variable translates the effect of one variable to another (MacKinnon, 2008). This third variable could be a mediator variable, a variable that occupied an intermediate place in the causal chain between the independent and the dependent variable. As Mackinnon writes: "*In a mediational analysis, the independent variable causes the mediator which then causes the dependent variable.*" (Mackinnon, 2008, p. 8, emphasis in original). For example, mental effort could be mediator of the causal chain between a game and its learning outcome. The third variable could also be a moderator variable, a variable that interacts and change the relation between the independent and dependent variables. As Mackinnon explains: "*A moderator is a variable that changes the sign or strength of the effect of an independent variable on a dependent variable*." (Mackinnon, 2008, p. 8, emphasis in original). Following the example, a moderator could be individuals' computer literacy, so that the effect of a game on learning would occur for individuals high on computer literacy.

A mediational analysis entailed three general steps: 1) the identification of possible mediators that may affect the outcome of interest; 2) to determine whether or not a particular mediator is causally related to the outcome of interest; and 3) to manipulate this causally related mediator so as to change the outcome. Points 1) and 2) provide a conceptual theory of learning from educational games, that is, how the mediator variable affects the outcome. Point 3) provides a theory of action, that is, how a particular educational game or intervention affects the mediators identified. Below a brief description of the possible independent and moderator variables, together with the main mediator (i.e., engagement) and outcome or dependent variables is provided.

Figure 1: Overview of the general structure for building a conceptual framework



Note. IV = Independent Variable; MV = Mediator Variable; DV = Dependent Variable

Input – Independent Variable (IV) and Moderators. The main independent variable of interest is the game itself. This means the game attributes and the game design patterns. The former has to do with the trilogy of fantasy, challenge and curiosity together with level of control, conflict and feedback. The latter refers to how these attributes have been instantiated in the game. For example, there are dozens of patterns that can be employed for the attribute "challenge" (see Filsecker & Kerres, 2013). In order to measure the variable related to the game there are at least two alternatives: The first one involves the administration of a questionnaire at the end of the game session asking for the perception of the game, e.g. in terms of graphics and aesthetics properties, together with questions related to the core gameplay and main attributes of the game. The other alternative is through the collection of game metrics while individuals are playing the game (Nacke, Drachen, & Goebel, 2010).

A second variable of interest may be the instructional support "embedded" in the game. This support can take the form of simple hints or more sophisticated formative assessment practices within the system or adaptive systems that may model and scaffold individuals' performance (Filsecker & Kerres, 2012). This variable can be seen as a dichotomous variable with or without support or with different types of support. Similarly, a third variable to be considered is the "type of content" in terms of both its degree of difficulty and its nature (e.g., procedural or declarative). Finally, a fourth variable may be related to the person's characteristics. Within the person is important to consider the level of prior knowledge and the working memory capacity. Together some conative factors affecting performance such as motivational orientation, self-efficacy and action control tendencies or volitional style (Snow, 1989). These variables can be easily assessed using existing instruments reasonable well validated.

In this framework the variables mentioned if measured before the intervention, that is, before individuals play the game, can also function as *moderators*. As such, they can inform, for example, whether or not individuals highly action oriented are positively affected by the game as opposed to state oriented individuals. Or whether learning oriented individuals profit more or less from the educational game than performance oriented individuals. In this sense, this part of the framework may inform the "for whom" and "under what circumstances" a game might work.

Process – Mediator Variable (MV). E We argue in this article that engagement and its three dimensions (i.e., behavioral, cognitive and emotional) represent the main moderators of interest in learning from educational games. The framework assumes a highly interactive process between the player and the game. More specific, the framework assumes a reciprocal determination (Bandura, 1986) between the player's perceptions during gameplay, the player's actual actions or behavior, and the system responses to those behaviors. These interactions can be captured by the constructs of volition and types of engagement that are aiming at the same core processes (Table 1). Below we define each type of engagement and its possible measurement strategies.

Table 1: The Process Aspect of the Framework based on Volitional and Engagement Constructs

Volitional constructs	Types of Engagement
Action control: resource allocation and management, protective action toward goals, copying with distractors	Behavioral: Time on task and allocation of attention
Goal-related cognition: mindfulness & adaptive strategy use	Cognitive: mental effort & learning strategies
Consequences: flow and other affects	Affective: flow and other affects

Behavioral engagement. It includes behaviors such as concentration, effort and attention and is commonly understood as time "on task". In the present framework, the concentration and attention are understood in terms of the volitional processes of resource allocation and management and the protection of individuals' action from distractors. Normally, behavioral engagement has been measured either through direct observation in order to determine the amount of on-task versus off-task behavior or through self-reports. In the context of educational games log-files analysis have been conducted to examine individuals' interaction with the game (Hickey, Ingram-Goble, & Jameson, 2009). To have a closer look at individuals' action in the game, the examination of individuals' eye movements represents a promising line of research. Among the dozens of measure possible to obtain from eye tracking data (Holmqvist et al., 2011), the classical fixation duration and dwell time measure together with new ones such as depth of reading and "overview versus reading" scanpath, can provide valuable information concerning individuals' attention patterns while "engaged" in the game.

Cognitive engagement. Cognitive engagement involves both the idea of investment (i.e., effort) in learning and the idea of self-regulation or being strategic. It refers to a "psychological investment in and effort directed towards learning, understanding, mastering the knowledge, skills or crafts that the academic work is intended to promote" (Newmann, Wehlage, & Lamborn, 1992, p. 12) and conceptually similar to Mindfulness (Salomon & Globerson, 1987). Salomon and Globerson define mindfulness as the "*volitional, metacognitively guided employment of non-automatic, usually effort demanding processes"* (p. 625, emphasis in the original). The role of mindfulness in learning is based on empirical evidence showing that when mindfulness is evoked the learning outcomes are improved. Cognitive engagement refers also to the deep or surface cognitive strategies used to process information (cf. Rose & Craik, 2012; Marton & Säjlö, 2005). Therefore, cognitive engagement entails both quantitative aspect (i.e., the amount of mental effort) and qualitative aspects (i.e., the kind of information processing strategies for self-regulating learning) (Corno & Mandinach, 1983). It has been measured mainly through self-reports, such as the Amount of Invested Mental Effort (Salomon, 1984), although there are attempt to measure this mental effort in terms of individuals' pupil size (e.g., Marshall, 2007). The qualitative aspect of it has seldom been addressed. One attempt has been made by the first author in the context of his dissertation (Filsecker, 2013). In his work, Filsecker conducted a process interview (Järvelä, & Salovaara, 2004) and content analysis to examine participants' acquisition and transformation processing strategies (Corno & Mandinach, 1983). To capture the qualitative aspect of human functioning has proven to be a highly complex endeavor and it is still in its infancy.

Emotional engagement. In the literature on learning in schools, this dimension comprises general feelings towards school and the subjects of learning, such as happiness, interest, and being bored. In the context of virtual environments, some authors have defined engagement entirely as an emotional state (Schuurink & Toet, 2010). In general, the qualitative distinction between positive emotions and deeper involvement or mental effort is not made, with exception of the concept of "flow" (Fredricks et al., 2004). The concept of intrinsic motivation (i.e., liking, fun, enjoyment, etc.) belongs to this category of emotional engagement as well as the concept of flow. In the educational game literature, however, most of the questionnaires assessing motivation overlap with the ones used to assess emotions and affects. Therefore, making these distinctions seems theoretically sound and methodologically useful.

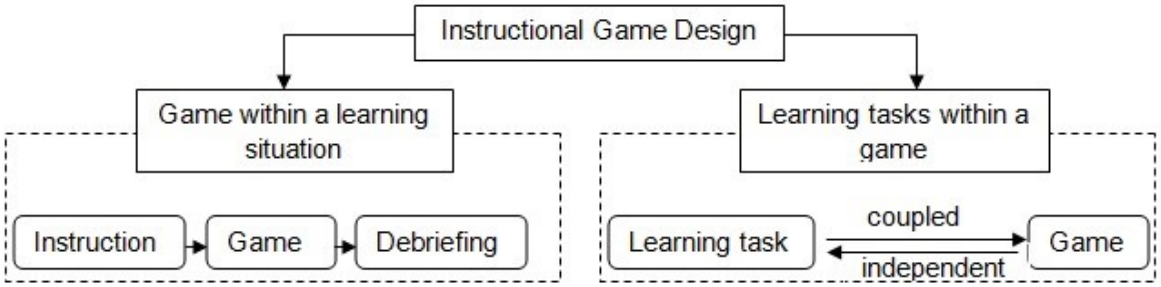
Outcome – Dependent Variable (DV). Outcomes of gaming / learning can be divided in terms of cognitive, conative and affective outcomes. By cognitive outcomes we mean declarative and procedural knowledge, understanding and skill development. Conative

outcomes refer to motivational or volitional aspects that can be affected by a game. Among these we have, for example, motivation to learn, interest, adaptive action control, and achievement orientation, among others. Affective outcomes relate to development of positive attitudes and values toward the subject matter or theme of the game and the game itself as a useful instructional alternative. The literature provides various tools for (reliably) measuring most of these constructs.

Implications for Instructional Game Design

The conceptual framework defines research questions that need to be addressed to understand the role of engagement in learning from games. A theory of learning from games should specify which (instructional) elements and features of games are more likely to support effective learning while minimizing undesirable side effects. By defining engagement as a volitional concept within this conceptual framework it is possible to start working towards the development of an empirically-based theory of learning from games which, finally, will lead to effective design prescriptions.

Figure 2: Strategies for Instructional Game Design by Kerres et al. (2009)



Eventually, a designer of games aiming towards learning can take various strategies of instructional game design (Figure 2) that translate into different routes as to how learning and gaming processes can be interrelated (see Kerres et al., 2009; Filsecker & Kerres, 2013):

Games within a learning situation. A game can take place in a particular learning situation as a source for reflection or a context for practicing the content delivered by instruction. The game will not be able to assure learning by just playing through the game. In this route of instructional game design, a high engagement within the game is not sufficient for learning. In this scenario, embedding the game into a broader context of learning is necessary, for example by an introductory instruction and a debriefing (Crookall, 2010) following a game session. That means, engagement must endure and outlast the game session. In practice, a very high engagement during the game might even conflict with the motivation to participate in a debriefing following (interrupting?) the game session. Therefore, instructional design of the learning context must ensure engagement for the activities of evaluation and reflection following the game session.

Learning tasks within a game. The gameplay (or the progression within the game) is the reward for having solved a certain learning task (= mission). Gameplay and learning activities can be more or less coupled or independent (cf. Klopfer, Osterweil, & Salen, 2009).

2a) If they are highly independent then learning tasks and the actual gameplay are separate areas within the application. The user will have to solve certain tasks to progress with the gameplay. Based on analyses of eye movement patterns, Bormann, Heyligers, Kerres, and Niesenhaus (2008) have demonstrated that it is difficult for students to keep up engagement for a learning task within a game if it is separated from the “real” game. Then, the learning

task might be perceived as a "punishment" and students might tend to use approaches of "trial & error" in order to be able to revert to the "real" game. The volitional control process is actively reducing the cognitive load from the learning task and focusing attention on all possibilities to escape the (then: aversive) "learning situation". Hence, instructional game designers must be very careful to ensure that students keep up motivation and perform a deeper processing of relevant learning materials while being engaged with a learning task in a game. Our discussion indicates that this route is rather fragile and will not always lead to the desired learning outcomes. However, many educational games are based on this scheme of instructional game design and therefore, must cope with this challenge.

2b) If learning and gaming is highly integrated then playing the game in itself leads to learning. In the optimum case, playing the game alone leads to learning: learning and gaming activities are isomorphic. In this case, the game's supports are enough to help individuals implement their goals within the game. To a certain extent, (good) educational simulations provide such an environment for learning: While exploring the simulation (e.g., of a company, of a machine, of an airplane) the student acquires (procedural) knowledge about the system, its variables and their interplay. "Working" with such a simulation, on the other hand, easily becomes "instruction". This means that simulations lack the volitional support of games and assume that individuals' will use effective volitional control to implement the goals suggested by the simulation.

Conclusion

Previous conceptualizations of engagement in terms of a single theory (e.g., intrinsic motivation) do not seem to make justice to the multidimensional character of engagement. Situating engagement as a volitional process opens new theoretical and practical venues. From a theoretical perspective, it may be possible to consider games as supporting volitional processes instead of motivational ones and that – precisely by doing this successfully– games are able to strengthen individuals' motivation. From a practical perspective emulating the volitional features of games and focusing the design of volitional support may represent an enormous advancement for more effective educational game design. Finally, proposing engagement as a mediating variable within a comprehensive conceptual framework provides with a tool to examine in the long-term the questions of how, for whom and under what circumstances educational games – or similar educational interventions – work.

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