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EVALUATIONS OF AN EXPERIENTIAL GAMING MODEL

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Abstract: *This paper examines the experiences of players of a problem-solving game. The main purpose of the paper is to validate the flow antecedents included in an experiential gaming model and to study their influence on the flow experience. Additionally, the study aims to operationalize the flow construct in a game context and to start a scale development process for assessing the experience of flow in game settings. Results indicated that the flow antecedents studied—challenges matched to a player's skill level, clear goals, unambiguous feedback, a sense of control, and playability—should be considered in game design because they contribute to the flow experience. Furthermore, the indicators of the actual flow experience were distinguished.*

Keywords: *flow experience, educational games, game design, engagement.*

INTRODUCTION

Computer games are a quite new form of media (Salonius-Pasternak & Gelfond, 2005), but today they have already established themselves as an everyday phenomenon. In addition to providing entertainment and diversion, games satisfy the basic requirements of learning environments that have been identified by Norman (1993) and can provide an engaging environment for learning as well. Unfortunately, educational games have been used primarily as tools for supporting the practice of factual information learning. In fact, it can be argued that most educational games too often resemble digital exercise books and do not utilize the power of games as interactive context-free media. The reason for this may be that the field of educational technology lacks research on how to design game environments that foster knowledge construction and deepen understanding (Moreno & Mayer, 2005) and problem-solving while engaging and entertaining the user at the same time.

However, Kiili (2005a) proposed an experiential gaming model that may end this trend since it helps designers to understand the learning mechanism in games by integrating

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pedagogical elements into the design process and distinguishes the factors that make game playing enjoyable. The flow theory is emphasized as a design principle because it provides a universal model of enjoyment, detailing the common aspects of the process that takes place when anyone experiences enjoyment. Kiili (2005b) evaluated the experiential gaming model through the IT-Emperor game, which was employed in a usability course. Kiili (2005c) revised the experiential gaming model to better address the needs of educational game designers. The revised version of the model is illustrated in Figure 1.

The experiential gaming model can be used to design and study educational games and gaming in general. It consists of a gaming cycle and a design cycle. The gaming cycle provides a description of the gaming process and the learning process in games. It aims to focus the efforts of designers toward enhancing the most important factors that influence the gaming experience and learning with games. Meanwhile, the design cycle describes the main phases of game design and works as a guideline in the design process. The design process is presented abstractly because it may vary among the different game genres. The model emphasizes the importance of considering several flow antecedents in educational game design: challenges matched to the skill level of a player, clear goals, unambiguous feedback, a sense of control, playability, gamefulness, focused attention, and a frame story. The ambition of designing the sort of games that enhance experiencing flow is justifiable because previous research indicates

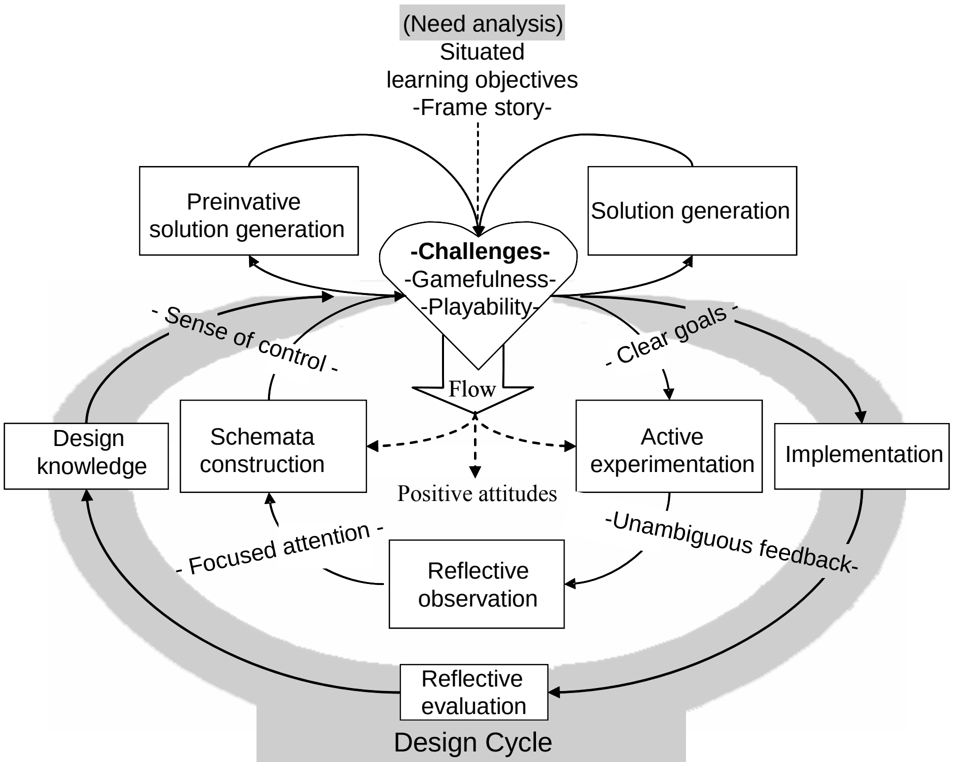

Figure 1. The experiential gaming model developed to bridge the gap between game design and pedagogy. (A fuller description is provided in Kiili, 2005c).

that flow has a positive impact on learning, exploratory behavior, and the attitudes of players (Ghani, 1991; Kiili, 2005b; Skadberg & Kimmel, 2004; Webster, Trevino & Ryan, 1993). A more detailed description of the model is provided in Kiili (2005c).

In this paper, the usefulness of the experiential gaming model is studied through a problem-solving game. Two main goals can be distinguished. The first goal is to validate the main flow antecedents included in the experiential gaming model and to study their influence on the flow experience. Second, this study aims to operationalize the flow construct in a game context and to start a scale development process for assessing the flow experience in game settings. Although Csikszentmihalyi (1991) defined flow as a multidimensional construct consisting of nine dimensions, he relied primarily on the challenge–skill balance to measure flow (Jackson & Eklund, 2002), which is not an adequate measurement method alone. Thus, this paper focuses on developing a flow scale that takes all relevant flow dimensions into account. This paper begins with a brief discussion of the flow experience and the methodology used to measure flow before turning to the evaluations of the experiential gaming model.

FLOW EXPERIENCE

Flow describes a state of complete absorption or engagement in an activity and refers to the optimal experience (Csikszentmihalyi, 1991; Ghani & Deshpande, 1994). During the optimal experience, a person is in a psychological state where he/she is so involved with the goal-driven activity that nothing else seems to matter. Csikszentmihalyi (1991) defined the phenomena of flow state as having nine dimensions. The first five dimensions can be considered flow antecedents and the rest indicators of flow experience (Kiili, 2005c).

1) *Challenge–skill balance*. When experiencing flow, a person perceives a balance between the challenges of the activity and his or her skills, with both operating at a personally high level (Jackson & Marsh, 1996). In the other words, a person's skill is at just the right level to cope with the situational demands.

2) *Action–awareness merging*. The flow state is so involving that, during it, activity becomes spontaneous and automatic. This dimension is problematic from the point of view of educational games because the ultimate aim of educational games is to support knowledge construction, which requires cognitive processing (Kolb, 1984; Winn, 2004). Thus, in this context, the action–awareness dimension should be applied to the playability of the game rather than to the entire gaming activity. Pilke's (2004) argument that the goal of flow-inducing interface design is to design good usability and vise versa supports this view.

3) *Goals of an activity*. The goals should be clearly defined in order to be able to achieve flow (Novak, Hoffman, & Duhachek, 2003). However, the goals of some activities cannot be always clear, as in the case of creative activities. Still, a person can develop a strong personal sense of what he/she intends to do.

4) *Unambiguous feedback*. Unambiguous feedback is related to the goal dimension because it allows a person to know how he/she is succeeding in a specific goal. A reasonable feedback system is easier to develop if the main goal is divided to subgoals.

5) *Control*. A sense of control is experienced without the person actively trying to exert it. Csikszentmihalyi (1991) has stated that this is more a sense of the possibility of control

rather than the actuality of having control. A person senses when he/she can develop skills sufficient enough to reduce the margin of error to close to zero, which makes the experience enjoyable. According to Ghani and Deshpande (1994), this sense of control is one of the most important flow antecedents in games.

6) *Concentration*. Concentration on the task at hand is the most frequently expressed flow dimension (Csikszentmihalyi, 1991). While in flow, a person concentrates totally on the activity and is able to forget all unpleasant things beyond the game. Because flow-inducing activities require a complete focusing of attention on the task at hand, the person has no cognitive resources left for irrelevant information processing.

7) *Loss of self-consciousness*. The self disappears from one's awareness during flow because when a person is thoroughly engrossed with an activity, few cognitive resources are available to allow the person to consider either the past or the future. In other words, flow allows no mental room for self-scrutiny (Csikszentmihalyi, 1991).

8) *The transformation of time*. According to Csikszentmihalyi (1991), the sense of time during the flow experience tends to bear little relation to the actual passage of time as measured by the absolute convention of a clock. Time seems either to "fly" or to "drag." Csikszentmihalyi (1991) argued that losing track of the clock is not a major antecedent of flow and it may be just a by-product of the intense concentration required for the activity at hand.

9) *Autotelic experience*. Autotelic experience refers to an activity that is "done, not with the expectation of some future benefit, but simply because the doing itself is the reward" (Csikszentmihalyi, 1991, p. 67). According to Kiili (2005c), this is the most important final result of flow in educational gaming: Students undertake studying activities not necessarily with the expectation of some external future benefit, but simply because playing the game is enjoyable, a reward in itself. This nature of the flow experience supports the ideology of life-long learning and is a priceless goal in education.

Whenever people reflect on their flow experiences, they mention some and often all of these characteristics (Csikszentmihalyi, 1991). The combination of these elements causes a sense of deep enjoyment that is so rewarding that people feel it's worthwhile to expend a great deal of energy to experience it.

Measuring Flow Experience

Flow has been studied in previous research using several methods. These methods can be divided into two main approaches.

1. The activity–measurement method begins with involving participants in a selected activity. Afterward, participants evaluate their experience either through an interview or by completing a survey instrument (Ghani & Deshpande, 1994; Pilke, 2004; Skadberg & Kimmel, 2004; Webster et al., 1993).
2. The Experience Sampling Method (ESM) gathers information during certain activities. Participants are interrupted for a short period throughout the day activity to evaluate their experience with a survey instrument (Csikszentmihalyi, Larson & Prescott, 1977; Csikszentmihalyi & LeFevre, 1989; Csikszentmihalyi & Nakamura, 1989; Havitz & Mannell, 2005).

In spite of some criticism, both approaches have been successfully utilized in flow studies. An important question in the first approach is whether the respondents can reliably evaluate flow after, rather than during, an activity. On the other hand, the ESM can be criticized for interrupting a participant's experiences and normal behavior, which may decrease the ecological validity of the study (Loomis & Blascovisch, 1999). However, it is apparent that different activities and contexts require different methods for use. Although the ESM provides continuous information about the experiences of the participants during an activity, it is not the appropriate approach for short experiments like the small problem-solving games utilized in this study. For that reason, the first method was selected in this study. The most significant challenge for this study was to operationalize the flow experience appropriately.

Operationalization of the Flow Experience

For the past two decades, researchers have strived to understand how the flow model fits the experiences of people (Voelkl & Ellis, 1998). The nine dimensions of flow outlined by Csikszentmihalyi (1991) have been used as a framework to operationalize flow in various contexts. In spite of that, most of the formed operationalizations of flow branch off quite distinctively from one another. For example, Ghani and Deshpande (1994) used a 15-item scale measuring only the dimensions of enjoyment, concentration, challenge, control and exploratory use. Exploratory use refers to amount of experimentation with tools available. On the other hand, Webster et al. (1993) studied the experiences of an accounting firm's employees who attended a course with a 12-item flow scale measuring the amount of control, focused attention, curiosity, and intrinsic interest they experienced. In sport and physical activity settings, flow experience has been assessed using the Flow State Scale (FSS) questionnaire developed by Jackson and Marsh (1996). This 36-item instrument provides scales of all nine dimensions of flow outlined by Csikszentmihalyi (1991). Internal consistency estimates for the nine FSS scales were reported to be reasonable.

Although the operationalizations of flow diverge from one another, almost all flow measuring instruments include the challenge–skill dimension that has been argued to be the most important flow antecedent (Csikszentmihalyi, 1991). However, Chen, Wigand, and Nilan (1999) have argued that researchers studying the flow phenomenon in a Web environment too often operationalize the perceived challenge too generally. Researchers tend to ignore the original concept of flow as a construct that induces human beings to grow in the sense of fulfilling potentialities and going beyond those limits (Csikszentmihalyi, 1975). Thus, it is not reasonable to assume that we can develop digital environments where users experience flow throughout the entire time they are interacting with or in the virtual environment. In fact, the states of anxiousness and frustration should be understood more as the triggers or driving forces that motivates a user to strive for the flow state rather than as a plague that should be eliminated entirely.

Another important question is how valid users' evaluations of perceived challenge are. In fact, Chen et al. (1999) found in their study that a great number of the participants were confused with the questions measuring challenge. These results indicate that the ways of measuring the skill–challenge balance should be studied more exhaustively.

In spite of efforts to operationalize flow in different contexts, several researchers maintain that much work remains to be done in the operationalization of the key concepts of flow before valid empirical research can be conducted (Chen et al., 1999; Novak, Hoffman,

& Yung, 2000). One aspect that should be considered, in particular, is the partition of flow dimensions into flow antecedents and the flow state. It can be argued that it is not always appropriate to blindly use all nine dimensions of flow before considering the aims of one's study. Is the aim to study the flow state or the factors contributing to the flow experience? In this paper, both flow antecedents and the flow state are studied. The flow dimensions are divided to antecedents and flow state according to previous research (Kiili, 2005c).

METHOD

Participants

Participants (*N* = 221) were recruited by e-mail from university students and staff and their families. The gender breakdown was 56% males and 44% females. The ages of participants were distributed as follows: 9% were over 30 years old, 72% were 21–30 years old, 14% were 16–20 years old, and the rest were 11–15 years old. Fifty percent of the participants played digital games almost daily, 22% played once a week, and the rest played rarely or not at all. All were native speakers of Finnish.

Materials

The game used in this study was based on a Japanese crossword, which is a puzzle also known as nonogram, griddler, and paint-by-numbers. The puzzle genre was selected for this study because solving mental puzzles is one of the oldest forms of enjoyable activities (Csikszentmihalyi, 1991). Generally, the aim in Japanese crossword is to solve the image encrypted with numbers. The numbers are clues that can be interpreted by using logical deduction in order to color the correct squares of the grid. As Figure 2 shows, clue numbers are located at the left and top of the grid. Each number indicates the number of contiguous cells to be colored (length of the filled block). The blocks of cells to be colored are arranged from left to right and from top to bottom according to clues. At least one empty cell must exist between the filled blocks.

The experiential gaming model's design phase was utilized to extend the traditional Japanese crossword into a new game called Day Off. The crossword was embedded within a story line that gives meaning to the puzzle to be solved. The actual game space consisted of 15 columns and 9 rows (Figure 2). The image to be revealed was the Finnish steamship *Piiparinen*.

The game, which was conducted in Finnish, starts with an introduction implemented as an animation that describes the ordinary world of the main character (hero), who is a professional chess player. He has just won the world championship title in chess and is enjoying his vacation by fishing in a national park. Suddenly military troops kidnap him and transport him to their base. The hero is compelled to help military officers solve an encrypted message that contains information about the location of a bomb that terrorists have primed to go off in 20 minutes. The hero hesitates but decides to cooperate because the officers inform him that his son is working in the very harbor where the bomb is located.

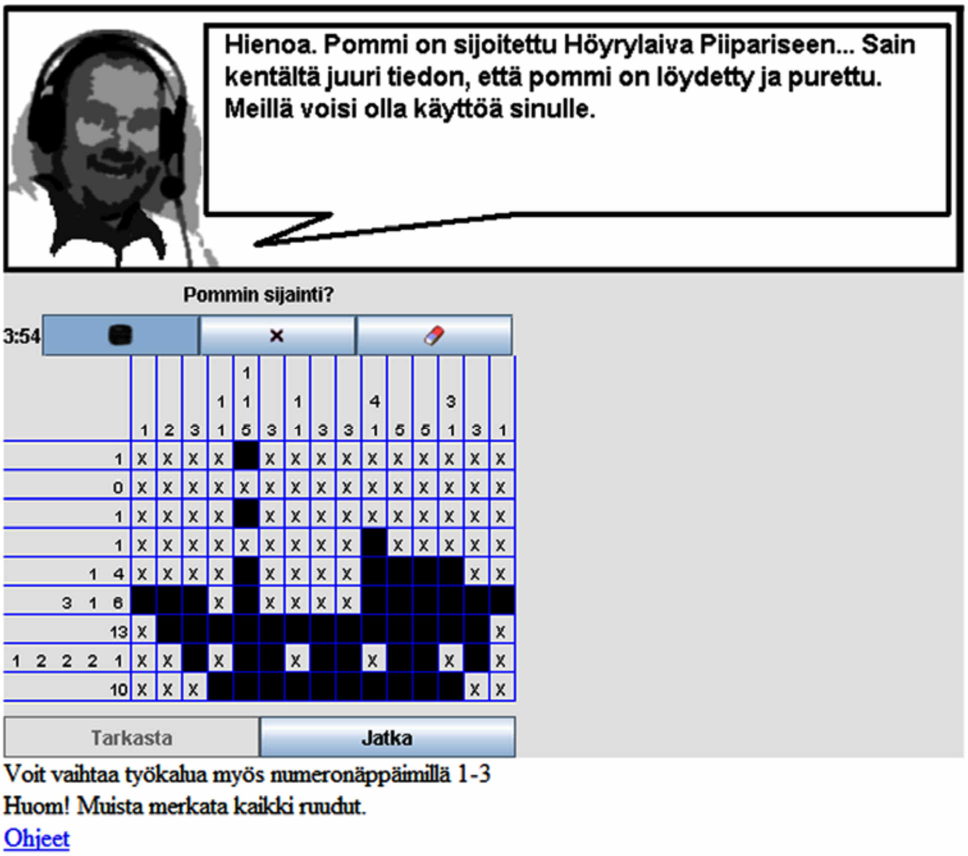

Figure 2. A screenshot of the solved game. (Agent Bob informs that the bomb has been found and disposed of.)

The aim of this scene-setter is to explain the events that have happened to the hero to this point and establish the context for what is going to happen. More importantly, however, the introduction tries to make the player identify with the hero's desperate situation and to get the player committed to and immersed in the task at hand.

The user interface of the game was assumed to be easy to use because there were only three different tools that could be used, two fill-in tools and an eraser. Furthermore, an Agent Bob, who observed the hero's performance and provided feedback and information from the field to the player, was included. When the game begins, Bob introduces himself and explains his role as an assistant in this mission. After 3 minutes of playing time, Bob comments on player's performance at the start of every minute. If the player has not made any mistakes, Bob informs the player that he/she is doing well and should continue accordingly. On the other hand, if the player has made mistakes, Bob informs the player of the number of mistakes made. Bob does not give any specific information about where the mistakes are; the player alone must find the mistakes to be corrected. This type of practice requires the player to reflectively consider his/her problem-solving strategies and may lead to a better understanding of the problem domain. In addition, such feedback minimizes the possibility of participants solving the puzzle using a trial and error method.

One noteworthy characteristic of the game is its low-level adaptivity. If a player has solved 80 % of the puzzle using only 8 minutes, Bob informs the player that a field agent has reported that the bomb will go off sooner than was originally thought. To be more precise, the player is notified that only 4 minutes are left to solve the remaining 20% of the puzzle. The purpose of this characteristic was to make the game more challenging for those users who otherwise would have perceived the game as too easy.

Measures

The data were gathered with virtual observation and a questionnaire. Successfully completing the puzzle, the time used to solve the game, Bob's remarks regarding any mistakes, and the number of mistakes made were virtually observed and recorded to log files. The Flow Scale for Games (FSG) assessment instrument, a condensed and contextualized version of the FSS developed by Jackson and Marsh (1996), was created and used 5-point Likert-type response format (5 = *agree*, 1 = *disagree*). The FSG (see Appendix) consisted of all nine dimensions that Csikszentmihalyi (1991) proposed, except that the action–awareness dimension was implemented as a playability dimension. Included within the FSG instrument were three background questions, two open-ended questions, and a control question of flow experience.

Before analysis, each participant was labeled with a combination of alphabetic letters. This was done to cover participants' identities.

The mean scores and standard deviations of each question were calculated as well as the reliability of each dimension. The reliability was calculated using Cronbach's alpha estimates. In addition, a correlation was used to study the relationship between the dimensions that represent flow antecedents and those that represent the flow experience.

Procedure

The experiment can be divided into three phases; 1) introduction to the study and login, 2) the completion of the Day Off game, and 3) the assessment questionnaire. In the first phase, some background information of the study was presented to participants. When a player logged in, the game started with the animation and some guidelines embedded in the story format, then the actual game playing session began. Players had 20 minutes to solve the game. If the player could not decrypt the message in time, the bomb went off (explosion sound). Then the correct answer was revealed to the player. On the other hand, if the player succeeded in solving the game, Bob informed the player that bomb has been found and dismantled. No matter what the outcome of the game, all players completed a questionnaire aimed at measuring their playing experience.

Results and Discussion

Table 1 shows the means and standard deviations of the items included in the FSG, as well as the reliability estimates of the instrument. The flow dimensions are divided into flow antecedents and indicators of flow experience. The high mean values of the antecedents indicate that the game was well designed and provided good circumstances for the players to experience flow. Despite the playability antecedent, however, the reliability of other antecedents was found poor. This means that the questions measuring the challenge, goals, feedback, and sense of control dimensions need to be further developed. Nevertheless, the reliability of flow antecedents as a construct was acceptable ($\alpha = .71$).

Table 1. Mean Scores, Standard Deviations and Reliability Estimates of Flow Dimensions Included in the FSG (N = 221).

Item number	Flow dimension	Mean	Standard deviation	Reliability
	FLOW ANTECEDENTS			.71
1	Challenge	4.30	0.98	.43
10	Challenge	3.62	1.26	
3	Goal	4.17	1.04	.49
12	Goal	4.35	1.00	
4	Feedback	4.05	1.04	.55
13	Feedback	4.01	1.04	
6	Control	3.94	1.04	.39
15	Control	3.35	1.24	
2	Playability	4.05	1.12	.78
11	Playability	4.34	0.99	
	INDICATORS OF FLOW EXPERIENCE			.74
5	Concentration	3.94	1.13	.75
14	Concentration	4.04	1.13	
19	Concentration	3.82	1.08	
21	Concentration	3.57	1.17	
8	Time distortion	3.09	1.38	.82
17	Time distortion	2.92	1.33	
9	Autotelic experience	4.18	0.89	.87
18	Autotelic experience	3.97	1.02	
20	Autotelic experience	3.81	1.00	
22	Autotelic experience	3.35	1.00	
7	Loss of self-consciousness	4.33	1.02	.57
16	Loss of self-consciousness	3.53	1.28	

Flow experience was measured in two different ways. First, a description of flow experience was given to players and they were asked directly to rate if they had experienced flow on a 5-point Likert scale (control question). The mean score of flow experience was 3.3. Further, the flow experience was measured as a sum of the concentration, time distortion, loss of self-consciousness, and autotelic experience dimensions that can be considered as indicators of flow experience. Results indicated that the correlation between these two measuring methods was very significant (*r* = .62). Further, the Cronbach's alpha estimate of reliability of constructed flow experience was found reasonable (α = .74). Only the reliability of loss of self-consciousness dimension was poor. This constructed flow experience will be used in further analyses. The gaming experience, age, and gender did not have an influence on the flow level perceived.

Table 2 shows the relationship between the flow antecedents and the flow experience. All correlations are significant, which indicates that a challenge matching the players' skill levels, clear goals, unambiguous feedback, a sense of control, and playability dimensions should be considered when trying to design flow-inducing games. Although, these results were achieved through studying a small problem-solving game, the results provide some baseline evidence of the usefulness of flow antecedents, as demonstrated in the experiential gaming model for game design. Now these antecedents are discussed in greater detail.

As previous research (Chen et al., 1999; Kiili, 2005c) has indicated, measuring the perceived challenge is problematic. The results of this study support this finding. As might be expected, people perceive the presented challenge differently. For example, in this study the mean of the perceived challenge of players who could not solve the game (*M* = 3.58) was almost the same level as the mean of players who solved the game (*M* = 3.96). This indicates that the outcome of a playing activity did not have a clear influence on the perceived challenge level. It seems that some people are used to facing more challenging tasks and they appreciate a challenge more than others. Additionally, it may be hard to admit that one's skills are not sufficient to handle the task at hand. On the other hand, according to the t-test, success in the game had a positive impact on the perceived flow level $t(219)=2.15$, $p = .03$ (K-S d = .09 and sense of control $t(219)=2.72$, $p < .00$ (K-S d = .14).

Generally, the goal of the game was well understood and only few players were unable to catch the idea. It seems that the frame story of the game clarified the goals of the game, as player C reported, "*I felt that the frame story increased the clearness of the goal of the game*." In fact, some players reported that they felt responsible for saving the people that the bomb was threatening. However, the frame story also aroused totally opposite feelings in others and was considered a ridiculous and needless feature in small games like this.

In this study, playability was considered from the usability point of view. Players' experiences pointed out that the user interface of the game was functional and did not induce any confusion. Playability had a clear relationship to the sense of control (*r* = .36). Surprisingly, the feedback that Agent Bob provided negatively affected both the sense of control (*r* = -.24) and playability (*r* = -.26). Some of the players felt that Bob did not allow them to solve the puzzle in peace, but disturbed their line of thinking. However, perhaps the clearest reason for negative correlations was the alarm sound used to catch a player's attention

Table 2. Correlations Between Flow Antecedents and Flow Experience (*N* = 221).

	Challenge	Goal	Feedback	Control	Playability
Flow experience *	.31	.28	.30	.47	.31

* All *p* = .00

when a new message appeared. The alarm was experienced as being an annoying feature that disturbed concentration and the whole gaming experience. In fact, the number of incoming messages correlated negatively with the concentration dimension (r = -.22), as well as the feedback dimension (r = -.15). These results indicate that minor things, such as sound effects that break the harmony of the game, can ruin the enjoyment of the game.

One interesting finding was that several players reported that the feedback was pointless because it simply informed that the player was doing very well or the number of mistakes made. Players would have liked to have more precise feedback, such as the location of mistakes. However, such feedback would not have encouraged the reflective thinking that the feedback system was aimed to support. Furthermore, the feedback was constructive only if the player had made mistakes in the game. Thus, the players who had made mistakes in the game gave higher scores on the usefulness of feedback than players who hadn't made any mistakes.

CONCLUSIONS

In this paper the experiential gaming model, useful for the process of designing educational games, was studied through a small problem-solving game. The focus of the experiment conducted was on flow experience because the game used did not provide means to study all aspects of the model. Although the game studied can not be considered a typical educational game, it provided the appropriate environment to study flow elements included in the experiential gaming model. Overall, the results of the study indicated that the original flow dimensions that Csikszentmihalyi (1975) has presented can be divided into flow antecedents and flow experience as follows.

The flow antecedents studied—challenges matched to a player's skill level, clear goals, unambiguous feedback, a sense of control, and playability—should be considered in game design in order to produce engaging and enjoyable experiences for players. Playability is a new flow antecedent that has not been proposed before. It was constructed to replace Csikszentmihalyi's (1975) action–awareness merging dimension, which is problematic in the educational game context. This replacement is reasonable because, according to Csikszentmihalyi, all flow-inducing activities become spontaneous and automatic, something undesirable from the transfer point of view. In contrast, the principles of experiential and constructivist approaches emphasize that learning is an active and cognitive knowledge construction process (Kolb, 1984; Winn, 2004). Thus, a distinction should be made between the cognitive activities related to solving the tasks of the game as compared to the use of the controls of the game. This distinction is illustrated in Figure 3, which reflects the challenge-based relationships among the player, the tasks of the game, and the artifact (the user interface of the game).

All three components—the player, task, and artifact—should be taken into account when designing educational games. Generally, the aim of an educational game is to provide students with challenges related to the main learning task in a way that the flow experience is possible. When both the task and the use of the artifact are complex, then these may detract the player's attention from the learning goal. A game with poor playability decreases the likelihood of the player experiencing task-based flow because the player has to sacrifice attention and other cognitive resources to some unrelated activity. Because the information processing capacity of

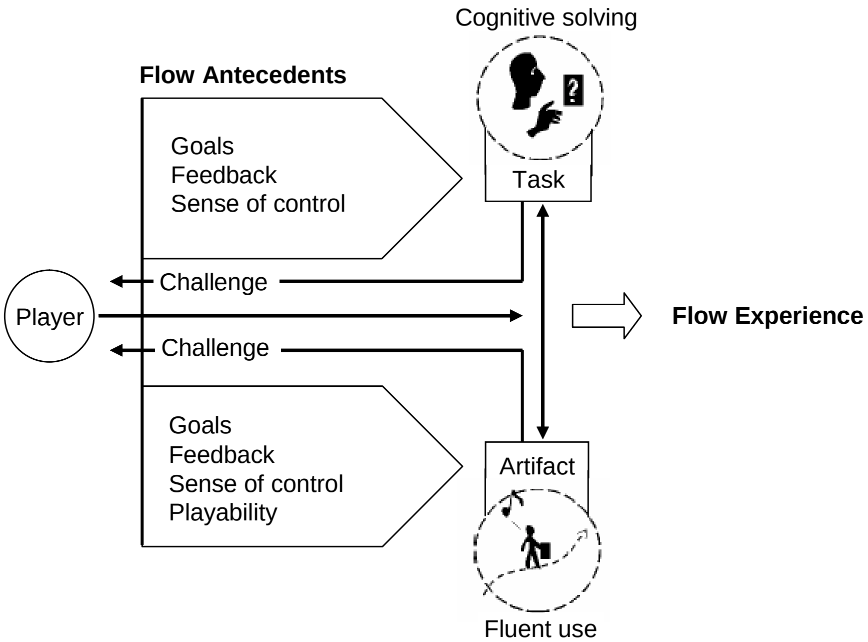

Figure 3. Relation of the flow antecedents to the tasks and the user interface of the game.

human working memory is limited (Miller, 1956), all possible resources should be available for relevant information processing (the main task) rather than for game control issues. Thus, the aim of game designers must be to support the shift from cognitive interaction to fluent interaction. In an ideal situation, the controls of the game are transparent and allow the player to focus on higher order tasks.

The user interface of the Day Off game was quite simple and did not confuse any players. However, an important lesson of this study was the fact that even minor aspects that break down the harmony of the game can ruin the entire playing experience. For example, in the Day Off game, a sound effect that players found annoying disturbed their experiences and inhibited their flow experience.

The results of the study supported the assumption that the concentration, time distortion, autotelic experience, and loss of self-consciousness dimensions can be considered indicators of the flow experience. The interplay of these dimensions facilitates the flow level experienced by players. Furthermore, the results indicated that the flow experience was independent of gender, age, and prior gaming experience. This result is consistent with Csikszentmihalyi’s (1991, p. 49) argument that the optimal experience and the psychological conditions that make flow possible seem to be the same the world over. Thus, it can be argued that the flow antecedents included in the experiential gaming model presented here provide an appropriate design framework for various kinds of games and players.

It is important to note that the flow experience usually occurs when a person’s mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile. Therefore, supporting the flow experience toward a state of enjoyment does not require that educational gaming to be effortless. On the contrary, educational games should stretch a player’s mind to its limits in his/her effort to overcome worthwhile challenges. This nature of flow supports the premise of using flow as one design approach in educational game design. However, perhaps the most important final result of flow is that flow-inducing learning activities are not undertaken by the player with the expectation of some future benefit, but rather because the playing of an educational game itself is the reward. This type of attitude supports the ideology of life-long learning and is a priceless goal in education.

This study is a part of an ongoing attempt to develop a usable and valid scale for assessing the flow experience of players in educational games. The results of the experiment described in this paper demonstrate that the constructed FSG instrument provides a satisfactory tool for assessing the gaming experiences of players. However, this work is still in its very initial stages and the FSG instrument needs further development and validation with more complex educational games.

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Appendix

Flow Scale for Games (translated from Finnish to English)

Please answer the following questions in relation to your experience with the Day Off game you just played. These questions relate to the thoughts and feelings you may have experienced during playing. Think about how you felt and answer following questions. When you have answered all the questions, press the Send Form button. Thank you!

		Agree				Disagree
1	I was challenged, but I believed my skills would allow me to meet the challenge.	5	4	3	2	1
2	I could use the user interface of the game spontaneously and automatically without having to think.	5	4	3	2	1
3	I knew clearly what I wanted to do and achieve.	5	4	3	2	1
4	I was aware how I was performing in the game.	5	4	3	2	1
5	My attention was focused entirely on playing the game.	5	4	3	2	1
6	I felt in total control of my playing actions.	5	4	3	2	1
7	I was not concerned with what others may have been thinking about my playing performance.	5	4	3	2	1
8	My sense of time altered (either speeded up or slowed down).	5	4	3	2	1
9	I really enjoyed the playing experience.	5	4	3	2	1
10	The challenge that the game provided and my skills were at an equally high level.	5	4	3	2	1
11	The use of the user interface was easy to acquire.	5	4	3	2	1
12	The goals of the game were clearly defined.	5	4	3	2	1
13	I could tell by the way I was performing how well I was doing.	5	4	3	2	1
14	It was no effort to keep my mind on game events.	5	4	3	2	1
15	I had a feeling of control of my actions.	5	4	3	2	1
16	I was not worried about my performance during playing.	5	4	3	2	1
17	The way time passed seemed to be different from normal.	5	4	3	2	1
18	I loved the feeling of playing and want to capture it again.	5	4	3	2	1
19	I had total concentration while playing the game.	5	4	3	2	1
20	The playing experience left me feeling great.	5	4	3	2	1
21	I was totally immersed in playing the game.	5	4	3	2	1
22	I found the experience extremely rewarding.	5	4	3	2	1
23	Read the description of flow experience and answer to the following statement: I experienced a clear flow experience during playing.	5	4	3	2	1
	Description of flow: The word flow is used to describe a state of mind sometimes experienced by people who are deeply involved in some activity. For example, a football player may experience flow when nothing else matters but the game itself and it is going very well. Activity that induces flow totally captivates a person for some period of time, in which case time seems to distort and nothing else but the activity seems to matter. Flow may not last for a long time on any particular occasion, but it may come and go over time. Flow has been described as being an intrinsically enjoyable experience.					
24	If you experienced flow, what factors in the game contributed to flow experience?					
25	If you did not experience flow, what factors in the game disturbed achieving a flow experience?					