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TEACHING OPEN INNOVATION USING A GAME: SOME LESSONS AND RECOMMENDATIONS

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ABSTRACT

This chapter presents how to use a game to teach open innovation, based on a particular experience from which lessons and recommendations are drawn. The focus is on playing a board game in a graduate course of the international engineering program with a focus on innovation and busniess. We identify several important themes related to the process of learning through playing and the social dynamics of open innovation, while we also highlight possible caveats of "playing" and practicing open innovation.

Prerequisite	Basic understanding of open innovation concept.
Objectives of the lecture	Providing knowledge of the process of open innovation, with specific emphasis on the tension between collaboration and competition; Developing the social skills and competences in the context of open innovation.
Workload	4h preparation; 4h teaching, including evaluation.
Learning outcomes	**Knowledge** **Lo #2:** to explore concepts of collaborative innovation and make them actionable. **Skills** **Lo #38:** to identify the nature and characteristics of the innovation process. **Lo #3:** to recognise and evaluate the creative process in individuals and teams and how it contributes towards increased innovation. **Competences** **Lo #89:** to apply management practice in order to promote innovation.
Reading List	Bogers, M., Zobel, A.-K., Afuah, A., Almirall, E., Brunswicker, S., Dahlander, L., Frederiksen, L., Gawer, A., Gruber, M., Haefliger, S., Hagedoorn, J., Hilgers, D., Laursen, K., Magnusson, M. G., Majchrzak, A., McCarthy, I. P., Moeslein, K. M., Nambisan, S., Piller, F.T., Radziwon, A., Rossi-Lamastra, C., Sims, J., & Ter Wal, A. L. J. (2017). The open innovation research landscape: Established perspectives and emerging themes across different levels of analysis. Industry and Innovation, 24(1), 8-40. Bouncken, R. B., Gast, J., Kraus, S., & Bogers, M. (2015). Coopetition: a systematic review, synthesis, and future research directions. *Review of Managerial Science,* 9(3), 577-601. Dodgson, M. (2017). Innovation and play. *Innovation: Organization & Management,* 19(1), 86-90. Du Chatenier, E.., Verstegen, J. A., Biemans, H. J., Mulder, M., & Omta, O. S. (2010). Identification of competencies for professionals in open innovation teams. R&d Management, 40(3), 271-280.
European Qualifications Framework (EQF) Level	Levels 6, 7.

LECTURE CONTENT

INTRODUCTION

This chapter describes how a playful game was used to students about relevant innovation management concepts and practices with particular reference to open innovation — a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model (Chesbrough & Bogers, 2014: 17). More broadly, this process is related to challenges of complex social interaction, e.g. at the intersection of business and engineering where different disciplines such as management, engineering, and design typically have to collaborate across boundaries in order to create something together. We believe that this is a particularly relevant area to apply this pedagogical approach given that open innovation (and related areas) is an increasingly important topic within academia, practice and education (Bogers & West, 2012; Chesbrough, Vanhaverbeke, & West, 2006; Dahlander & Gann, 2010; West & Bogers, 2014).

Games and play are deeply rooted in human beings as a way to learn how to cope with a complex environment. They are a source of creativity, a support for the development of social competence, and a trigger for innovation (Dodgson, 2017; Thomas & Brown, 2011). Playing can be a source of imagination and fun, as well as being conducive to deep learning (Biggs & Tang, 2007; Kolb & Kolb, 2010; Ramsden, 2003). Games give play a direction, and feed into the general theory of learning because playful games can offer students a platform to interact with their environment and acquire/recombine relevant knowledge through addressing the cognitive, emotional and social dimensions of learning (Illeris, 2002, 2003). Furthermore, games allow for the design of elements of active, collaborative, cooperative and problem-based learning (cf. Prince, 2004), into a complex but graspable experience. Moreover, playing games in a teaching setting, also including reflective activities, can address various levels of Bloom's taxonomy and the SOLO-taxonomy of intended learning outcomes (Biggs & Tang, 2007).

We propose that playing a game that includes both co-operative and competitive elements is well suited to approach the complexity of open innovation (cf. Bouncken, Gast, Kraus, & Bogers, 2015). Using such a game can create a shared experience through iterations of relating that enable reflection on intangible social interaction across boundaries. This helps with the teaching of open innovation, because it can increase the understanding of the relevant theories and concepts through application in practice (cf. Schön, 1983). At the same time, it can also contribute to the development of the practical, social competencies that are essential for open innovation — which are until now not completely understood (Du Chatenier, Verstegen, Biemans, Mulder, & Omta, 2010). In this chapter, we therefore address the question of how playing a game, in a teaching

setting, can contribute to the understanding and development of social competencies to cope with the social dynamics of open innovation. Based on our results, we inductively identify five main themes that are important for teaching and coping with the social dynamics of open innovation: 1) social dynamics in playful games; 2) exploring and developing social competencies; 3) managing co-opetition; 4) participation in open innovation; and 5) knowledge as a resource in flux.

Background

Innovation Processes Across Boundaries

Innovation implies the recombination of knowledge and thus implies boundary-crossing knowledge flows (Bogers & Horst, 2014; Galunic & Rodan, 1998; Leonard-Barton, 1995), which in the context of open innovation specifically refers to organizational boundaries even though these boundaries may be considered at multiple levels (Bogers et al., 2017; Chesbrough & Bogers, 2014). When firms open up their boundaries to work together with other stakeholders, including their competitors, many strategic issues arise. In particular, the simultaneous cooperation and competition — co-opetition — with other stakeholders within a value network both enables and constrains firms' abilities to create and capture value through innovation (Afuah, 2014; Bouncken et al., 2015; Brandenburger & Nalebuff, 1996; Nalebuff & Brandenburger, 1997). Open innovation processes also affect the individual level as shown by Du Chatenier et al. (2010) who examine the competencies that professionals need for working in open innovation teams, and to cope with the challenges they face. Their study reveals the importance of brokering solutions, and being socially competent within a context that is inductive to knowledge creation, trust building, and low reciprocal commitment within the open innovation. In other words, social competence is strategically important for collaborative innovation, which links well to the importance of collaborative learning as shown in the educational psychology literature (Kirschner, Paas, & Kirschner, 2009).

The strategic role of social competencies for open innovation is to enable utilization and recombination of existing knowledge within or outside an organization's boundaries, and the generation of new knowledge across boundaries. There is typically different common and domain-specific knowledge within each boundary. This means that managing knowledge creation across boundaries represents challenges related to the different interests and to understanding of meaning between the involved and often interdependent actors (Carlile, 2004). Consequently, a central dimension of open innovation is learning to relate across boundaries in social interaction, and to cope with the inherent challenges. These challenges can be understood as the interplay of complex processes of creating, maintaining, destroying, and recreating rules, use and meaning. We propose to call this social dynamics, and argue that it entails a number of intangible elements, which are accessible only through experience in action. For example:

• continuous (re-) negotiation of power and meaning through local interaction of people (Stacey & Griffin, 2005);
• cognitive social capital such as shared language emerging in practice (Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998);
• institutions as socially constructed frameworks for the justification of knowledge, depending on the acceptance of involved actors (Rolfstam, 2009; Searle, 2005; Tell, 2004).

Thus, strategically important social competencies — the ones our students need to understand in order to grasp open innovation — are context-specific. This implies a need to relate to a co-opetition context in order to understand, and cope with social dynamics of open innovation.

Using Games in Higher Education Courses

Social dynamics, as we described them above, can be understood as an iterative process of perspective making, perspective taking (Boland & Tenkasi, 1995), sense giving, and sense making (Hill & Levenhagen, 1995). During gameplay, relations and shared understanding emerge where the players either take the given perspectives, or give new sense to what and how they do, thus changing their perspectives and what is justified to be true. And while play is free (Huizinga, 2009), games can give play a direction because they are goal-oriented and purposeful (e.g. winning, or leveling up). Mäyrä (2008) argues that games allow designing (learning) experiences in a given contextual frame, through their close relation to simulation, the domestication of information and communication, and interaction. Further, games can provide the closed, limited space, and the complete order that are necessary for play to happen. Thus, games (and board games in particular) can provide a ludic space that is conducive to the development of social competences needed to cope with social dynamics. Related approaches include Brandt and Messeter (2004) who show how design games can facilitate collaboration, while Habraken et al. (1987) explore games as tools for research in design theory and methods. Iversen and Buur (2002) moreover illustrate how games can help to develop design competencies.

As a pedagogical tool and mechanism, playful games fit into a more general theory of learning, as for example proposed by Illeris (2002, 2003), because they integrate internal (psychological) learning, and external interaction with the social, cultural, and material environment (cf. Lave & Wenger, 1991). This is also in line with Thomas and Brown (2011), who propose play, and games as suitable means to enable a new culture of learning (as opposed to the old culture of teaching) that is important for the ability to innovate. This culture, they say, enables learning from within an always emerging and changing environment, and is more about finding the right questions to inquire novelty than about providing right answers. Also, games can put different types of knowledge (e.g. old and new) in relation in order to create a detailed understanding of complex concepts, and underlying processes (rather than only aiming at completing particular task requirements on the surface level).

Further, games are potentially conducive to deep, rather than surface learning (Biggs, 1999; Biggs & Tang, 2007; Ramsden, 2003). Furthermore, games allude to both the cognitive dimension of learning particular content, and the emotional dimension of mental energy, feelings and motivations, while it also relates to the social dimension of external interaction with the environment (e.g. participation, communication and co-operation) (Illeris, 2003).

CROSSROADS: A CASE OF A PLAYFUL GAME

The Goals of the Game

We argue that the opportunities and challenges of social interaction in open innovation processes can be better taught through experience and active involvement rather than through simple transfer of abstract information. Learning and teaching processes of social interaction such as the ones we encounter in open innovation is difficult, because given the high level of uncertainty, both students and teachers have to feel safe to fail. It is important to feel safe to fail (and free to try again), because this allows complex learning in iterations of exploring novelty. Games can provide a ludic space that is conducive to the development of social competences needed to cope with uncertain social dynamics.

Games are moreover a way to introduce activities into the lecture and promote student engagement (active learning). They allow students to go beyond individual work (collaborative learning), to introduce co-operation among the students (co-operative learning), and to address or solve the problem of what needs to be done to play the game together. This also leads to a better understanding of the inherent challenges of open innovation at large (problem-based learning) (Prince, 2004).

By using the game Crossroads, we aim to understand how players make sense of rules in social interaction, and how they create group-specific ways to reach the goals they negotiated. In our approach students are not encouraged to learn memorizing a solution. We aim for deep learning social competences in open innovation through relating, reflection, and inquiry into a shared experience where failure and conflict are welcome sources for learning. Thus, the goal of using Crossroads was not to teach the students a specified way that they must memorize in order to reach a specific outcome. Rather, we aimed for a deeper understanding of the emerging processes when facing the social dynamics of co-opetition as a central element in open innovation by:

1. Creating a shared experience of social dynamics and the paradox of co-opetition for the students:
   a. Sense-making in local interaction: emerging in relation to the context (rules, roles, identity and team spirit within and across groups);
   b. Creating social capital: negotiating meaning, goals, and collaboration;
2. Enable critical reflection on social dynamics of co-opetition based on this experience:

a. The role of rules, and norms when facing novelty across boundaries: perspective-making and perspective-taking;

b. Roles, and turn-taking: sense-making and sense-giving across boundaries;

c. The role of power, and local interaction: conflicts as a resource or problem?

3. Experience-based learning - enable the students to apply what they learned from their reflection and experience through iteration:

a. Learning to confront failure as an opportunity to learn individually and together;

b. Learning how to cope with conflict as an opportunity to learn individually and together;

4. Create deeper understanding of open innovation:

a. Linking experiences and theory.

The Design of the Game

The format

The game (see Figure 1) is a board game for four players, and ideally one has at least two games and two groups of four playing against each other. It was designed at our institute and we use it to address the social dynamics that emerge when facing the dilemma of conflicting interests between individuals, the group they are in, and the group their group is competing against. We chose to develop a board game because the materiality creates both a physical ludic space and it enables natural, personal interaction, especially the use of verbal and non-verbal communication (cf. Bürgi, Jacobs, & Roos, 2005).
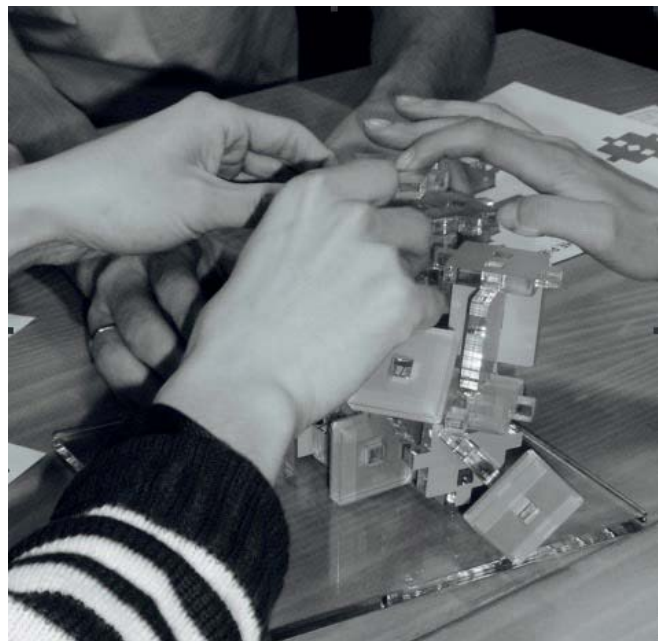

Figure 1. Students playing the game

The physical and intellectual engagement allows the players to experience the complementing interplay of knowledge (the rules of the game) and knowing (how the players put the rules into action or not), as described by (Cook & Brown, 1999). The game consists of a game board, and 36 pieces (nine for each player) in four different colors (one for each player). The pieces differ by the number of holes and fittings, which make it possible to connect them and build a construction. The less connective a piece is, the higher is its point value (e.g. a five-point piece has just one hole, and no fitting, while a one-point piece has three holes and four fittings). Further, there are four action

cards (one for each player) that allow players to manipulate the game play. The players can force a player to take back a piece, swap a piece with another player, steal a turn, or force a player to skip a turn. The players can, but do not have to use the cards. Furthermore, there is a rulebook that provokes the players to negotiate whether to start with only the core rules, or the full set of rules, including the detailed scoring. Players can win in two ways, either as a group by having the most valuable construction (i.e. you need at least two groups), or as an individual by having the least points.

The challenge

The players play two rounds (each seven minutes) and are supposed to take turns in order to put pieces and build a construction with as many points as possible together. Players are not allowed to connect two pieces of the same color. This means they are dependent on other players to provide opportunities and at the same time provide opportunities to others in the form of connective pieces. So far, this is an incentive to collaborate within one group in order to win. However, it is also possible to win as an independent individual of both groups. In order to achieve this, players have to have fewer points in the form of remaining pieces than the other players, i.e. there is an incentive to be competitive and play the high-point pieces first. For example, it is not possible to connect another piece to the piece with the highest point value. If a player would put this piece it would make it difficult (or impossible) for fellow players to add to the construction, leaving the competitive player with an advantage. However, to become the individual winner, the player does not only compete within his group but also with the individuals of the other group(s) that he cannot influence.

Therefore, the players experience the paradoxical challenge of cooperating and competing at the same time. On the one hand, there are incentives for collaboration, because players are interdependent and have to cooperate to build a complex construction. The group with the biggest and most valuable construction wins (this is why you should have two groups playing against each other). This means players have an incentive to provide opportunities for other players to contribute. On the other hand, each individual player has an incentive to play competitive and become the individual winner of all groups by decreasing chances for the group through opportunistic behavior. The complexity of different players and paradoxical goals makes the gameplay uncertain and unpredictable, but when we let the students play the game in iterations (at least two rounds), the dilemma is to find a way to cope with the social dynamics of co-opetition. Table 1 illustrates how the complex theoretical aspects related to open innovation are represented in the game challenge.

Table 1. Presence of Open Innovation Challenges in the Game

Open innovation concept	Game Challenge
Co-opetition	Coping with the dilemma of having an incentive to comptete, and to collaborate at the same time.
Business model	Establishment of a strategy to create maximum value (individual vs. group).
Co-creation	Being dependent on each other to create something together, and win the game (both individual and group); Mutual/collective engagement in stabilization of construction.
Institutions	Class arrangement, game rules, different cultural backgrounds.
Social capital	Development of shared meaning (cognitive), norms and trust (relational), and sub-group building (structural).
Relations	Obligation to interact to play; emerging in interaction during play.
Social skills	Development of group awareness, flexibility, adaptiveness, empathy.
Motivation	Intrinsic: mastering the game, and winning; extrinsic: winning the group/ individual prize.
Reciprocity	Each action taken by a player has consequences for the following players, and is a reply to previous actions.
Power and Control	Who determines how the game is played?
Negotiation	The course of action has to be negotiated between the players with their different interests, and backgrounds.

The Framing

The particular experience presented here is based on an international Masters-level course on open innovation within interdisciplinary engineering program with emphasis on innovation and business. The game was used at the beginning of the course, after the students were introduced to some basic notions in the context of open innovation — also to serve as background for playing the game the next class. After a recap of basic open innovation concepts (including co-operation and competition, knowledge inflows and outflows and incentives and motivations, this class then offered an introduction to the game before the students actually played it. In the introduction, we also presented the prizes for the individual winner (a book in the case of our example) and the

group winner (a copy of the game for each member of the group in our case). In our exemplary case, there were 13 students who were put into three teams of four, with one team having an extra member who served as an observer and did not play the game (this role shifted between the two iterations).

We let the students play two rounds. In the first round, students got a feel for the way the game was played. After that we ran a quick reflection round before the second round started, in which the students could win prizes. After the second round, we gave the students some time to discuss their experiences among each other before we started a reflection. We closed the session by tallying points and distributing prizes.

The physical and intellectual engagement of the interdependent players distinguishes the game from other more abstract learning experiences that typically focus more on transfer of explicit knowledge. Originally, the game was developed to explore group dynamics under novelty and uncertainty within one group of players with regard to the role of rules, power, participation and sense-making. Moreover, in our particular case we believe that the design of the game corresponds to the goals of teaching open innovation when it is used with at least two groups at the same time and played in two rounds:

• Playing the game with different groups creates a shared experience of social dynamics and the paradox of co-opetition within and across groups.
• Discussing the experiences between and after the two rounds enables critical reflection on the social dynamics of co-opetition.
• Running a second round enables the students to apply what they learned from their reflection and experience through iteration.
• The discussions after the game session among and with the students, during which we also inquire theory on the basis of our shared experiences, create a deeper understanding of open innovation.

See also Table 1 for an illustration of how some of the complex theoretical aspects are represented in the game challenge.

Learnings and Attention Points[1]

The First Round and Reflection

The first round was intended to allow the players to explore the game without competing for the individual or the group prize. In the first round, we could observe several social dynamics of open

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[1] This chapter is drawn from the results of our earlier study as presented in Bogers and Sproedt (2012) where there is also more information about the data collection and analysis.

innovation and we iteratively identified four categories of results: physical interaction, social capital, power and rules, and creativity and communication. Table 2 shows similarities and differences between the three groups who played the game. For all groups, the physical interaction with the material in the context seemed to be important for the ability to make sense and grasp the novel situation. Moreover, this physical interaction together with existing social capital is important for negotiating meaning and the creation of new social capital in the form of a shared language and meaning. However, the three groups differed significantly in terms of hierarchical power relations, which dominated the gameplay in groups 1 and 3, while group 2 displayed no hierarchy. While the power built on the control that one group member took over the rulebook in group 3, it emerged from the power of the speaker role to shape perspectives through articulation of own interpretations in group 1. The gameplay of group 2 in contrast, can be characterized by creative exploration and making of perspectives.

Table 2. Observations from Round 1

Group 1	Group 2	Group 3
Physical interaction: Exploring perspectives and making sense of novelty in a complex situation:		
All students interacted physically with the game material while listening to the instructions given by the teacher.		
Drawing on and building new social capital:		
All students negotiate, and create a shared understanding of the game material, and the rules in social interaction with at least one other player. This happens through talking, gesturing, and actively playing the game in a try-and-error manner. For group 1, for example, the shared insight that pure competition leads to gridlock.		
Within the three groups, we found that there emerged sub-groups that formed on the basis of existing social capital, e.g. friendship, nationality, or first language. If there emerged conflicting perspectives, or uncertainty in the larger group regarding how to play, this was discussed in the sub-groups before negotiated with the rest of the group.		
Power and rules:		
One player took the speaker role without any resistance from the other players.	Power, and control were in flux in this group. All group members participated equally engaged when they took control over the game board with the emerging construction in order to put their pieces, and also when they pushed it over to the next player to invite him to put his.	In contrast to the other groups with four members, this group had five members. Player five was assigned to observe the game play.
The rules served as a rough reference point for this group's exploration of the gameplay.		The observer took ownership of the rulebook, and claimed the power to manage, and lead the other players.
Through articulating what happened, and how the speaker interpreted that, he got the power to moderate the		The fifth player used the

Group 1	Group 2	Group 3
discussions. He led the making of the emerging perspective in the course of sense-making, and sense-giving in this group.		rulebook to justify his legitimacy to tell the other players how to play right. Gameplay was led by the fifth player, because if players explored actions that turned out to go wrong (e.g. play competitive), they increased the authority of the fifth player.
	Creativity and communication: The group did not take the perspectives given by the rulebook. Instead they negotiated their own perspectives as a result of exploring opportunities in the emerging gameplay: e.g. by playing counter clockwise instead of clockwise, or by moving the game board over the table. The group talked, pointed, and gestured a lot while moving the game board, and putting the pieces. This group had a very active, and fluent gameplay.	

In the short reflection that followed the first round, the members of groups 1 and 2 said they realized the paradox related to the need to cooperate when they actually had competitive intentions. Further, they expressed that the more they got in the flow of playing, the less the rules mattered. Group 3 was mostly concerned about what was done wrong by certain players (according to the observer who also led the gameplay). Further, this group said that a competitive move of one player in the beginning of the game (despite the other players' protest) determined the rest of the gameplay.

The Second Round and Final Reflection

In the second round, the groups were competing for the group prize and all players competed for the individual prize. When the groups prepared for the second round after the first reflection,

they referred to their experiences from the first round and they negotiated how to play in order to win one of the prizes. There were different opinions within the groups regarding which prize is more valuable and desirable. Table 3 presents our observations during the second round, where we iteratively identified four categories of social dynamics in the gameplay: grasping; social capital and strategy; conflict; and creativity and motivation. In the gameplay of groups 1 and 2, we found evidence for the social dynamics of open innovation regarding the role of social capital for coping with conflict, creativity and perspective-making. The gameplay of group 3 provided evidence for how rules and strategy can take the playfulness out of social interaction, disturb the flow and exclude group members, leaving them frustrated and less motivated to further participate.

Table 3. Observations from Round 2

Group 1	Group 2	Group 3
Grasping novelty through experience:		
The experience of the first round and the following reflection provided knowledge about the gameplay, and developed social capital that allowed the groups to negotiate a group-strategy for how to play the second round.		
Social capital and strategy:		
Engaged in strategic discussion until the game started again.	Rapid interaction, and strong invitations to take over.	The group has a new observer, but the players continue the intense discussion about how to put pieces right while they start playing.
A flying start with almost no conversation, and very quick interaction.	Strong relations, and empathy: players anticipated other players' moves, and preselected possible pieces.	
Few difficulties, but the players helped each other by supporting the construction, or pointing to possibilities for how, and where to put pieces.	Continuous readjustment of choice in relation to the emerging flow of the gameplay. emerging flow of the gameplay.	Each piece is discussed regarding where to put it at which hole, or fitting to use.
Conflicts:		
Parts of the construction fell apart, and the rule that the player who caused it has to take all fallen pieces was ignored.	The more complex the structure on the game board, and the more the players engaged, the more they negotiated possible moves, and helped each other.	Gameplay leads to the exclusion of the blue player, because he cannot put any more pieces.
After being reminded about that rule, the group seemed astonished and the particular player was unhappy, but the		After this happens for the second time, there is a break in, and a discussion emerges about the use of action cards. However, nobody uses them in

group members then followed the rule.

When parts of the construction again fell apart for 2 players, the group consciously subordinated that rule to the goal, and the group members all covered-up the cheat, and immediately added the fallen pieces to the construction again.

All players' efforts increased to stabilize the construction when one player added a piece.

order to avoid conflicts.

Shortly before the time of the second round runs out, the blue player starts challenging the group strategy after realizing that he will be the loser. Time runs out during this discussion, leaving the blue player losing the game. When offered the possibility to put one last piece, because the discussion stole too much time, he refuses with a short "No!".

Creativity and motivation:

The group playing speed caused the yellow player to add his last piece (after being encouraged by the group) before five minutes have passed, i.e. two minutes ahead of time.

While waiting for the other groups, an intensive discussion emerged about gameplay, and what could have been done differently (e.g. using action cards).

The group modified the set-up: they put the game board on a bag to make it slide better over the table when they moved it around when taking turns.

The players literally exchanged their perspectives: when the construction became too complex to be moved across the table, the players started to move around the table to find the best opportunities for themselves, or the group.

The gameplay appears a-spontaneous, and driven by strategy.

During the game, we saw that no player used his or her action card. After counting the points and discussing what happened during the game within the respective groups, the different groups were asked to share their experiences, observations and insights in a general reflection. Group 1 said they were not aware of all the rules and they just wanted to finish as quickly as possible. The players said they had a good collaboration and were happy to "at least have won the individual prize." For the players in this group it was important to "create opportunities for everybody to connect." Group 3 said that they had the goal to create value together. Specifically, one group member said: "We didn't have any competition within our group. We helped each other. So, I guess, if you put it in some theory […] we were able to appropriate the value among the members of our group."

Another player in group 3 said that they had a strategy but did not really think about how the game would end. The group mentioned that there was a positive correlation between group and

individual performance. However, one player was left as the loser, because he was excluded when he could no longer connect his pieces to the construction. The group claimed this could have been resolved if communication between them had been better. The player who lost said he realized the problem before it was happening, but he was not sure whether he did not say anything or if the others did not listen. In either case, he did not consider interfering by playing a card (and risk provoking a conflict). Finally, group 2 mentioned that after this round they think they got a feel for the game and how to finish it in time. They said they learned that they "were too greedy for the group prize, we started with the ones that had more points," which in their case meant that they lacked opportunities to connect pieces in the end.

LESSONS FROM A PILOT OPEN INNOVATION GAME

Social Dynamics in Playful Games

The outcomes of social processes underlying innovation across boundaries and different units of analysis are uncertain and the ways to succeed are largely unpredictable, because the context changes continuously along with the actors and how they participate in the process (Bogers et al., 2017). For this game, which intends to explore the social process of innovation, this means that we cannot know (and teach) how the students should play, because we have no perfect information about the players' motivation, disposition and how they relate to each other. The players have to learn together through exploration.

This kind of learning, as we explained earlier in this chapter, is enabled through play. As we showed in Tables 2 and 3, our playful game allows us to explore how players negotiate a context-specific strategy in emerging social interaction and how they make sense of rules. Instead of monitoring if they comply to a predefined "right" strategy, our game allows to inquire the context (e.g. rules and constellation of players) and interactions of players in relation to each other and to other groups. As we can see in Tables 2 and 3, in group 2 this means that players might find new or unexpected ways of dealing with the challenge of the game - i.e. they can learn social dynamics of collaborative innovation through exploration and reflection on own experiences.

Exploring and Developing Social Competencies

In the game, which addresses the social dynamics when facing the paradoxical dilemma of co-opetition, it is not clear whether cooperation or competition is fully rational. The players have to negotiate what makes sense while the gameplay unfolds in iterative social interaction. In other words, when they make sense of rules and negotiate meaning, the players negotiate what is justified to be true across the boundaries of their different backgrounds and intentions in relation to their new context of interaction (e.g. Table 3, groups 1 and 3). In our conception of games, rules can

be changed by the players through negotiation of meaning and improvisation (e.g. Table 2 and 3, groups 2 and 3). The game invites to explore and to challenge boundaries and understanding, as it is often necessary for innovation. Thereby, playing the game enables students to explore the unknown and test communicative and social processes of interaction through pushing of rules, roles and turn-taking and through cycles of experimentation and reflection (Iversen & Buur, 2002).

This approach aims to enable deep learning through a complex experience with iterations of relating, as it is enabled through play (Illeris, 2002, 2003; Kolb & Kolb, 2010). In this approach, there are rules, but our aim is not to teach the students to follow the rules slavishly in order to achieve a predefined goal in a predictable way. Rather, we aim to understand how players make sense of the rules in social interaction, and how they create group-specific ways to reach the goals they negotiated. Instead of encouraging students to memorize a solution, we aim for deep learning of social competencies in open innovation (Du Chatenier et al., 2010) through reflection, and inquiry into a shared experience where failure, and conflict are welcome sources for learning.

Managing Co-opetition

The game shows that when people enter a collaborative effort that entails motivating a joint production (Lindenberg & Foss, 2011), and openness to external stakeholders (Bogers, 2011; Laursen & Salter, 2006), they might be challenged to balance certain dimensions. All social dynamics categories were related to the dominant theme of the study — the challenge to compete and collaborate at the same time. In round 1, physical interaction was important to make sense of the game and the challenge it represented in relation to and with the other players. In their sense making, the players were drawing on existing, and building new social capital.

This process led to different relations regarding power and rules within the different groups. For example, group 1 explored how far to get on the lane of competition, and they learned that focusing on the individual goals meant ending in a gridlock situation. Based on that shared experience, they smoothly turned to a more co-operative mode. In group 2, we could neither observe any competitive behaviors, nor did the players neglect their own interest in contributing. Interestingly, this group showed social dynamics that we categorized under creativity and communication, because they negotiated their own balance of co-opetition in a surprisingly fluent gameplay. The gameplay was characterized by intense communication (talking, pointing, gesturing) and moving the game board between the players. In doing so the players competed for the best chances to put their pieces, and at the same time they cooperated to create opportunities for the next player. Group 3 was interesting, because here the rulebook played a dominant role for co-opetition. After one player justified his role as a leader by taking ownership of the rulebook, the group turned to a collaborative strategy that did not tolerate competitive behavior.

Participating in Open Innovation

Open innovation depends on sustainable participation of the involved stakeholders. It is therefore important to understand the social dynamics of participation. Participation was rather intense in all groups and we believe that physical interaction facilitated grasping the situation and thus participation. However, the nature of participation was very different. We find that whether all players are motivated to participate – or rather feel obliged to do so – depends on the social dynamics of power and rules, social capital and strategy, and conflicts. Only where the gameplay was explorative and cooperative (groups 1 and 2) could we find evidence for creativity and eagerness to explore further.

Group 1 showed eager interaction with a focus on speed and ad-hoc reacting to the previous player. There was a leader but power and control were shared during the gameplay. In group 2, we observed how the players continuously took control and ownership over the game board for their move (pulling it closer) but also inviting the next player (pushing it over) right after they finished. Further, the players closely followed each move of the other players to anticipate the best way to contribute and adapt their choice for the next piece to put in adjustment to the gameplay. We argue that this shows that the players actively took part in what was going on also when it was not their turn. This could also be observed later when it was no longer safe to push the construction around and all players stood up to better follow and contribute. Group 3 showed a more rational-minded way of participation where moves were discussed and decided from a strategic perspective to try to find the right way. Power and control were organized through the strategy they followed. This is noteworthy, because in that group the game ended with the exclusion and frustration of one player. Even though the group achieved its goal to win the group prize it is questionable how much trust to submit to a group strategy and readiness for collaboration there would be next time. Further, it is interesting that the only way for the group to avoid the frustration of a member would have been to use the more competitive action cards, which would have allowed to exchange pieces.

Knowledge as a Resource in Flux

We identify limits to the traditional understanding of knowledge as something one can possess and which essentially only comes in one kind, thus emphasizing a relational view of knowledge. We found that using playful games is in line with an epistemology of practice, as proposed by Cook and Brown (1999) who see knowledge and knowing as mutually enabling instead of competing. Also Neck and Green (2011) support the argument that teaching complex, dynamic phenomena requires practice-oriented methods. Our evidence supports the argument that knowing emerges in iterative interaction with the social and physical world (grasping), and that interplay between knowledge and knowing can be a source of innovation – e.g. new ways of dealing with challenges (see Table 3, group 2).

In our summarized observations in Tables 2 and 3, we can see the different knowledge conceptions at work in the gameplay. In each group the players engaged in physical interaction with the material and the other players. The players grasped the situation in iterative interaction and developed new social capital while drawing on existing social capital during their sense-making process. They developed a contextual understanding of meaning within their group and different (endogenous) norms how to play, which sometimes diverged significantly from the rulebook (exogenous) – e.g. in group 1 and 2. This happened through continuous negotiation of meaning through talking, pointing, and gesturing – helping them to bridge challenges (mutual helping in group 1 and 2) or causing frustration (rule of strategy in group 3). As mentioned above, we only found evidence for creativity - understood as the development of new knowledge or the recombination of existing knowledge in unexpected ways - in groups 1 and 2. We believe that the reason for this can be found in the different quality of interaction compared to group 3. More concretely, the groups that showed creativity displayed explorative interaction, and they took failure and conflict as a motivation to mutually support each other (group 1) and as an opportunity to learn (see Table 3, group 2). In contrast, group 3 negotiated each step in detail before taking action and put effort in making sure everybody did what was planned (see Table 3, group 3).

Conclusion

This chapter provided a playful and explorative perspective on teaching open innovation concepts and practices. We argued that play can be a source of creativity, imagination and fun in a teaching setting (cf. Kolb & Kolb, 2010). We found indications that playful games can help to create such an experience through interactive experience and simple simulation - thereby helping the students to better understand the theory behind open innovation (Bogers, 2012; Chesbrough, 2003; Chesbrough & Bogers, 2014; Dahlander & Gann, 2010). Moreover, playful games allow understanding open innovation as interplay of complex processes of relating, social capital, and institutions (Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998; Rolfstam, 2009; Searle, 2005; Stacey & Griffin, 2005). They thus allow us to get a more holistic understanding of the complex social dynamics that emerge when people have to deal with novelty.

We used the game Crossroads to create a shared experience of social dynamics of co-opetition for our students. The shared experience enabled reflection on complex social dynamics such as sense-making and the creation of social capital that were experienced in iterations of playing, and enabled experience based learning, and a deeper understanding of theory. The playful game helped the students finding questions to inquire the complexity of open innovation through reflection. Our evidence indicates that the shared experience of playing iterations of the game helped students to relate to, and to develop social competencies that are required for professionals working in open innovation teams (Du Chatenier et al., 2010).

We found that a shared experience of emerging social dynamics during collaborative sense-making and dealing with novelty creates an awareness among the students that facilitates teaching intangible aspects of open innovation. The playful game thus allows to discuss how social dynamics emerge, and how they can lead to differences in co-opetition, participation, and knowledge. For example, we found that creativity is linked to a collaborative gameplay that is open for exploration of competition. Gameplay controlled by strategy was linked to frustration, despite the respective strategy's focus on collaboration, raising the question whether there was too much (strategic) collaboration. Furthermore, knowledge and knowing emerged interdependently in iterations of grasping novelty through iterative interaction with the game material, and other players.

Finally, we hope that this chapter provides valuable insights for educators who would like to use playful games (or play more generally) in their teaching within open innovation. Moreover, we propose that it is important to focus on and explore the process of learning - thus going beyond a simplified input/output perspective. More generally, in the context of innovation and collaboration, our experience so far gives some relevant lessons to consider when coping with novelty across boundaries in a teaching setting, such as that too much strategy can hamper creativity, physical interaction can foster grasping of novelty in dynamic contexts, planning can prevent playfulness and thus exploration, and forced collaboration can prevent sustainable participation. These implications may not only apply directly to an education setting but also have implications for how individuals and groups connect and develop knowledge as a form of social capital in a corporate setting - the ultimate professional space for many students - in which a more playful approach to innovation can provide great opportunities as well as challenges (cf. Statler, Roos, & Victor, 2009).

KEY TAKE-AWAYS

• Playing a game develops the social dynamics of open innovation.

• Games provide an opportunity to engage in negotiation, improvisation, and exploration of boundaries.

• Certain games require managing co-opetition, i.e., the simultaneous pursuit of cooperation and competition.

• Participating in open innovation depends on the social dynamics of power and rules, social capital and strategy, and conflicts.

• In open innovation as a complex and dynamic phenomenon, knowledge can be seen as a resource in flux.

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