Scenario Based Education as a Framework for Understanding Students Engagement and Learning in a Project Management Simulation Game

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Abstract: In this paper I describe s how students use a project management simulation game based on an attack-defense mechanism where two teams of players compete by challenging each other's projects. The project management simulation game is intended to be played by pre-service construction workers and engineers. The gameplay has two parts: a planning part, where the player make managerial decisions about his construction site, and a challenge part where the player chooses between typical problems to occur on the opponent's construction site. Playing the game involves analyzing both your own and you opponent's building project for weak spots. The intention of the project management simulation game, is to provide students with an increased sensitivity towards the relation between planning and reality in complex construction projects. The project management simulation game can be interpreted both as a competitive game and as a simulation. Both of these views are meaningful and can be seen as supporting learning. Emphasizing the simulation aspect let us explain how students learn by being immersed into a simulated world, where the players identify with specific roles, live out specific situations, and experiment with relevant parameters. Emphasizing the competition game aspect we can see how play and competition allow players to experience intrinsic motivation and engagement, as well as thinking strategically about their choices, and hence put attention towards all the things that can go wrong in construction work. The goal of the paper is to investigate empirically how these two understandings influence game experience and learning outcome. This question is approached by qualitative post-game interviews about the experienced fun, competition and realism. Specific attention is given to how the understandings of the experience (for instance as a game and as a simulation) is entangled when the students describe their experience. Using the concepts frame and domain it is analyzed how the students conceptualize and make meaning of the particular educational scenario manifested by the project management simulation game. We take as an outset that students interpret the situations in the project management simulation game as relating to one or several domains, especially the domains competition and simulation. Results suggest that the views of the scenario as a competition and as a simulation do coexist, and that these views merge in a subtle way. The players consider the game to be both a realistic simulation of construction site work and a fun competition in which they try to beat their opponents and these two views do not seem to create cognitive conflicts. In the discussion it is explored how aspects of the design affords this double conceptualization (e.g. the "manage mode" and "challenge mode"), and finally it is discussed how we can explain why the players experience the challenges that they pose on each other as a natural part of the gameplay, but not as a realistic aspect of the game as a simulation.

Keywords: serious games, simulation, scenario based education, epistemic epistemic games, frame analysis, learning games; simulation and competition

1. Introduction

Games holds an educational promise: games are engaging, allows users to try things out in an artificial environment furthermore games embody the constant strive to become better (Gee, 2003) and finally games allow its users to act as through a simulated practice (Shaffer, 2006).

These strengths of games to support learning do not constitute a coherent pedagogical framework, because games both act as a simulated world to experiment with and experience from and also act as a motivational driver for educational activities.

This paper investigates how an educational game combines a *simulation* of important situations and a *competition* against peers into *one* experience and addresses how such an experience can support learning.

Simulations developed to support learning are often built on a conceptual model designed to correlate with the real world, and hence allow for training and experiential learning (Kolb 1984). Competitions on the contrary motivate a player to perform as good as possible in competition with either peers or the game, in order to win. Hence the underlying conceptual model of a game might very well be designed to be fair and

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transparent, without having any alignment with real world phenomenon. Serious games sometimes occupy an intermediate space, both supporting learning by providing experiences with potential transfer to the real world, and by making use of various gamification mechanisms (points, competitive elements etc) unrelated to any simulation (Hamari et al. 2014). The ambition of this paper is to understand how students make meaning in such an intermediate space.

The discussion of the relation between games and simulations goes back several decades and there have been numerous theoretical contributions aiming at developing analytical clarity on this subject (Klabbers 2009; Zimmerman & Salen 2003). This paper explores empirically how an educational design that taps into learning potentials relating both to simulation and competition, is perceived by students. Using post-game interviews, it is investigated how the experience of using the design stems from players' immersion in the simulation of the construction site manager praxis or from the strategic reflections that are necessary to play well and win the game, and how these two meaning making mechanisms interacts.

The paper describes the game *Benspænd* (eng. The Challenge Game), and continue to introduce a theoretical framework for understanding students' work in open ended educational scenarios. The framework focuses on how students and teachers *frame* their activity toward different *domains* of knowledge and praxis, such as school situations and future work situation, but also domains of competing and gaming. After describing the theoretical framework a number of post-game interviews with students of engineering, architecture and various forms of craftsmanship, is described, and finally it is discussed how we can study the way in which the conception of *Benspænd* as a *competition* and as a *simulation* blend in the students framing of their activity.

2. The challenge game-Benspænd

The challenge game www.benspaend.dk is designed to be played by two teams of players. Each team plays the role of manager of a construction project. The gameplay has two main parts: a planning part, in which the construction site manager plans his own activities, allocating resources to various parts of his construction site, and addresses issues that come up, and a challenge part. In this part of the game, the players create problems for the other team of players and thereby make the other players' game more difficult. Playing the challenge game involves analyzing the competitors' building site and plans to find weak links to target for maximum effect. When the players return to the planning part of the game, they must react to the challenges imposed upon them by the other team of players. Figure 1 shows the game interface. The Right side shows a Gantt chart of the timeline of the project. The navigation in the game interface is on the vertical bar to the left. Here you have options of visiting the construction site, the Gantt chart, the different actors, and the economy of the game.

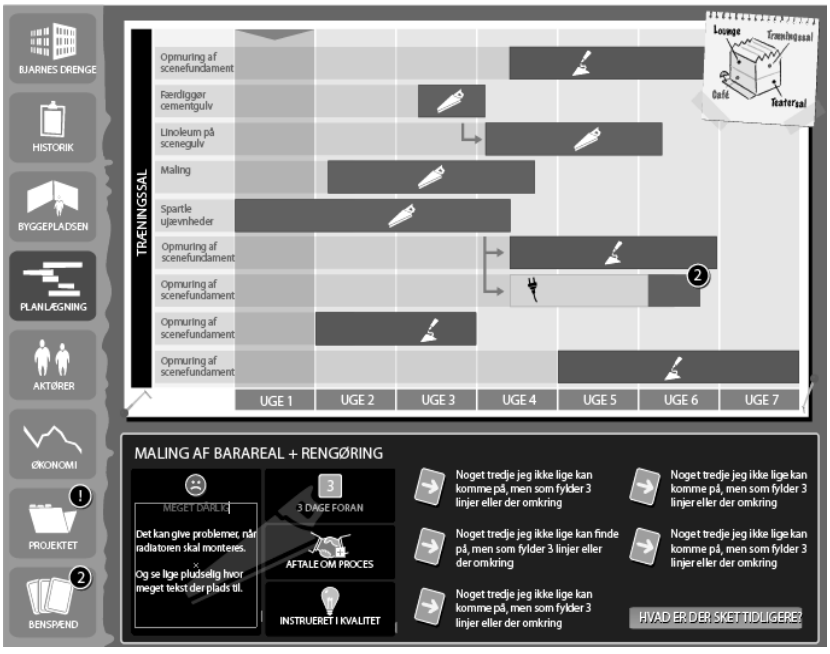

Figure 1: The game interface.

The interface in both the planning part and the challenge part of the game consists of a number of *views;* a Gantt chart, a construction site, and a meeting room with the characters representing all stakeholders involved in the construction project (end users of the house, various construction workers and specialists, the architect, the financial officer, and an engineer). In all these views, players can choose actions (either of a management nature in the planning part or disruptive actions in the challenge part). Furthermore, the interface consists of a view dedicated to the project budget, a newsfeed and a deeper description of the project. The last two views contain overview and information about the construction project and a view, dedicated to prioritizing the chosen actions.

By going through the various views the players are able to discern where the critical and vulnerable parts of the project are and act accordingly by choosing from a set of managerial decisions or challenges. The challenges change the status of the players' projects and when they receive their project after the challenge part, the players need to revise their managerial decisions. These challenges can affect all levels of the construction site, from receiving unclear directions from the architect over problems with rotting timber to social problems and animosity between the workers at the site. The challenges are presented as very short narratives describing what the challenge entails.

The game has been tested in prototype and final versions in order to learn about how the players experienced the combination of the competition like attack/defense mechanism and simulation like use of the construction site as scenario for actions. In order to develop an understanding of this interplay I will introduce some theory.

3. Scenario based education

Scenario based education is a newly developed framework or approach to understanding educational situations building on *scenarios,* understood as real or artificial situations that are used to create context, experience of relevance and immersion, in educational situations. Examples of scenarios include inquiry based approaches where students develop projects answering life problems, various uses of commercial games in education (Hanghøj, 2011), role playing scenarios such as epistemic games (Shaffer 2006) and practicum work.

In educational processes involving scenarios the ability to envision various outcomes of situations predict and make hypothesis, about various outcomes of actions is important. Hanghøj, et al (n.d.) with reference to Dewey (1922) has described this as a process of students *dramatic rehearsal* envisioning, and living out, various possible outcomes of actions in a scenario. We will take four technical terms from scenario based education: *frame, translation, scenario* and *domain*. *Frame, translation* and *domain* are analytical concepts used to describe how students and teachers conceptualize and make meaning of a particular *educational scenario* in this case the challenge game, and how knowledge and competence is moved or translated from various domains in society into education. This way of conceptualizing educational situations is inspired by Hanghøj et al. (Hanghøj et al. n.d.).

Many teaching situations involves a particular environment or situated task that the students work within, in this case it is the challenge game. Following Hanghøj and colleagues (n.d.), I describe such an environment as an educational *scenario.* The concept *frame* designates the socio-cognitive structures that make it possible for people to interpret their world and act within that world. In that sense framing is the cognitive mechanism that allows the generation of a "situation" from the many and diverse sensory motor inputs that an individual receive (Goffman, 1974). Hence frames are crucial for making meaning of educational scenarios. But educational scenarios allow framings to be related to different *translations* between *different domains.* The scenario can be framed as a teaching situation (with tasks to be accomplished by the students by request from the teacher), it can be framed as a competition (where you can win or lose), and it can be framed as a simulation (that resembles a situation that it is important to master). I assume that different *domains* are present in the framing of the educational situation by the individual. Domain is an analytical concept that allows us to point to the relevant clusters of practice. The challenge game is about construction site management, and the students *framing* of the challenge game can be understood with reference to *domains* of craftsmanship, school situations, management and collaboration, but also with reference to domains of gaming and competing. Different actors will frame activities differently and towards different domains. Using a teaching scenario such as the challenge game always involves reductions or simplifications of non-school knowledge practices. In that sense a practice simulation is never build on a complete and accurate model of practice in one specific domain. And furthermore other domains (of schooling, simulating and gaming) can very well be present in students and teachers framing of the situation.

Figure 2 illustrates how the students relate to the educational scenario through different knowledge domains. Disciplinary domains related to the involved scholarly traditions, (eg. management and engineering) specialized domains related to the special aspects of the scenario setting (knowledge about the practice that you enact in the scenario), Your everyday knowledge (e.g. about games and gaming) and school related knowledge about educational traditions, mutual teacher students expectations ect.

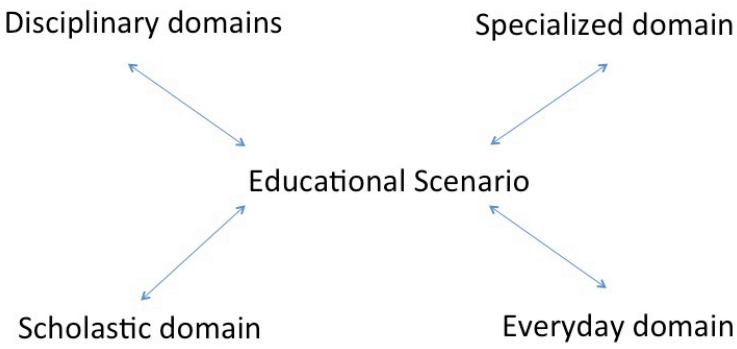

Figure 2: Scenario based education

The concept of frame and scenario is close to Shaffer's framework of *epistemic frames* and *epistemic games* (Shaffer 2006). Shaffer's main idea is to copy professional working situations in order to create a new kid of learning where important competencies come into play. Shaffer considers *epistemic frame* as the way he wants the participants to look at the world, when they play his *epistemic games* which are computer supported practice simulating games. The concept *epistemic game* is to a large extend similar to the concept of educational scenario, but the concept of *epistemic frame* is in a sense a combination of a *frame* - a way for the participant to make meaning in a situation, and a *domain* - a collection of practices, narratives about practices, skills and criteria's and that are known by participants and hence make it possible for them to frame a scenario as a meaningful situation. There is another difference between the frame concept that I apply and epistemic frames. Epistemic frames are learning goals - ways of looking at the world that the student should assimilate to. The frame concept applied in this article is to larger extend an analytical concept, used for understanding how students make meaning in educational situations that points to practices outside school. In the analysis I will focus on how the challenge game is perceived as competition and simulation by focusing on how the students frame the educational scenario towards the two domains *construction site management* and *gaming and competition*, as shown in figure 4.

The domain of construction site management is characterized by enacting managerial decisions in a highly complex situation involving many different groups of employees, investors and users. The domain is relevant to the students playing the game since they all are enrolled in a program targeting a career in the construction sector (Rump et al. 2011).

Games considered as competitions and playful interaction does introduce different domains than school, disciplines and work related domains. Games always communicate the fact that they are games. Playing involves simulating in the sense of using *representations of actions rather than actions*, but playing games also involves competing by making advancing over other players or raising level of points on an artificial scale. Games, in other words, communicate "this is not real - it's just a game" (Zimmerman & Salen 2003).

4. Method, data and analysis

The challenge game was developed in collaboration between experts in construction management, game design professionals and educational experts. The development has followed a design-based research methodology, this means that the data presented here are collected over a period of several years, where we have developed and refined the Challenge Game. The investigation builds on three design based research dogmas by being *iterative*, respects *context* and being *oriented towards theory* (Barab & Squire 2004; diSessa & Cobb 2004). We have used the challenge game as a prototype, a beta, and as the final version. The game has been used with students of architecture, engineering, construction management, and various types of

craftsmanship. The iterative nature of the design process is described in figure 3 where the different prototypes and tests are shown in a timeline diagram.

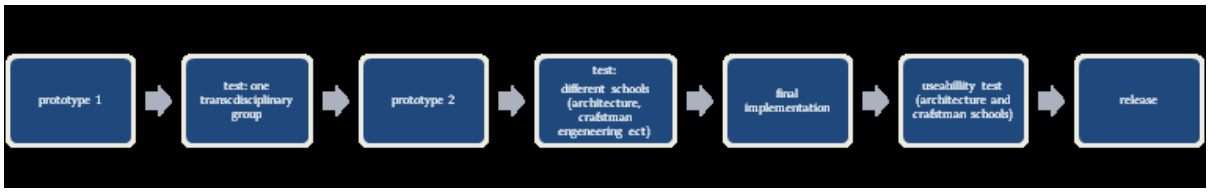

Figure 3: The development process has consisted of iterations of development and test with different stakeholders, and user groups.

Post-game interviews (9 one person interviews and 3 focus groups) were conducted around the experienced realism of the game, the complexity, and the competitive and fun aspects of the game, as well as Human Computer Interaction aspects of the game. These interviews where conducted in relation to the second prototype test.

The interviews evolved around the questions

- How and to what extend is the game considered realistic?
- What kind of learning do the challenges that students pose to each other's constructions convey?
- Do the game mechanics promote the acceptance of disruptive behavior at construction sites?

Apart from these interview data, the team has observed many hours of playing the project management simulation game, had a number of debriefing conversations with users of various prototypes, collected teacher statements from teachers using the game, and collected quantitative data about the users experience with using the game. This article is based on the 9 post game interviews, collected in relation to the test of the second prototype.

The analysis is focused on generating empirical understanding of playing the challenge game and how aspects of simulation and competition are present in the student's conception of playing the game. The domains considered in the analysis are the domain of gaming and competing and the domain of construction site management. In the analysis I investigate how students frame the activities in relation to these domains. The analysis starts with considering the framings and domains related simulation, continues to competition and gaming and ends up discussing how these framings together constitute the students game experience.

5. Simulation

In all post-game interviews the issue of realism was addressed in a very direct way; by asking the students whether or not they considered the game experience as "realistic". In most cases they did, and the question of realism was followed up by a discussion of the nature of the experienced realism, as shown in the following example from an interview with an engineering student (L):

Interviewer (I): Do you think it was a realistic kind of complexity you experienced here?

Respondent (L): Yes.

I: realistic in what sense?

L: Well, uh ...

I: I guess [I am asking because] the game did not contain all the tasks with which belongs to… [normal construction work]

L: no, what can you say? In a small scale, it was very realistic. Obviously missing a lot compared to a real …[construction site/process]

I: So, what was it, that was realistic?

L: Well it was, the consequences of your choices. Only afterwards you could look at the consequences and say, oh yes, of course.

The transcript shows how this student perceives the complexity of the game. The student obviously realizes that the game is different from the real world, yet he still considers the game experience realistic. "L" describes the game as being realistic "on a small scale" in the sense that the game universe is small, and not as complex as the real world, but the feeling of acting within a complex universe where not all regularities are known a-priori is considered as in line with how real construction work unfolds. This is described by "L" as the consequence of not knowing everything before making a choice but understanding, or at least accepting, the choice afterwards.

A similar view is described by another engineering student, who described the game experience as "simplistic realistic".

I: Do you think that the complexity in the game was realistic?

Lo: yes ... simplistic, but realistic, yes.

I: ok. What do you mean by simplistic, but realistic?

Lo: uh. So the concepts/curricular items we are working with now in the Construction Management class -

I: yes, yes

Lo: we must think about a lot more than in the game.

I: yes, ok ... so there are more things in reality?

Lo: Yes

I: What is it then that is realistic? Can you explain how it can still be realistic?

Lo: well, quality assurance, for example. It has consequences if we just progress [with low quality] to meet the time schedule, and that might impact your finances and so on.

This quote also shows that the relation between course of action and consequence is considered realistic even though there is a clear indication that the game experience is not the same as the real world. The game experience described by the two students show that realism is not the same as an immersion into a full-fledged simulation or a fictional universe. Both students show an understanding of realism as something that deals with a specific aspect of the game, the experienced complex relation between cause and effect.

Several of the other respondents did consider the game realistic, but did not consider this realism as having to do with a specific aspect of the game as seen in the following quote with a male masonry trainee "K"

K: yes it was a very realistic game, I think.

I: Fine, I'll just ask, did you do something to decode the game? For example if we do that here, then it will probably have this effect on the status or the numbers in the game?

K. yes yes. When we saved money on something, then we spent some money on providing a good piece rate, to get it to be as nice as possible. But still cheap.

This respondent does not understand that the interviewer asks about where the realism in the game ends and more strategic considerations begins. This can of course be due to communicational problems between respondent and interviewer, but it can also be seen as an indication that the respondents do not even question the realism of the game. When asked about whether or not his team was making game strategic reflections within the game, he answer that they did make management related reflections. We saw several examples in the interviews of respondents that considered the game as realistic without reflection on in what respect the game was realistic.

The students all answer positively when asked whether or not the game is realistic. Some, but not all of the students are able to articulate the type of realism they experience. It seems that the realistic aspect of the game has something to do with the relation between course and consequences. This is expressed as "small scale realism" and "simplistic but realistic". This is a positive result in the sense that the learning objective of

the game exactly deals with understanding the relation between plans and reality, especially in cases where the plan I challenged by unforeseen incidences.

In the observations of students playing the game as well as in the post game interviews we saw no tendencies neglect the fiction of the game, and only play against the game mechanics. Data hence support that the students in general accepts the game as realistic enough to learn with. We need more data to be conclusive in terms of how the game in general is perceived, but we can see that the students that are able to discriminate and articulate how the game is considered realistic, all point to the relation between courses and consequences as the focal aspect of realism in the game.

Most respondent did considered the game realistic, but there was some diversity in how reflective the students were in describing the specific way in which the game was realistic, as some students considered the game realistic without being able to discuss in what way. But the students who are able to discriminate and articulate how the game is considered realistic all point to the relation between courses of consequences and consequences as the focal aspect of realism in the game.

6. Competition, attack and defense

The post-game interviews were also concerned with understanding how the game was perceived as a competition based on rules. A construction manager student expressed his experience as follows after the first proof of concept test:

> *It was fun, like building a sandcastle, and then once in a while the tide comes in and takes some of it, and then:*
>
> *"Oh, s***," now you are set back a lot. And every time you end a task it was like "Yes! Now we are home free with this part."*

The competitive element is highlighted as one of the reasons for the game being entertaining, for example

> *A: it made it more fun – definitely. As soon as there is no competition, then everybody would win, right? And as soon as you get to choose some challenges you think about where you can hit them as much as possible, right? So again, it's just ... having the most fun possible, right? How can we beat them? So, it definitely made it more fun.*

In that sense the competitive aspect and especially the aspect of challenging the other team's project are important for the experience of the game as fun. There is no indication that the students frame the actions of posing challenges towards the domain of construction sites in a direct sense since this would mean that, one could argue that the players act as saboteurs, damaging the opponents' construction site. But the process of posing challenges can support learning in a direct sense. In order to pose the right challenge to the construction site you are targeting, you need a good understanding of the other team's project, plan and available choices. During the tests we observed that participants discussed the other team's plan in detail, to pinpoint where the weak points were and how the disruption of one task could delay the entire plan. This is also expressed by A, who continues the above statement with saying:

> *A: You start unconsciously searching for their most critical path.*
>
> *I: hm*
>
> *A: it is also important in our profession, when we are sitting and doing schedules.*
>
> *I: but it seems you also know that you look at ... uh ... know when you make it there Obstructions?*
>
> *A: Well, obviously. This might seem to the inside. Oh ... but where can we hit them very, hardest? Where will it go really wrong for them if it is ...*
>
> *I: yes*
>
> *A: If we play one of these cards? Which card would go most wrong for them? So unconsciously you look for the most critical path, for them.*

In that sense the competitive aspect and especially the aspect of challenging the other team's project are important for the experience of it being a fun game.

7. Blending competition and simulation; posing of challenges

The respondents described the process of posing challenges to the other team's construction site as making the game fun and competitive. But furthermore the tactical considerations necessary for posing challenges relate to realism and support reflection about construction practice. This is clearly described in the statement above where A expresses that you need to "think about the critical path" (a technical term for describing the most fragile parts of a plan), when posing challenges. Some students even describe a synergy between realism and fun when posing challenges. For example the student "L" (from above) suggested that the game is both a collaboration and a competition because

L: I think it is both, the more competition you put into it, the more our group tried to ruin it for the others, and hence competing to win the game, the more complex the game became for the other team.

Another student expresses that posing challenges forced you to think forward in the game. Her argument is that posing challenges requires that you think a plan through, where is the plan weak, and what can go wrong. This conception of posing challenges is also seen in the interview with the bricklayer student K:

> *I: How was it playing against the others? How did you experience obstructing the others building processes?*
>
> *K. it was fun in a way. You had to think a little tactical and try to play forward in the game.*
>
> *I: hm (yes)*
>
> *K: like so ..*
>
> *I: Was it like a competition against the other team or was it ...*
>
> *K: Yes it was ultimately a contest and [the goal was] to get their plans to not come true.*

Even though K does consider the game purely a competition he does express the need to think forward in the game in order to beat the others, and this shows that the tactical considerations in posing challenges have the potential of supporting learning, but to building on this potential might require that the topic is addressed by at teacher or facilitator.

Hence the game is considered realistic by the students that we have interviewed. Furthermore, a small group of the students that we have interviewed considered the game realistic in a more specific sense. These students were definitely aware that they were playing a game and that the game simulation was different from the real world. Nevertheless, they considered the relation between course of action and consequence in a complex construction process to be very realistic.

The interviewed students all considered posing challenges as a fun and competitive. Some of the students related this activity to the game realism both by reflecting on how the process of posing challenges supported their thinking about what can go wrong in construction sites and even more directly, by suggesting that the posing of challenges is a good way of creating a complex and interesting simulation for the opponent team.

The framework of scenario based education can help us understand how the students conceptualize the game experience. The two concerns of realism and competition can be understood as framing the educational scenario involving the challenge game towards the domain of *construction sites* and towards a domain of *attack defense competitions.* The challenge game *is perceived as a simulation* in the educational scenario if this scenario is framed towards construction sites and *as a competition* if it is framed towards winning an attack defense mechanism game. The data suggests that the challenge game is experienced both as a game and as a simulation in the educational scenarios studied. Furthermore the data suggest that there is a complex interplay between the framings towards the two domains. In order to capture this interplay *two types of framings* can be introduced; (1) *reflection* and (2) *immersion*.

With these concepts the empirical data suggest that the game is considered a realistic simulation since the interviewed students adopt an immersive framing towards the domain of construction site management (they experience doing construction site management), mainly when they perform managerial actions on their own construction site. Furthermore they adopt an immersive framing towards an attack defense mechanism game, mainly when posing challenges (they experience playing a game). The data suggest that some students frame

the posing of challenges, as reflective towards the construction site domain, in the sense that the students reflect on what can go wrong at a construction site, when they are posing challenges against it.

Figure 4 illustrates how the students frame their activities towards the domains of construction and competition in different ways. In the management part they in general adopt an immersive framing towards the domain of construction site, hence accepting the game as a simulation. Simultaneously they adopt a reflective framing towards the domain of competition, being aware that they play a game. In the challenge part the students adopt an immersive framing towards the domain of competition, which makes the challenge game fun and engaging. In the challenge part the game is still framed towards the domain of construction sites, but in a reflective manner. The students are aware of all the things that can go wrong in construction processes without immersing themselves into the role of a construction site manager

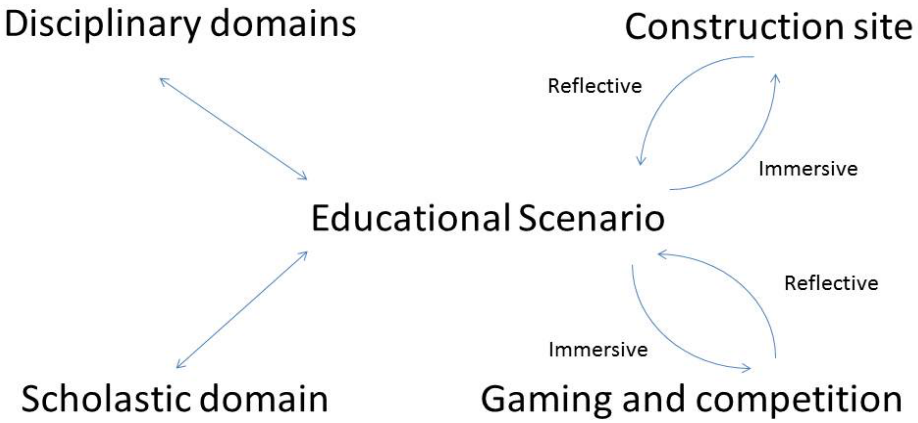

Figure 4: How students frame the educational scenario towards the domains construction site management and gaming and competition.

In conclusion, the challenge game was considered fun by the respondents interviewed, and one main reason for the game being "fun" was the process of posing challenges. This was consistently described in the interviews. At the same time students accept the game as realistic. This means that the choices the players make are both framed towards the domain of construction sites as a realistic simulation and as part of a competition where you have to attack your opponent with challenges and defense yourself against the opponent's aggressive moves.

The gameplay highlights that the same educational scenarios can be framed towards different scenarios by the same individual playing the game. It is documented by previous research that such a situation can create clashes and conflicts for the students (Hanghøj 2011), but this does not seem to be the case in the educational scenarios we have investigated. The data shows no indication that students immerse themselves into a disruptive role. Hence posing challenges is not understood by the students as taking on the role of a "problem creator" as an epistemic frame or set of values in the sense proposed by Shaffer. Rather the role as problem creator for the other construction site creates a competitive gameplay, and acts as an engine to keep students interested in the game. Concerns like "how will my attack work?" And "how will the team we attack react?", suggest that the students frame the game toward a competition. Furthermore awareness' like "what will the other team do to our site?" or "how can we prepare the site for their actions?" allows the students to move meaningfully between framings towards competition and simulation.

The two roles, defending and attacking, give two different perspectives on planning. While trying to foresee what can go wrong in order to avoid it and trying to make things go wrong require similar competences in thinking forward, the framing of the situation is, as we have seen, very different. This double framing might give the players a fuller understanding of the relation between plans and reality.

8. Contribution to scenario-based education

Our analysis shows that students enact several types of translations towards the domains of *construction site* and of *games and competition* in framing the game scenario. We see how there is a delicate blend of translations making specific actions in the game meaningful both in relation to game/competition and in

relation to construction site. The analysis contributes to our understanding of scenario-based education by distinguishing these different translations and framings towards different domains in the scenario and by showing how framings contains translations towards several domains in a game based learning situation.

We distinguish reflective and immersive translations towards both domains of simulations and of competitions. These translations relates to different approaches to learning.

The reflexive translation from the domain of construction site, or more broadly the domain of simulation, allows the student to think about how he/she relates to the practice of construction site management, and reflect about their own role and ways of engaging in practice. Contrasting to this is the immersive translation which allows the students to frame the scenario as lived experience, and as a way of building competence by training. Where the immersive translation resembles a training metaphor for learning, the reflexive framing allows the active intellectual process of relating the practice of constructive side management to theoretical categories. In that sense we have empirical findings that suggest a relation between game activities and learning resembling the findings of Shön (1983) and Kolb (1984), and how they describe of the relations between learning and practice in work life and education.

The translations towards the domain of game and competition can in a similar a way be seen as having a reflective and an immersive component. This way of looking at the translation resonates with the data we have presented about students experience with the construction site management game. The students experience the game as fun and they engage in the competition on an emotional level. Working with the game is experienced as a playful process. But there is a clear strategic reflection on top of the playful experience. When students talk about the fun, they also mention thinking about how "to hit the others as hard as possible" and in that sense making the reflective translation an integrated aspect of the fun. Neglecting the reflective translation from the domain of game and competition has been described by Zimmerman and Salen (2003) as "the immersive fallacy" where engagement in games is understood solely as a matter of immersing oneself into a game world, taking on different identities ect.

The interviews show that the students consider their experience meaningful even thought they frame it as a blend between translations towards the domains of "gaming and competition" and towards the domain of "construction sites". The analysis suggests two different reasons for this. The first reason is that the game is divided into a planning part and a challenge part. These two game modes guide the students to frame their activities towards simulation and construction site (in the planning mode) and game and competition (in the challenge mode). Furthermore if the game actions are framed only through translations toward one of the domains (for instance "simulation and construction sites"), they might not be meaningful. Why develop competence in how to obstruct construction sites? The students interviewed, expressed that posing challenges to the other players construction sites was very meaningful because you "*had to think a little tactical and try to play forward in the game*", this cane be interpreted as a framing combined of a reflective translation towards the domain of gaming and competition and as well as a combination of an immersive and a reflective translation towards the domain of construction sites because the challenges that the players can pose for the other teams, also represents possible problems in real world practice. And because it raises the awareness of the insecurity and contingency in the relation between planned and conducted construction work.

9. Conclusion

In this article it is documented how students frame their experience in an educational scenarios involving the challenge game. The game allows students to experience a simulation of the process of managing a construction site. Furthermore, we have seen that the mechanism of posing challenges introduces a framing that contains translations towards a domain of gaming and competing, while there is none or at least very little conflict between these two domains. Further research should aim at establishing criteria for when such framings towards multiple domains in general are productive or disruptive for teaching and learning, but in this paper we have seen a proof of concept that such framings containing translations towards several domains can support a meaningful educational experience. Furthermore we have shown have the concepts of scenario, domain, translation and framing can be used to

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